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• CHEMICALS
• PETROCHEMICALS
• TECHNOLOGIES, PROCESS
  PLANT MACHINERY, CONTROL &
  AUTOMATION SYSTEMS

HANDBOOK ON
INDIAN CHEMICAL INDUSTRY
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Message

Chemical industry is critical for the economic development of any country. India is emerging as one of the focus destinations for chemical companies due to its high domestic consumption growth and Government’s “Make in India” is creating a conducive environment to facilitate investments. A number of multinational and large Indian companies have invested in the Indian Chemical sector in the past and if Indian Government’s Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) policy is implemented well, it is expected to attract major investments from domestic as well as foreign companies. Infrastructure development like ports, productivity, new pipeline, reach and quality of roads, power availability and streamlining the regulatory procedure are key enablers for growth.

I am sure, India Chem 2016, the largest composite event of the chemicals & petrochemicals industry in India with the theme “Exploring Opportunities” will give a good boost to the sector by showcasing its status and potential and debating the way forward.

I am sure all stakeholders will benefit from their participation.

Mr. Vinay Mathur
Deputy Secretary General
The chemical industry is a capital as well as knowledge intensive industry. The industry plays a significant role in global economic and social developments. Globally the industry is integrating as technologies merge. Indian Chemical Industry is a critical part of Indian economy, with huge unrealized potential. The drivers of growth are huge population base, sustained economic growth coupled with present very low rate of consumption levels. The sector faces opportunities as also many challenges.

I am pleased to note that Federation of Indian Chambers of Commerce and Industry (FICCI) and Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Government of India are organising India Chem 2016, the ninth event in the series. As Chairman of the FICCI National Chemical Committee, I must congratulate all the stakeholders.

I wish the event all the success.

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(Deepak C Mehta)

Industry’s Voice for Policy Change
The Indian chemical industry is a critical part of the Indian economy. With more than 80,000 products for downstream industries like automotive, textiles, pharmaceuticals, personal care, consumer durables, construction & engineering, food production and processing, the Indian chemical industry is playing a critical role in nation building and enhancing the quality of life.

I am happy to note that FICCI jointly with the Department of Chemicals and Petrochemicals, Govt of India is organising the India Chem 2016, with the theme “Exploring Opportunities” which is very relevant in the present context. I wish all the best to the event.

Mr. Prabh Das
Chairman-FICCI National Petrochemicals Committee
Managing Director & CEO
HPCL-Mittal Energy Limited
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Foreword

Federation of Indian Chambers of Commerce and Industry (FICCI) and Tata Strategic Management Group (TSMG) together have taken an initiative to highlight the importance of chemical industry for the Indian economy and we are pleased to present the fourth edition of the handbook.

The handbook encompasses an assessment of the chemicals industry in India, within the context of the global industry and the opportunities and challenges it presents. The country’s chemical industry was estimated at $147 Bn as on FY15 and has the potential to grow at 9% per annum to reach $226 Bn by FY20. The growth is expected to be driven by rising demand in end-use segments and expanding exports fuelled by increasing export competitiveness.

With initiatives like “Make In India” program gaining steam, investments, innovation and infrastructure are going to be the major thrust areas for chemical industry. GST reform will also give boost to the chemical industry by lowering the transaction cost and avoiding cascading effect on the taxes. The initiatives like setting up a fully functional single window system for all clearances (SWIFT), reforming labour laws, easing the land acquisition rules coupled with ‘Make in India’ and GST, are expected to propel Indian chemical industry forward. We believe that India has the potential to become a competitive manufacturing hub if the government and domestic players rise up to the challenge.

The authors are grateful to the industry leaders for their insights, point of views and participation in the “CEO speaks” survey. Their knowledge and guidance has helped us shape the handbook. We are thankful to FICCI for providing us an opportunity to develop this report which could benefit the Indian chemical players in assessing the opportunities and improving its competitiveness in coming years.
Table of Contents

Executive Summary ................................................................. 1
CEO Speaks ................................................................. 6
Overview of Indian Chemical Industry ........................................ 9
Indian Chemical Industry: Segment Analysis ................................. 21
  Bulk Chemicals ................................................................. 21
  Petrochemicals ................................................................. 43
  Intermediates ................................................................. 51
  Fertilizers ................................................................. 55
  Pharmaceuticals ................................................................. 60
  Agrochemicals ................................................................. 66
  Specialty Chemicals ............................................................... 76
  Bio-Tech. ................................................................. 102
  Process, Plant and Machinery ............................................... 113
Thought Notes ................................................................. 117
  Opportunities in India in the evolving Global Petrochemical Industry ......................................................... 117
  Future Growth of Indian Chemical Industry mired due to availability of building blocks ......................................................... 122
  Acquisitions: Route to growth in Indian Specialty Chemicals ................................................................. 130
  Reverse SEZ - An opportunity for Indian Petrochemical Industry ................................................................. 135
  Strategies for Indian Agrochemical Companies to address Global Agrochemical Demand ......................................................... 138
  Margin Improvement a Necessity for Indian Construction Chemicals ................................................................. 141
  Strategies for Indian Pharma in a volatile world ................................................................. 147
Crop Protection Chemicals industry-Imperatives of growth .................. 152
A Window to Plasticulture ........................................................ 154
Organizational Culture Diagnostics Study ........................................ 158
About Tata Strategic ............................................................... 167
Tata Strategic Contacts ............................................................... 168
About FICCI ................................................................. 169
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hemicals industry is a diversified industry and covers more than 80,000 commercial products. It provides key building blocks to a host of downstream industries such as automobiles, textiles, papers, paints, soaps, detergents, pharmaceuticals among many others. It is a capital intensive industry which employs approx. 2 Mn people in India. As a result, it plays a key role in the economic and social development of the country. It is a critical element of the manufacturing industry and is highly fragmented in the downstream sector.

Globally, chemical industry was valued at $ 4.3 Tn in 2015 and is expected to grow at 5.5% per annum till 2020 driven by demand from end use industries. The industry is increasingly shifting eastwards in line with the shift of its key consumer industries (e.g. automotive, electronics, etc.), to leverage higher manufacturing competitiveness of emerging Asian economies and to serve the increasing local demand. China, as result of this shift, is the largest contributor with 34% share followed by European Union (17%) and North America (16%) to the global chemical industry.

Indian Chemical Industry
Indian chemical industry is estimated to be valued at $147 Bn in 2015 and contributes 3% to the global chemical industry. It ranks 14th in exports and 8th in imports of chemicals (excluding pharmaceutical products) globally. India's chemical's trade balance is negative with imports being significantly higher than the exports. Net imports have grown at 17% per annum during the 2011-15 period. Western India has been the dominant region contributing approx. 50% to the Gross Value Added (GVA) for the chemical sector.

Government of India has taken several initiatives which will support the growth of chemical industry in India. 'Make in India' is one of such initiative. The initiative is expected to foster growth in Indian chemical industry by enabling duty rationalization for feedstock, improving infrastructure and R&D & skill development along with ease of regulation for setting up “Reverse SEZs” and tax incentives for R&D investments. The other key reform is approval of the GST bill which is expected to be operational from April 1, 2017. This key tax reform is expected to lower logistics cost by 10-15% and create a unified market across the country. To improve trade, SWIFT (Single Window Interface for Facilitating Trade) has been launched which enables importers or exporters to file a common integrated declaration, instead of 9 forms across 6 agencies.
Chemicals industry is a diversified industry and covers more than 80,000 commercial products. It provides key building blocks to a host of downstream industries such as automobiles, textiles, papers, paints, soaps, detergents, pharmaceuticals among many others. It is a capital intensive industry which employs approx. 2 Mn people in India. As a result, it plays a key role in the economic and social development of the country. It is a critical element of the manufacturing industry and is highly fragmented in the downstream sector.

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Driven by consumption growth and Government’s initiatives, the Indian chemical industry provides multiple opportunities for both the MNCs and the domestic companies. Few of which are:

- Chemical producers could enhance profitability of their product portfolio by exploring adjacencies and vertical integration options
- MNCs could further strengthen their position in the country by building strategic alliances, investing in market creation activities and by scaling up through M&A’s
- Domestic companies with competitive cost structure could leverage export potential opportunities

The R&D intensity of Indian companies has traditionally been limited, but this situation is slowly changing with more and more companies looking at R&D as a key source of building and sustaining competitive advantage. The investment in R&D for Indian companies is expected to grow above 2% (as % of revenues) thereby bridging the competitive gap to a certain extent. The industry is also observing increasing tie-ups with academia which will facilitate the technology / applied research further.

Innovation is a good way to ensure sustainability over long term and address challenges occurring due to recession, cyclicality etc. It is not constrained to R&D but applicable to the entire value chain. Innovations in market delivery, supply chain, go to market propositions etc. could help increase competitiveness. Indian manufacturers have been developing market access quite strongly with deeper understanding of regional needs and focus on brand development. Development of these intangible assets will certainly enhance competitive advantage of such companies.

Despite the new government initiatives and continuous improvement efforts by industry participants, the chemical industry continues to face several challenges. Availability of feedstock at competitive cost remains a key concern. Lack of domestic manufacturing of several intermediates increases lead times and lowers competitiveness of downstream producers. Lack of adequate physical infrastructure and sub-par chemical logistics infrastructure makes material production and movement cost intensive. Uninterrupted power supply remains a challenge for the energy intensive chemical industry. To add to above, significant glut in global chemical capacities has led to growth of imports in India. Large capacity additions in Middle East and USA are another cause of concern for the domestic players. The duty structure needs rationalization for several products value chain in order to boost domestic value addition. PCPIRs implementation is yet to take off as expected. Only four states, Gujarat, Andhra Pradesh, Orissa and Tamil Nadu have so far shown interest in developing PCPIR regions.
Chemical Industry Classification

Chemical industry can be classified into 9 key segments (including process, plant and machinery). The key segments are:

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1. **Bulk Chemicals**: Bulk chemical include basic organic chemicals (methanol, acetic acid, formaldehyde, Phenol etc.) and basic inorganic chemicals (caustic soda, Chlorine, Soda Ash etc.). Bulk chemicals (including intermediates) market is estimated at $39 Bn in FY15 and has seen subdued growth despite the growth in consumption, due to falling commodity prices. It is expected to grow at 5% per annum during the next 5 years. Feedstock availability is a major concern area. Improving feedstock supply and exploring Coal and other alternate feedstock are the key opportunity areas.

2. **Petrochemicals**: Major segments for petrochemicals are basic petrochemicals and end-product petrochemicals. The total petrochemical market is valued at $28 Bn in FY15 and had registered a growth of 11% per annum during the FY11-FY15 period. It is expected to grow at rate of 9% to reach $44 Bn by FY20 driven by current low per capita consumption and rise in polymer demand. Volatility in raw material prices, increase in competition from middle-east & China and high entry barriers remain key challenges for the petrochemical industry.

3. **Intermediates**: It includes derivatives of ethylene, propylene, toluene, xylene and benzene. High import dependency, focus on bulk end products, lack of specialized infrastructure and technology changes are critical challenges. It is critical for companies in India to create an integrated petrochemical intermediates plan which would match feedstock availability with downstream and end-use demand. This segment is expected to provide significant growth opportunities for Indian players.

4. **Fertilizers**: It includes all types of N, P & K based fertilizers like Urea, DAP, Complex fertilizers etc. It plays a critical role in Agriculture sector which is critical for social and economic development of India. Market is estimated at $16 Bn in FY15 and has been stagnant in last 5 years due to decline in DAP and NPK consumption, increase in retail prices of DAP and reduction in government subsidy. It is expected to grow moderately at 2.5% in the next 5 years driven by low International prices for Urea, DAP & MOP and continued government support.

5. **Pharmaceuticals**: It includes formulations and APIs. Market in India is estimated at $17 Bn in FY16, having grown at 7.2% per annum from $10 Bn in FY11. India is a world leader in production of generic drugs and is an exporter of pharmaceuticals to more than 200 countries. Compliance with global cGMP standards, high level of fragmentation, government control on prices, lower spend on R&D, lack of skilled manpower are key challenges.
challenges for pharmaceuticals. Despite the same, pharma sector is expected to grow at 12% over the next 5 years driven majorly by demographics, better diagnostic facilities, increased government spending and increased penetration of health insurance.

6. **Agrochemicals**: It includes insecticides, fungicides, and herbicides. Market in India is estimated at $4.4 Bn in FY15. Prevalence of spurious products, stringent regulations, low focus on R&D, inefficient distribution system and lack of awareness among farmers remain key challenges. Market is expected to grow at 7.5% in next 5 years. This growth is primarily driven by increased planned expenditure, formation of Farmer Producer Organizations and increase in exports.

7. **Specialty Chemicals**: Specialty Chemicals are targeted towards specific end-use application and includes Polymer additives, Personal care ingredients, Water treatment chemicals, Construction chemicals, Paints and coatings and Colorants. These chemicals are R&D intensive, high value and low volume chemicals. Market estimated at $28 Bn as of FY15. Market is expected to continue to grow at 13% p.a. to reach $52 Bn by 2020 driven by growth in end use industry (textiles, automotive, glass, construction, paints etc).

8. **Biotechnology**: Biotechnology uses biological processes, organisms or systems to develop products for improvement of human life. It includes segments like Bio-pharma, Bio-services, Bio-Agri, Bio-Industrial and Bio-informatics. India is one of the top 12 Biotech destinations in the world and accounts for about 3% of the global market. It has grown from $ 4.4 Bn in FY11 to $ 11 Bn in FY16 growing at a rate of 20%. This segment is expected to grow rapidly at 23% in the next 5 years primarily driven by Indian demographic factor, higher healthcare expenditure, increasing acceptance of bio products and strong growth in exports demand.

9. **Process, plant and machinery**: The process plant machinery sector in India caters to a wide range of process industries like oil and gas, petroleum refining, fertilizers, chemicals, petrochemicals, oleochemicals, pharmaceuticals, metal processing, cement, paper, sugar, food processing and water treatment. The demand for Process machinery was $3.6 Bn in FY15. Industry has remained flat for the last 3 years due to slow growth in world economy leading to slowdown in investment cycle and delays in government clearances for major project. It is expected to register a modest growth of 5% in the next 5 years driven by growth in Indian economy and possible uptrend in the capital expenditure cycle.

**Conclusion**

Strong end use industries growth driven primarily by consumption is expected to fuel demand of the chemical products and thereby offers an opportunity for both MNCs and domestic chemical companies to grow. Strong outlook for chemical demand should ideally result in investment in capacity additions and hence import substitution. However, increasing domestic production requires being competitive at a global level to withstand imports and increase exports. To successfully achieve this, availability of feedstock, competitive value chain trade position, availability of advanced technology, competitive capital cost and move towards global standards in a planned manner are required.

Besides the above, adoption of an integrated cluster in cluster approach could also contribute in enhancing the competitiveness of domestic manufacturing. India is today seen as a growth market for MNCs looking to expand in emerging markets. Several domestic companies have built significant assets and have the opportunity to go global. The Government initiatives like ‘Make in India’ and GST are certainly major steps which will help improve industry’s competitiveness but a lot more remains to be done. The same could be achieved if industry and Government work in tandem with a vision to make Indian Chemical Industry as one of the most competitive in the world.
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CEO Speaks

Dr. Raman Ramachandran, Chairman & Managing Director, BASF India Limited & Head BASF South Asia

The chemical industry should not be looked at in isolation, but as a part of the Indian economic growth story. The Indian GDP is likely to cross USD 5 Tn in the next 10 years, if we continue to grow at a steady pace and with reforms like GST coming into play. While the demand for speciality chemicals and intermediates will continue to grow in double digits during this time, the tipping point for consumption of high end polymers will occur once the per capita income exceeds USD 2,500. This could be further expedited if the Government creates a level playing field for MNCs and domestic players in terms of infrastructure and standardized policies that encourage innovation, investments and adherence to stringent EHS standards. A solution based approach must be adopted by the Government with a “benefits and penalty” system, to enable the chemical industry to further contribute to the India growth story.

Mr. B K Sethuram, Managing Director, Celanese India

“The industry is expected to grow at a sustained pace but large investments are going to remain a challenge primarily due to feedstock challenges, slow adoption of global standards and regulatory compliances. Consumers needs and preferences are changing rapidly for better products and their adoption could be sped up if the government creates an enabling environment for implementation of global standards”

Mr. Deepak Mehta, Vice Chairman & Managing Director, Deepak Nitrite Limited

Indian chemical industry is on the cusp of a growth trajectory. Seasoned industry players need to be bold and take advantage of this future opportunity. There are several investment avenues to partner through Government initiatives like Reverse SEZ and PCPIR’s which may open up further opportunities for Indian and large global players.
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Mr. Rakesh Bhartia, Chief Executive Officer, India Glycols Limited

“The chemical industry in India will continue to grow and will play a significant role in all major initiatives undertaken by Government viz: Agricultural productivity, Clean India, Make in India etc. Biggest challenge is to make the growth happen in a sustainable manner without compromising its reputation and safety. To meet the growing requirements, industry must prioritise ‘innovate to adapt’ and then pursue R&D for innovation”

Mr. N B Godrej, Managing Director, Godrej Industries and Chairman, Godrej Agrovet

As rightly said by Sheikh Zaki Yamani, “The stone age did not end for lack of stone, and the oil age will end long before the world runs out of oil”. The prices of crude have fallen but it should not mean that speed of innovation through alternate feedstocks should slow down. Using renewable sources instead of fossils and technologies such as cellulosic cracking is a great opportunity for chemical industry having a distinct possibility of reducing the impact on climate change. Further improvements on ease of doing business by Government such as allowing free power trading could improve competitiveness of Indian industry.

Mr. Vipul Shah, COO - Petrochemical Division, Reliance Industries Limited

Business sentiment in the country has certainly been improving, following a number of strategically undertaken economic and regulatory developments. In light of this promising environment and the volatile global arena, the competitive landscape in our country is expected to change. So as to sustain global competition, chemical players in India need to focus on value addition and customer service. Moreover, in order to tread a sustainable growth trajectory, agility will play a vital role in determining one’s competitive advantage. You can expect the Indian chemical industry to undergo consolidation through acquisitions and integration so as to realize some of these strategic objectives.
The Indian chemical industry would continue to provide a critical platform and play a key role as an enabler for other industries, and itself, to deliver on the promises and objectives of marquee initiatives like “Make in India”, “Smart Cities” and “Swachh Bharat”. Core to our strategy is the continuing pursuit of Sustainability and Innovation and this we believe would remain the key opportunity area for fueling growth in this sector.

Government can help catalyse the growth of the Indian chemical sector by recognizing more actively the potential this industry can bring to the table by truly partnering with it in a host of ways ranging from early stage consultations in shaping relevant policies, providing a free yet fair market, engaging in building capability and skills to drive innovation.....the priorities and areas are well known.
Chemical industry in India is a diversified industry, covering more than 80,000 commercial products. The chemical industry is the mainstay of industrial and agricultural development of the country and provides building blocks for several downstream industries such as textiles, papers, paints, soaps, detergents, pharmaceuticals, varnish etc. It is knowledge as well as capital intensive industry which employs a large number of people. In India, more than 2 Mn people are employed in this industry.

Indian chemical industry comprises of both small scale as well as large scale units. The large scale units are able to set up capital intensive projects with long gestation periods. While the fiscal incentives provided to small scale units earlier led to development of large number of small and medium enterprises (SME). Over the last five years Indian chemical industry has started to evolve rapidly.

With initiatives like "Make in India" program gaining steam, investments, innovation and infrastructure are going to be the major thrust areas for chemical industry. Apart from this, a large talent pool is available which will foster growth of the chemical industry. The current low per capita consumption (10 kgs for polymers in India as compared to world average of 25 kgs) suggests that the demand potential is also yet to be realized. Moreover India has a very strong outlook for the key end user industries (e.g. Packaging is expected to grow at 18% p.a. over the next five years, Electronic is expected to grow at 12% p.a. over the next five years, Construction and Automotive both sectors are expected to grow at 12% p.a. over the next five years).

In the biggest tax reform since Independence, "Goods and Services Tax" bill was passed on 3rd August, 2016 by Rajya Sabha which will give boost to the chemical industry by lowering transaction cost and avoiding any cascading effect on the taxes.

Hence, going ahead the demand of chemical products is expected to surge at 9-11% p.a. over the next five years.
Global chemical market size was estimated at $4.3 Tn in 2015 and is expected to grow at 5-6% per annum over the next 5 years to reach $5.7 Tn by 2020. Indian chemical market size stands at $147 Bn in 2015. Despite its large size and significant GDP contribution, Indian chemical industry currently accounts for only 3% of the world chemical market. India ranks 14th in the world exports of chemicals (excluding pharmaceutical products) and ranks 8th in the world imports of chemicals (excluding pharmaceutical products) with a valuation of $29.76 Bn in 2014.
Chemical sector accounted for 2.5% of the overall GVA (at 2011-12 prices) in 2013-14, compared to 2.45% in 2012-13. The share of this sector in the GVA for manufacturing sector at 2011-12 prices was 13.84% during 2013-14 as compared to 13.38% in 2012-13.

Net imports have grown at 17% between 2011 and 2015. Import - Export trend from 2010 to 2015 is shown below:

**Figure 3: Import - Export Trend of Indian Chemical Industry (In Rs. Lacs Crore)**

![Import-Export Trend Chart]

**Note:** HS Codes 28, 29, 32, 39, 4002, 54 and 55 are considered in the above figure

**Source:** Chemicals & Petrochemical Statistics at a Glance 2015

Consumption of major chemicals has also witnessed 6% CAGR between FY11 and FY15. Top six States, namely, Gujarat (33.5%), Maharashtra (19.7%), Uttar Pradesh (6.0%), West Bengal (5.0%), Himachal Pradesh (4.7%) and Tamil Nadu (4.1%) contributed 73% in the Gross Value Added (GVA) for the chemical sector. The same six States, namely, Gujarat (30.6%), Maharashtra (16.3), Uttar Pradesh (5.4%), West Bengal (6.4%), Himachal Pradesh (3.1%) and Tamil Nadu (5.3%) contributed 67% in the Value of Output.

**Figure 4: Major Chemical Consumption Trends in India (In 000'MT)**

![Major Chemical Consumption Trends Chart]

**Source:** Department of Chemicals & Petrochemicals
Industry segments

Chemical industry is broadly classified in the following sub groups:

1. **Bulk Chemicals**: It includes basic organic chemicals (methanol, acetic acid etc.) and basic inorganic chemicals (carbon black, calcium carbonate, chlor alkali etc.).

2. **Petrochemicals**: Petrochemicals are chemical products derived from petroleum. The two most common petrochemical classes are olefins (including ethylene and propylene) and aromatics (including benzene, toluene and xylene isomers).

3. **Intermediates**: It includes derivatives of ethylene, propylene, toluene, xylene and benzene.

4. **Fertilizers**: Fertilizer is any organic or inorganic substance which supplies chemical elements required for plant growth. Fertilizer sector manufactures critical raw materials for agriculture which is a major occupation of the country.

5. **Pharmaceuticals**: It includes formulations and APIs.

6. **Agro Chemicals**: Chemicals essentially meant for protecting agriculture crops such as insecticides and pesticides are covered under this sub-group.

7. **Specialty Chemicals**: Specialty Chemicals, also known as performance chemicals, are low-volume but high-value compounds.


9. **Process, plant and machinery**: The process plant machinery sector in India caters to a wide range of process industries like oil and gas, petroleum refining, fertilizers, chemicals, petrochemicals, oleochemicals, pharmaceuticals, among others.

10. Of the five segments, a Bulk chemical (27% share) is the largest followed by petrochemicals (19%) and then specialty chemicals (19%). In terms of potential growth, a specialty chemical is the fastest growing segment followed by bulk chemicals.
Figure 5: Sector-wise Breakdown of Indian Chemical Sales in FY15 (In $ Bn)

Note: # Bulk Chemicals includes Intermediates
1. Process plant and machinery is excluded
Source: Industry reports, Analysis by Tata Strategic

Major Initiatives

- **Make in India**: Make in India is an initiative launched by GOI on 25th September, 2014 to encourage multi-national as well as national companies, to manufacture their products in India. It will help in the growth of chemical industry in the following ways:

  - **Feedstock**
    - Duty rationalization: partially addressed (import duty on ethane, propane, butane, reformate reduced to 2.5% from 5%)
    - Higher availability of feedstock and focus on alternate feedstock
  
  - **Infrastructure**
    - Higher focus on R&D and Skill Development Infrastructure
    - Comprehensive programme for treatment of chemicals under “Swachh Bharat Abhiyaan”
  
  - **Regulations**
    - Setting up of “Reverse SEZs”
    - Introduction of Tax incentives to catalyse R&D investments in the priority areas

Source: Industry report analysis by Tata Strategic
**Goods and Services Act:** Goods and Services act which is expected to be operational from April 1, 2017 will help the chemical sector in the following ways:

- GST implementation is expected to reduce the logistics cost for chemical industry by 10-15% which will directly add to their bottom-line
- Petrochemicals, if exempted from the purview of GST would lose input credits. It would also increase revenue neutral rate for other chemical products resulting in increase in tax burden
- Current urea manufacturing duty is 1% without CENVAT (on MRP) or 5% with CENVAT. Government subsidy is not taxed. Fertilizer should be zero rated
- Phosphoric acid/other chemical imports currently exempt - will have immediate cash flow impact unless IGST exemption granted
- Salt & Seeds business if not zero rated, will result in increase in cost

**Industry Challenges**

The industry is facing numerous challenges around raw materials, infrastructure & environment, duty structures, manpower etc. Some of the key issues have been detailed out below:

- **Feedstock**
  
  Continuous availability of feedstock at a competitive cost is a key concern for the companies operating in this sector. Feedstock (naphtha and natural gas) are critical inputs for both organic and inorganic chemicals industry. Costs of these raw materials are high as compared to countries like China, Middle East and other South East Asian countries such as Thailand and Malaysia, which makes the products uncompetitive in the International markets.

  More than 50% of global petrochemical capacities are based on naphtha, a crude oil derivative product, thereby making petrochemical prices highly volatile

- **Infrastructure & Logistics**
  
  Due to poor infrastructure facilities at ports & railway depot and poor pipeline connectivity, domestic manufacturers face difficulties in obtaining raw materials from suppliers at competitive prices. Apart from this, intermittent power supply is another issue which is affecting the energy intensive chemical industry, especially the small and medium players.

  The Indian bulk chemical industry is mainly concentrated in the West coast, especially Gujarat, due to close proximity of raw materials and ports. However,
Goods and Services Act

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- Petrochemicals, if exempted from the purview of GST, would lose input credits. This would also increase the revenue-neutral rate for other chemical products, resulting in an increase in the tax burden.
- Current urea manufacturing duty is 1% without CENVAT (on MRP) or 5% with CENVAT. Government subsidies are not taxed. Fertilizers should be zero-rated.
- Phosphoric acid or other chemical imports currently exempt will have immediate cash flow impact unless IGST exemption is granted.
- Salt and seeds business, if not zero-rated, will result in increased costs.

Industry Challenges

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  The Indian bulk chemical industry is mainly concentrated in the West Coast, especially Gujarat, due to close proximity of raw materials and ports. However, majority of the demand comes from end-use industries located in the Southern and Eastern regions, leading to distribution issues and high transportation costs.

- **Competition Intensity**
  
  The chemical industry faces a major challenge in the availability of cheaper imported chemicals from low-cost manufacturing hubs like China. Under various multilateral and bilateral agreements (FTAs), India has committed to gradually eliminate the tariffs on various chemical products in addition to non-tariff import barriers such as quotas based on amount and source. Also, many of the chemicals are placed in Open General Licence (OGL) of imports. This has increased the import of various chemicals, intermediates, and end products. If the government decides to reduce the import tariffs further to meet the increasing demand of the country, then the level of competition in the Indian chemical industry will further intensify.

  Large capacity additions in countries such as ethane-rich Middle East and shale gas-rich USA are another cause of concern for the domestic players as they may affect their market. It is estimated that out of the 30 Mn Tonnes of ethylene capacity additions expected during period FY15-FY19, 12 Mn Tonnes is expected to be in the US alone. Since, ethane and petrochemical products are cheaper than petrochemical products in India, it will affect the margins of domestic players due to underutilization of their capacities.

- **Regulatory Issues**
  
  The prevailing duty structure taxes raw materials (inputs) at a higher rate than the finished product, thereby discouraging domestic value addition through local manufacturing. Also, Free Trade Agreements (FTAs) with certain countries ensure that finished products draw negligible duty. In terms of finished goods, the domestic manufacturing has grown at a much slower pace than imports in the last 3 years.

- **Implementation of Petroleum, Chemicals and Petrochemical Investment Policies (PCPIRs)**
  
  Though the PCPIR policy was notified in 2007, it has not witnessed significant offtake by the states till now. Only few states including Gujarat, Andhra Pradesh, Orissa, and Tamil Nadu have shown interest in developing PCPIR regions. Some states have also witnessed opposition by the farmers in land acquisition for developing PCPIR. Hence, the Government is planning to revise the PCPIR policy to make it more attractive for states to implement it and attract investment.

- **Manpower**
  
  Lack of skilled manpower is a major issue faced by the industry. To address the issue, the Ministry of Chemicals and Fertilizers recently signed 3 MOUs with the Ministry of Skill Development and Entrepreneurship.
Key Industry Opportunities

Due to current initiatives of Industry and Indian Government, Indian chemical industry provides a host of opportunities for MNCs and SMEs alike. Some of the opportunities are listed below:

✧ Product Portfolio

Commodity chemicals can enhance their product portfolio by adding specialty chemicals such as polymer additives, water treatment chemicals, lubricating additives etc. For example, the demand for performance plastics such as biodegradable polymers is expected to be on rise across the world including India. Given the environmental concerns with traditional plastics, companies should look at expanding their portfolio and include more value add products.

Indian specialty chemical market is characterised by the opportunity for local customization. Lot of customers are sacrificing on some of the product attributes for a lower product price which can also lead to export competitiveness. During the period of 2014-2020, products worth $ 6.3 Bn are expected to go off-patent which will provide Indian generic product manufacturers an opportunity to expand their market presence and grow organically.

✧ Market Access

India represents a large and fragmented end-user market for which the companies need to adopt relevant strategies to serve the market efficiently. The companies need to develop key account strategy for large customers and partnerships with other companies to foster distribution and access across geographies. Also, it will be a critical growth driver to have a strong vendor base and partnership arrangements with cost effective local companies to achieve a leadership position. India’s share in exports is low compared to other counterparts and hence provides a significant export potential.

✧ Process/Infrastructure

The domestic organic chemical players lack pricing power on account of lack of opportunities for backward integration. However, with new finds of natural gas reserves in the country, the manufacturers should be able to leverage stable pricing going forward. Similarly, petrochemical companies producing benzene and propylene can look for forward integration opportunity given the demand supply deficit in the phenol market. An opportunity exists for companies with better access to natural gas supply to venture into the methanol market facing continuous supply deficit. For example, RIL successfully backward integrated from refining and petrochemical company to gas oil and gas exploration.
**Mergers and Acquisitions**

Mergers & Acquisitions have been playing a critical role in shaping the industry and in the past 5 years, several large and medium sized specialty chemical companies have used the acquisition route for growth. Hence, Equity investors are also actively looking at investment opportunities in this space as they see exits with attractive valuations. TATA Strategic analysis shows that 2015 has seen multiple deals in the specialty chemicals space with valuations in excess of 10X EBITDA. Some of the transactions in specialty chemical space are given below:

![Figure 7: Recent Transactions in Specialty Chemical Space](source: VC Circle, DealCurry, TSMG Deal Tracker)

M&A is expected to pick up pace in the coming year, with continued portfolio realignment and consolidation plays in various segments. Higher deal volumes are likely as companies use M&A as a tactic to deliver growth to counter challenging business conditions, which are expected to continue in these segments. Moving into 2016, these segments may also see transformational moves, especially after current portfolio adjustments and spin-offs underway are completed. Additionally, competitive pressure to build scale within all segments may drive further activity. The Indian chemical industry M&A outlook for 2016 will likely be driven by commodity chemicals and significant transaction volumes expected in the specialty and agricultural chemicals segments.

**Future Outlook**

To address the macro level uncertainties associated with an industry level growth estimate, Tata Strategic has developed three scenarios to look at the possible growth outlook of Indian chemical industry based on the growth rates of its sub-segments.
In the base case, the market size is estimated at $206 Bn by FY20. The most likely case growth rate is pegged at 9% with a market size of $226 bn. And the optimistic case is likely to achieve a growth of 11% p.a. over the next five years resulting in an industry size of $248 bn.

**Figure 8: Growth projections of Indian chemical industry market size (In $ Bn)**

<table>
<thead>
<tr>
<th></th>
<th>FY15</th>
<th>FY20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>147</td>
<td>206</td>
</tr>
<tr>
<td>Most Likely</td>
<td>206</td>
<td>226</td>
</tr>
<tr>
<td>Optimistic</td>
<td>226</td>
<td>248</td>
</tr>
</tbody>
</table>

**Government Initiatives**

**Ease of doing business & single window**

Indian government has taken initiative to improve ease of doing business in India. Some of the key initiative areas include:

**Customs**: Single Window Interface for Facilitating Trade (SWIFT) clearances has been launched which enables importers/exporters to file a common electronic integrated declaration. It replaces nine separate forms required by the said 6 different agencies including Customs. CBEC also introduced Integrated Risk Management facility for Partner Govt. Agencies (PGAs) which ensures the consignees are selected for examination & testing based on the principle of risk management. It greatly expedites clearances from all concerned & channelizes scarce resources. Deferred duty payment for select categories of importers and exporters enables speedier clearance and improves liquidity in hands of business. Digital signed declaration has been introduced and documents required now, are just limited to electronic declaration, Invoice cum packing list & bill of lading. Customs Clearance Facilitation Committee (CCFC) has been set up at every major Customs seaport and airport and 24X7 customs clearance facilities have been extended to 19 sea ports and 17 Air Cargo complexes. Now physical control has been replaced by record based control in Customs warehouse. The period of warehousing will be extended till de-bonding or consumption of goods in respect of EoUs/EHTPs/STPIs/Manufacturing Units under Customs Bond which shall reduce transaction costs and burden of documentation.
Export Promotion (Drawback): 100% disbursal of Drawback can be done electronically & there is provisional payment of drawback to exporters, pending fixation of brand rate. Exemption has been extended to payment of excise duty in the case of locally procured excisable goods, against advance authorization, which would improve cash flow for exporters. Rules are amended to grant exemption from self-sealing of bulk cargo for export.

Taxation: 13 cesses levied by other Ministries / Departments and administered by the Department of Revenue, where the revenue collection from each of them is less than Rs.50 crore/year has been abolished and major concessions have been given to ship repair units and aircraft maintenance & overhaul operations.

Goods Service Tax

GST is a more efficient tax system which would primarily lead to wider tax base eventually lowering the tax rate and classification disputes. Tax multiplicity and eventual cascading effects would be eliminated. Compliance procedure is simplified resulting in a rationalized tax structure. Duplication is removed with harmonization between state and centre tax administrator, thereby reducing compliance cost. Automation of compliance processes would reduce error, redundancy and improve efficiency. GST bill was passed recently by the parliament. GST would substitute Central excise and service tax. Till the time GST is implemented, government has taken measures to enable online registration of new Service tax & Central excise assesse, which can be now done within 2 days and also the interest rate applicable has been reduced to 15%.

Sustainability Development Goals

Source: UNDP, Industry Report Analysis Tata Strategic
The Sustainable Development Goals was born in 2012 to come up with universally applicable goals which balance the dimensions of environment, social & economic development. SDGs build on the Millennium Development Goals (MDGs) which were eight anti-poverty targets with issues including slashing poverty, hunger, disease, gender inequality, and access to water & sanitation.

The new SDGs go much further than the MDGs, addressing the root causes of poverty and the universal need for development that works for all people. United Nation Development Program’s focus areas i.e. sustainable development, democratic governance & peace building, and climate & disaster resilience align with the SDGs. An integrated approach to supporting progress across the multiple goals is crucial to achieving the SDGs.

In an effort to move towards goal of no poverty, good health and wellbeing, quality education & reducing inequality; one of largest chemical company is reaching out to the needy through its plethora of CSR initiatives, offering those opportunities for learning and education. On climate action & affordable clean energy, companies are implementing several schemes to save energy across its plants, including the commissioning of a solar photo-voltaic plant. Another player has invested in CO2 purification and utilization plant to capture up to 500,000 tons of CO2 every year before purifying the gas and channelling it through a network to other affiliates to create valuable products, such as agricultural nutrients. Inspired by life below water goal, industry players are tying up with Wildlife Trust of India and State Forest Department to launch various initiatives like ‘Save the Whale Shark Campaign’, which has resulted in the rescue and release of 585 whale sharks. Other companies are providing healthcare through primary health center, employee health care services, HIV/DOTS therapy center, community development programs & women & youth empowerment programs.

More and more companies are thinking about sustainability and aligning to UNDP SDGs.
Bulk Chemicals

Bulk chemicals are group of chemicals that are made on a large scale and act as inputs to downstream industries. These chemicals compounds are often classified into two classes, organic and inorganic. Both are produced on large scale. Basic organic chemicals primarily include chemicals such as methanol, acetic acid, formaldehyde, acetic acid among many others. Basic inorganic chemicals primarily include chlor-alkali (Soda ash, Chlorine and caustic soda) and other inorganic chemicals such as carbon black, calcium carbonate among many others. Indian bulk chemical market (including intermediates) is estimated at $39 Bn. It has grown strong in volume term (8-10%) in the last 5 years but the value wise growth was subdued because of low commodity prices.

1.1. Basic organic chemicals

Introduction

Organic chemicals are a significant part of Indian chemicals industry. Availability of natural gas for use as a feedstock is critical part of the entire production process. Formaldehyde and acetic acid are important methanol derivatives and are used in numerous industrial applications. Phenol is an aromatic compound and derived from Cumene, benzene and propylene derivative. The chart below shows select major organic chemicals.

Figure 10: Major Bulk Organic Chemicals

Source: Industry report Analysis by Tata Strategic
Indian Organic Chemicals Industry

The consumption of organic chemicals in India has increased at a CAGR of 8.4% from 2.9 Mn metric tons per annum (mmtpa) in FY10 to 4.3 mmtpa in FY15. The domestic supply however, has grown at a CAGR of 2.3% from 1.4 mmtpa in FY10 to 1.6 mmtpa in FY15. The deficit has been met by a large increase in imports over the years. The net imports have grown at a CAGR of more than 13% from 1.5 mmtpa in FY10 to 2.9 mmtpa in FY15. The major reason of lower domestic production of organic chemicals has been oversupply in global markets leading to cheaper imports of organic chemicals into India. As a result, the capacity utilization levels of domestic producers have been in range of 55% to 65% during the FY10-FY15 period.

Figure 11: India bulk organic chemicals- Demand and Supply (in MMTPA)

Source: Department of Chemicals & Petrochemicals

The major organic chemicals are methanol, acetic acid, formaldehyde and phenol. The four chemicals contribute 75% of total organic chemicals produced in India in FY15.

Figure 12: Consumption details of major organic chemicals in India (in 000's MT)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Organic Chemical</th>
<th>Consumption (TMT)</th>
<th>Share in FY15, %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FY13</td>
<td>FY14</td>
</tr>
<tr>
<td>1</td>
<td>Methanol</td>
<td>1,469</td>
<td>1,536</td>
</tr>
<tr>
<td>2</td>
<td>Formaldehyde</td>
<td>271</td>
<td>262</td>
</tr>
<tr>
<td>3</td>
<td>Acetic Acid</td>
<td>801</td>
<td>815</td>
</tr>
<tr>
<td>4</td>
<td>Phenol</td>
<td>234</td>
<td>258</td>
</tr>
<tr>
<td>5</td>
<td>Others</td>
<td>991</td>
<td>1,082</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,775</td>
<td>2,871</td>
</tr>
</tbody>
</table>

Source: Department of Chemicals & Petrochemicals
Key Segments

**a. Methanol:**

Methanol, a very versatile chemical, is primarily produced from natural gas or naphtha. Demand for methanol has increased at a CAGR of 10% from 1.1 mmtpa in FY10 to 1.8 mmtpa in FY15. The domestic production of methanol is not sufficient to meet the demand of methanol in India. As a result, in FY15, net import of methanol was 1.64 mmtpa, i.e., more than 7 times the domestic production of 0.21 mmtpa. Import of methanol has increased at a high CAGR of 15% from 0.83 mmtpa in FY10 to 1.64 mmtpa in FY15.

**Figure 13: Methanol-Demand and Supply (in MMTPA)**

Source: Department of Chemicals & Petrochemicals

The two main end-user industries of methanol are chemicals and energy. In the chemicals industry, methanol is used mainly to manufacture formaldehyde, acetic acid, di-methyl terephthalate (DMT) and some solvents. In the energy industry, methanol goes into the manufacture of methyl tertiary butyl ether (MTBE), tertiary amyl methyl ether (TAME), dimethyl ether (DME) and bio-diesel among other chemicals. Methanol is also used for blending with petrol.

**Figure 14: Sectorial usage of methanol (% share)**

Source: Industry reports, Tata Strategic Analysis
Over the years the usage pattern of methanol has changed. The share of formaldehyde in sectoral usage of methanol has improved from 38% in FY09 to 51% in FY15 primarily due to increase in demand of formaldehyde from plastic and paints industries. The demand of methanol for production of MTBE has fallen primarily due to competition from Ethanol.

Indian manufacturers have small capacities compared to global standards. GNFC (Gujarat Narmada Valley Fertilizers Co Ltd), the largest producer of Methanol in India has a capacity of 269 kilo tons per annum (kta) followed by GSFC (Gujarat State Fertilizer & Chemical Co Ltd) with a capacity of 173 kta and Deepak Fertilizers with capacity of 100 kta.

b. Acetic Acid

Acetic Acid is an alcohol based chemical and is primarily used in the production of Vinyl Acetate Monomer (VAM), Purified Terephthalic Acid (PTA), Acetic Anhydride and Acetate Esters. The Acetic Acid derivatives are applied in various industries as mentioned in table below

<table>
<thead>
<tr>
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<tr>
<td>2</td>
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</tr>
<tr>
<td>3</td>
<td>Acetic Anhydride</td>
<td>Cellulose Acetate which goes in cigarette filters and textile applications</td>
</tr>
<tr>
<td>4</td>
<td>Acetate Esters</td>
<td>Solvents in a wide variety of paints, inks and other coatings</td>
</tr>
</tbody>
</table>

*Source: Industry Report Analysis by Tata Strategic*

Demand for acetic acid has grown at a CAGR of 11% from 0.52 Mn tons in FY10 to 0.87 Mn tons in FY15. The demand growth has happened mainly due to increase usage by manufacturers of PTA and organic esters such as RIL and Vinyl Chemicals.
Over the years the usage pattern of methanol has changed. The share of formaldehyde in sectoral usage of methanol has improved from 38% in FY09 to 51% in FY15 primarily due to increase in demand of formaldehyde from plastic and paints industries. The demand of methanol for production of MTBE has fallen primarily due to competition from Ethanol.

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</tr>
</tbody>
</table>

Most of the demand was met through domestic production earlier. However, due to oversupply of acetic acid in global markets and depressed prices, imports of acetic acid have grown from 0.39 mmtpa in FY10 to 0.71 mmtpa in FY15. Cheap imports have led to lower plant capacity utilization for domestic manufacturers. Utilization for domestic manufacturers stood at 44% only in FY15.

Market size of acetic acid is estimated to be around 0.87 mmtpa in India in FY15, of which imports constitute more than 80%. Major acetic acid producing companies in India are GNFC, Jubilant Organosys and IOC. Acetic acid is manufactured in India through two routes: the methanol route and the ethyl alcohol (from molasses) route. Manufacturing acetic acid using methanol is more cost-competitive and, therefore, more profitable. GNFC is the only company in India to manufacture acetic acid through the methanol route. It has a competitive advantage in acetic acid because of the assured supply of the raw material and its lower cost of production.

c. Formaldehyde

Unlike methanol, production of its derivative formaldehyde in India is sufficient to meet the domestic demand. The production of formaldehyde has marginally declined, at a similar pace as has its demand, at a CAGR of negative 0.4% from 0.265 mmtpa in FY10 to 0.26 mmtpa in FY15. Market size of formaldehyde is estimated around 0.25 mmtpa in India. Total production capacity is 0.41 mmtpa in FY15. Major formaldehyde producing companies in India are Kanoria Chemicals (Capacity of 0.18 mmtpa), Hindustan Organic, Rock Hard and Asian Paints. Asian Paints produces formaldehyde for captive consumption.
Key Trends

a. Market Trends

- Initial trends indicated a shift in production of Bulk chemicals from OECD countries to economies in transition. However, TSMG's analysis indicates that few countries with economies in transition are increasingly moving towards specialty and fine chemicals. This gradual shift is clearly visible in countries like China, India and Middle East.
- Consistent with trends from the past decade, China is expected to record highest annual growth rate in the bulk chemical production. On average China's chemical production is expected to grow at 10% between FY14 and FY21.
- Technology transfer happening from developed economies to economies in transition as a result of increased M&A activities, JVs and acquisitions has helped these economies play a larger role in the global market.
- Domestic utilization rates are expected to reach high levels of 90 per cent by the end of 2018, given the healthy growth in the end-user market.

b. Regulatory Trends

- Government of India continues to provide duty protection to domestic manufacturers. For example, in case of phenol, the custom duty of 7.5% was maintained in Union Budget of 2015-16, whereas the excise duty was only marginally increased from 12% to 12.5%.
- Government has also levied anti-dumping duty on import of phenol from countries such as China, USA, South Korea and Taiwan. In Oct 2008, an anti-dumping duty was levied on imports from Singapore, South Africa and EU for a period of 5 years. In 2010, anti-dumping duty of up to $547/ tonne was imposed on imports from Japan and Thailand for a period of five years. In 2014, anti-dumping duty of up to $80/ton was imposed on imports from China and up to $194/ton was imposed on imports from any country other than China for a period of six months. In August 2014, an anti-dumping duty of $47-$196 per tonne was levied on imports originating from Taiwan and the USA.

d. Phenol

Phenol is a significant organic chemical with numerous applications as mentioned in the table below.

**Figure 18: Phenol Applications**

<table>
<thead>
<tr>
<th>SN</th>
<th>Derivatives</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phenolic resins</td>
<td>Plywood adhesives, construction, automobile &amp; appliance industries</td>
</tr>
<tr>
<td>2</td>
<td>Caprolactam</td>
<td>Nylon and synthetic fibre</td>
</tr>
<tr>
<td>3</td>
<td>Bisphenol-A</td>
<td>Polycarbonates in electronics and housing industries</td>
</tr>
</tbody>
</table>

Source: Industry Report Analysis Tata Strategic

- Its demand is closely linked to end user industries like the construction and automobile industries. More than 83% of demand of phenol is met through imports with no marginal capacity addition in last three years. There are only two suppliers - Hindustan Organics and S I Group with capacity of 40 Kta and 37Kta respectively in FY15. As the consumption has grown from 0.17 mmtpa in FY10 to 0.24 mmtpa in FY15, the imports has grown at a higher CAGR of 14% to meet the rising demand. The total market size is 0.24 mmtpa approximately in India in FY15.
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**Growth forecast & drivers**

Domestic demand of basic organic chemicals is expected to grow at 8-10% and reach 5 Mn tonnes by end of twelfth plan period. This will be mainly led by the growth in the end-user market. In order to meet the burgeoning demand, organic chemical industry must also target to grow at 10-12% during the same period. This can be achieved through policy initiatives, ensuring strong fiscal and regulatory support, support for world scale plants in PCPIRs, integration with downstream facilities etc.

1. **Rise in Methanol demand**: Domestic methanol demand is expected to grow at a CAGR of 8.4% from FY15 to FY20. The key growth drivers are growth in Construction, Infrastructure and Pharma industries. The demand from the Formaldehyde segment (largest user of methanol) is expected to grow at 8-9%.

   ![Figure 20: Methanol Demand- Future Forecast (in MMTPA)](source)

   **Source**: Tata Strategic Analysis

2. **Rise in Phenol demand**: The demand of Phenol is expected to grow at a CAGR of 7.7% from 0.24 mmtpa in FY15 to reach 0.35 mmtpa in FY20. The improvement in demand is primarily driven by growth in application of phenolic resins in the decorative laminates sector, dyes and drugs in pharmaceutical industries.

   ![Figure 21: Phenol Demand- Future Forecast (in MMTPA)](source)

   **Source**: Tata Strategic Analysis

**Sources:**
- Department of chemicals and petrochemicals
- Industry reports
- TSMG previous reports
1.2. Basic Inorganic Chemicals

Introduction

Alkali chemicals are the oldest and the largest segment of the chemical industry. These chemicals serve as key inputs for a number of industries such as aluminium, soap, detergent, glass, tyre, rubber, pulp and paper, pharmaceutical, water treatment, textiles, leather, fibre among many others. The key chemicals in the chlor alkali industry are:

- Caustic soda
- Chlorine (including liquid chlorine)
- Soda ash

Indian Inorganic Chemicals Industry (including Chlor Alkali)

Industry Overview

The consumption of inorganic chemicals in India has increased at a CAGR of 5.5% from 7.1 Mn metric tons per annum (mmtpa) in FY10 to 9.3 mmtpa in FY15. The domestic supply however, has grown at a CAGR of 2.5% only from 6.6 mmtpa in FY10 to reach 7.5 mmtpa in FY15. The deficit has been met by an increase in imports over the years. The imports have grown at more than 11% p.a. from 1.2 mmtpa in FY10 to 2.1 mmtpa in FY15. The major inorganic chemicals are chlor-alkali chemicals with more than 82% of the overall inorganic chemical demand. Chlor Alkali has three key segments, namely, caustic soda, chlorine and soda ash.

Figure 22: India bulk inorganic chemicals-Demand and Supply (in MMTPA)

Source: Department of Chemicals and Petrochemicals, Tata Strategic Analysis

Note: 1. Inorganic Chemicals include Chlor Alkali
Indian inorganic industry especially the chlor alkali segment has seen M & A activities over years indicating towards consolidation. Some of the major deals include:

- Merger of Grasim industries and Aditya Birla Chemical Limited (ABCIL) in 2016
- Acquisition of Chlor Alkali division of Jayshree Chemicals (India) Limited by ABCIL in 2014
- Acquisition of Chlor-alkali and Phosphoric Acid division of Solaris Chemtech Industries Limited by ACBIL in 2013
- Acquisition of Chloro chemical division of Kanoria Chemicals by ABCIL in 2011
- Acquisition of acquired Brunner mond by Tata Chemicals in 2006
- Acquisition of Saurashtra Chemicals Ltd. by Nirma Chemical Works in 2005

**Key segments**

- **Caustic Soda**

Caustic Soda (chemically known as sodium hydroxide) and chlorine are produced together through the electrolysis of common salt solution (sodium chloride or brine). Caustic soda and Chlorine are generated in the ratio of 1:0.89. Demand for chlorine drives caustic soda production globally, but in India the industry has developed in line with the demand-supply balance of caustic soda.

There are three alternative technologies used to manufacture caustic soda from brine. These are mercury cell, membrane cell and diaphragm technologies.

1. The membrane cell technology involves lower power costs compared to the other two. It is also the most environmental friendly as it does not use any hazardous materials as compared to mercury cell and diaphragm technologies which use mercury and asbestos respectively.

2. The diaphragm technology involves higher capital and power costs. The quality of caustic soda is also of inferior quality. However, it is popular as the purity of chlorine from this method is highest and chlorine demand is major driver for caustic soda production globally.

3. Mercury cell technology involves lower capital costs compared to membrane and diaphragm technologies. However, it is not so popular because of related pollution hazards due to use of asbestos.

Globally the diaphragm and mercury cell technologies are the most widely used while in India the membrane cell technology accounts for more than 95% of the total capacity. Mercury cell is widely used in Europe and diaphragm technology is widely used in US.

**Global Scenario**

Globally the total capacity of caustic soda is estimated to be around 101 Mn tons in 2014. China has the highest caustic soda capacity at 47.5 Mn tons, accounting for 47% of world
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**Global Scenario**

Globally the total capacity of caustic soda is estimated to be around 101 Mn tons in 2014. China has the highest caustic soda capacity at 47.5 Mn tons, accounting for 47% of world capacity. North America has a capacity of 17 Mn tons. India had a capacity of 3.3 Mn tons in 2014 and accounted for 4% of the global caustic soda capacity.

![Figure 23: Breakdown of Global Caustic Soda Capacity, FY 14 (101 MnTPA)](image)

**Source:** Industry Report Analysis by Tata Strategic

China and North America are key production hubs for caustic soda. It is expected that there would not be any significant capacity additions in developed countries like North America and Western Europe primarily due to unattractive cost structures and flat demand.

Global consumption of caustic soda in 2014 is estimated at 81.7 Mn tons. Asia is the largest consumer of caustic soda and is expected to remain the same in near future. Majority of caustic soda is exported from North America, Europe and Asia. Australia and Latin America (Brazil) are the leading importers.

**Consumption Mix**

The majority of caustic soda is used in the Aluminium, Chemicals and Paper industry. Textiles, soaps & detergents and water treatment are other major areas consuming caustic soda.

![Figure 24: Breakdown of Global caustic soda consumption, 2014 (81.7 MnTPA)](image)

**Source:** Industry reports, Tata Strategic Analysis
Indian Scenario

Market Size

Caustic soda consumption in India increased at 2.6% CAGR from 2.5 mmtpa in FY10 to reach 2.8 mmtpa in FY15.

![Figure 25: Caustic Soda Demand- (in MMTPA)](image)

*Source: Department of Chemicals & Petrochemicals*

Caustic soda capacity addition at a steady rate

Total domestic caustic soda capacity increased from 2.7 Mn tons in FY10 to 2.94 Mn tons in FY15.

![Figure 26: Caustic Soda Capacity and Production (in MnTPA)](image)

*Source: Department of Chemicals & Petrochemicals*
Western region accounted for approximately 57% of the estimated capacity of 2.94 Mn tons in FY15 because of its proximity to salt which is one of the key raw materials. The southern regions accounts for 20% of the total capacity. The northern and eastern regions have a share of 12% and 11% respectively.

**Continued Growth of Caustic Soda Imports (FY11-15)**

Imports grew rapidly at CAGR of 31% from 138.5 thousand tons in FY11 to 408.0 thousand tons in FY15, after registering a spike in FY10. Exports decreased at a CAGR of 11% from 77.0 thousand tons in FY10 to 42.2 thousand tons in FY15.

![Figure 27: Import - Export Trend of Caustic Soda (in TMT)](source: Department of Chemicals & Petrochemicals)

**Major Companies**

Gujarat Alkalies and Chemicals Ltd. (GACL) is the market leader in caustic soda segment in India accounting for 14% of the total domestic sales value in FY15.

The Aditya Birla Group, through its companies such as Aditya Birla Chemicals Ltd (ABCL), Grasim industries Ltd and Aditya Birla Nuvo Ltd (ABNL) are other major players. Other major companies are DCM Sriram, Punjab Alkalies, Sree Rayalaseema Alkalies and Allied Chemicals & Andhra Sugars. The top six companies account for almost 60% of the total domestic sales of caustic soda in India.
Key Applications

Figure 28: Caustic Soda- India Consumption FY15 (2.81 MnTPA)

The key end user industries of caustic soda in India are textiles, alumina, paper, inorganics, soaps and detergents and pesticides. Textiles are the largest end-use industry accounting for 22% of the total caustic soda consumption in FY15. In the textile industry, caustic soda is used in processing of cotton fibres and bleaching of fabrics. Alumina is the second largest end-use industry accounting for 16% of the total caustic soda consumption. Caustic soda is used in processing of bauxite ore in the aluminium industry. The processing of bauxite ore gives alumina which is in turn used in the manufacturing of aluminium. Paper and Inorganics accounted for 11% and 8% respectively of total caustic soda consumption in FY15. In the paper industry it is used in water treatment, de-inking of waste paper and as a raw material in pulping and bleaching processes.

a. Chlorine

Indian Scenario

Consumption of chlorine in India in FY15 is estimated at 1.7 Mn tons. The key end-user industries of chlorine in India are PVC, inorganic and organic chemicals. Vinyl, a key determinant of chlorine demand globally, accounted for 10% of total chlorine demand in India.
Figure 28: Caustic Soda - India Consumption FY15 (2.81 MnTPA)

Key Applications

Source: Industry reports, Tata Strategic Analysis

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Caustic soda and chlorine capacity are correlated

Since caustic soda and chlorine are co-products capacities, production of caustic soda and chlorine are correlated. Chlorine production has been growing in line with the growth of caustic soda manufacturing and has not been determined by the growth of the chlorine-based downstream industries. There is marginally more chlorine produced in India than there is demand.

Industry Outlook

Demand for caustic soda from end-use industry

Demand for caustic soda is expected to be driven mainly by growth in the end use industry i.e. alumina, paper, Inorganics and textiles. Aluminium production is expected to increase by 7-8% CAGR over the next five years, following capacity expansions by players, including Vedanta, Hindalco and Balco, and gradual ramp-up of capacities. Demand for caustic soda from both paper and textile industry is expected to grow at 4-5% and 6-7% respectively, whereas demand from inorganic industry is expected to grow at 7-8% in next 5 years driven by demand from end-user industries such as paints and ceramics.
Driven by the end use industry growth, demand for caustic soda is projected to grow at a rate of 5.9% from 2.81 Mn tons in FY15 to 3.74 Mn tons in FY20.

**Figure 30: Caustic soda- Demand growth from end-use industry**

<table>
<thead>
<tr>
<th>SN</th>
<th>Industry</th>
<th>CAGR over next 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alumina</td>
<td>7-8</td>
</tr>
<tr>
<td>2</td>
<td>Paper</td>
<td>4-5</td>
</tr>
<tr>
<td>3</td>
<td>Inorganics</td>
<td>7-8</td>
</tr>
<tr>
<td>4</td>
<td>Textiles</td>
<td>6-7</td>
</tr>
</tbody>
</table>

*Source: Crisil Research, Tata Strategic Analysis*

There are three main processes to manufacture soda ash from salt.

1. **Standard Solvay process**: Characterised by low salt utilisation and requirement of good quality of limestone and coke. This process, compared to other two processes, generates a larger amount of effluents and hence requires good disposal facilities.
2. **Modified Solvay process**: Has better salt utilisation and requirement of limestone is less. But the process requires very high quality of salt without any impurities and ammonia requirement is also high.
3. **Dry Liming Process**: Raw material consumption is low in the dry liming process and it has a perfect steam power balance.

All the three processes are used in India and have their own advantages and disadvantages. In India, dry liming process is used for almost 49 per cent of the total domestic capacity in 2014-15. The standard Solvay process accounted for 48 per cent whereas modified Solvay process accounted for 3% only.

**Global scenario**

Worldwide consumption of soda ash is estimated at 57.3 Mn tons in 2014. Natural and Synthetic are two methods of soda ash production. From a total production of 57.3 Mn tons, natural soda ash accounted for 14.3 Mn tons in 2014.

*Source: Tata Strategic Analysis*

c. **Soda Ash**

**Introduction**

Soda ash is chemically known as sodium carbonate. Broadly, there are two ways in which soda ash is produced; it is either manufactured synthetically from salt or is obtained from refining of naturally available mineral, trona, or naturally occurring sodium carbonate-bearing brines. Globally, approximately 75% of soda ash is produced from the synthetic process.

**Figure 32: Soda Ash: Global production method FY14 (% share)**

*Source: United States Geological Survey (USGS), Tata Strategic Analysis*
Processing costs of soda ash from naturally available sources is less than the manufacturing costs of producing soda ash synthetically, thereby making the naturally available soda ash less expensive.

There are three main processes to manufacture soda ash from salt.

1. Standard Solvay process: The standard Solvay process is characterised with low salt utilisation and requirement of good quality of limestone and coke. This process, compared to other two processes, generates larger amount of effluents and hence require good disposal facilities.

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Global scenario

Worldwide consumption of soda ash is estimated at 57.3 Mn tons in 2014. Natural and Synthetic are two methods of soda ash production. From a total production 57.3 Mn tons, natural soda ash accounted for 14.3 Mn tons in 2014.

**Figure 33: Natural soda ash- Country wise production FY14 (% share)**

Source: United States Geological Survey (USGS), Tata Strategic Analysis
The US accounts for over 79.5% of global natural soda ash production of 11.7 Mn tons. The country has world’s largest trona deposit in the Green River basin.

The global soda ash capacity is estimated to be 71.7 Mn tons in 2014. China and US are the biggest soda ash producing countries accounting for 41% and 22% of the total global soda ash capacity respectively. India accounts for 4.3% of the total global capacity.

**Consumption Mix**

Globally the majority of soda ash is used in the glass industry which accounts for 53% of the global soda ash consumption. Detergents and Chemicals are other major end uses, accounting for 14% and 13% of global soda ash consumption respectively. Soda ash can also replace caustic soda in certain industries like pulp and paper, water treatment and certain sectors in chemicals.

**Figure 34: Soda Ash: Global consumption mix FY14 (% share)**

![Chord Diagram showing consumption mix](image)

**Source:** Industry reports, Tata Strategic Analysis

**Indian Scenario**

The Indian inorganic chemical industry produces two varieties of soda ash: light soda ash (that is used in the detergent industry) and dense soda ash (that is used in the glass industry). Total domestic soda ash consumption grew at 6% CAGR from 2.4 mmtpa in FY10 to reach 3.2 mmtpa in FY15.
Knowledge and Strategy Partner

**HANDBOOK ON INDIAN CHEMICAL INDUSTRY**

The US accounts for over 79.5% of global natural soda ash production of 11.7 Mn tons. The country has world’s largest trona deposit in the Green River basin. The global soda ash capacity is estimated to be 71.7 Mn tons in 2014. China and US are the biggest soda ash producing countries accounting for 41% and 22% of the total global soda ash capacity respectively. India accounts for 4.3% of the total global capacity.

**Consumption Mix**

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The imports for soda ash have been increasing over the years and stand at 726 thousand tons in FY15 compared to 556 thousand tons in FY10. The soda ash exports have declined from 257 thousand tons in FY10 to 28 thousand tons in FY15. The total operational capacity of soda ash in FY15 is estimated to be around 2.91 Mn tons. Salt is the main raw material for soda ash production. The Indian soda ash industry is concentrated in Gujarat due to the proximity to and easy availability of inputs like limestone and salt.

**Figure 35: Soda Ash- India Demand (MMTPA)**

![Soda Ash Demand Chart]

Source: Department of Chemicals & Petrochemicals

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**Figure 36: Import & Exports Trend of Soda Ash (TMT)**

![Import & Exports Trend Chart]

Source: Dept. of Chemicals & Petrochemicals
Domestic Consumption Mix

The consumption mix of soda ash in India differs significantly from the global mix. In FY15, detergent accounted for the largest share of soda ash consumption at 40%, followed by glass at 30%.

![Figure 37: Soda Ash- Domestic consumption (%, FY 15)](image)

*Source: Industry reports, Tata Strategic Analysis*

Industry Outlook

The domestic consumption of soda ash is expected to increase at a rate of 5.7% between FY15 and FY20. The domestic consumption is expected to be driven by the end-user industries like detergents and glass. Demand from detergents industry is expected to grow at a moderate rate of 6-7% between FY15 and FY20. The glass industry is driven by the construction and automobile sector. Both these sectors are expected to witness a high growth between FY15 and FY20.

![Figure 38: Soda Ash- Demand growth from end-use industry](image)

<table>
<thead>
<tr>
<th>SN</th>
<th>Industry</th>
<th>CAGR over next 5 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Detergent</td>
<td>6-7</td>
</tr>
<tr>
<td>2</td>
<td>Glass</td>
<td>5-6</td>
</tr>
<tr>
<td>3</td>
<td>Others</td>
<td>5-6</td>
</tr>
</tbody>
</table>

*Source: Crisil Research, Tata Strategic Analysis*

Demand from the glass industry is expected to witness a growth rate of 5-6% between FY15 and FY20.
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Key Challenges

- **Lack of world class infrastructure:** Given the poor infrastructure with lack of adequate facilities at ports & railway terminals and poor pipeline connectivity, domestic manufacturers will continue facing difficulty in procuring raw materials at a cost competitive price as compared to the global peers.

- **Lack of cheaper raw material availability:** Feedstock (naphtha and natural gas) and power are critical inputs for organic chemicals industry. Costs of these raw materials are high in India compared to countries like China, Middle East and other South East Asian countries such as Thailand and Indonesia.

- **Lack of power:** Uninterrupted power supply plays a major role in the efficient production of chemicals. In India, power supply has not increased at the same rate as demand, leading to interruption in the supply. India’s distribution losses which are well above the global benchmarks are only compounding the problem. Large Indian chemical companies have started investing in captive power plants to ensure continuous supply of power to their plants. But this problem is plaguing the small & medium players of the industry. Thus, uninterrupted power supply is a challenge that confronts the bulk chemical industry.

- **Logistic Issues:** Indian bulk chemical industry is mainly concentrated in the west in Gujarat. Though the manufacturers enjoy easy access to raw materials, they face difficulty in supplying to end-use industries which are located in southern & eastern regions. For example, soda ash manufacturers are located in Gujarat, whereas 40% of the end use industries (glass, detergent and soap units) are located in the south. This increases the transportation cost, thus making imports cheaper when compared to internal transport. (US$ 50 per metric tonne (PMT) freight cost for transportation from
western part to eastern part compared to US$25 to US$30 PMT average freight for imports).

- **No domestic price discovery**: Domestic prices of organic chemicals are highly correlated with international prices. Given the small scale of domestic operations, local manufacturers are more influenced by global demand and supply forces.

- **Large global capacity additions**: Apart from the current oversupply in global markets, there is another cause of concern for domestic manufacturers, with further large capacity additions happening in global markets. For example, globally, methanol industry is expected to witness excess capacity in the future due to a spate of capacity additions in gas rich countries such as Middle East and Russia.

- **Low capacity utilization**: Due to oversupply in global markets, prices of major organic chemicals have taken a steep decline, thereby forcing the domestic companies to underutilize their plants operating levels.

**Key Opportunities**

- **Consolidation**: Since most of the Indian manufacturers operate on a small scale compared to global peers, there is a room for consolidation in Indian organic chemicals industry. Domestic players can take advantage of economies of scale arising from consolidation and become more competitive thereby preventing cheaper global imports.

- **Improved feedstock supply**: Domestic organic chemicals players don’t have the advantages of backward integration and hence, they lack pricing flexibility. However, given the new finds of natural gas reserves in the country, domestic manufacturers will be able to get supply of feedstock at stable prices.

- **Coal to Chemical opportunity**: With no improvements in sight in the domestic production of natural gas and crude oil, Indian bulk chemical manufacturers should actively pursue the coal to chemical process to ramp up their manufacturing capacities. Government should take cognizance of the issue and make policy changes to encourage this route of bulk chemical manufacturing.

- **Use of alternative feedstock**: Domestic organic chemical players can explore alternative feedstock such as Coal based Methane, pet coke, and shale gas to secure feedstock supply in the long run.

- **Wider product portfolio**: Commodity chemicals companies can improve their product portfolio by adding specialty chemicals such as polymers additives, water treatment chemicals, lubricating additives among others. This will help in improving their margins but requires significant R&D efforts.
**Forward integration**: Petrochemical companies producing benzene and propylene can look for forward integration opportunity given the demand-supply deficit in phenol market. Similarly, an opportunity exists for companies with better access to natural gas supply to venture into the methanol market facing continuous supply deficit.

**Outbound approach**: Even successful companies from west are shifting their base to resource rich nations like Saudi Arabia, Qatar, Russia, etc. Indian organic chemical companies may also explore opportunities outside the country either through Greenfield or brownfield projects.

**Sources:**
- Department of chemicals and petrochemicals
- USGS
- Industry reports
- TSMG previous reports

**Petrochemicals**

**Introduction**

Petrochemicals are chemicals made from petroleum and natural gas. It plays a vital role in economic development & growth of the country as it enables the growth of other sectors in economy which includes agriculture, infrastructure, healthcare, textiles and consumer durables. Today, petrochemical products permeate the entire spectrum of daily use items and cover almost every sphere of life like clothing, housing, construction, furniture, automobiles, household items, agriculture, horticulture, irrigation, packaging, medical appliances, electronics and electrical among many others.

Petrochemicals are derived mainly from hydrocarbons derived from crude oil and natural gas. Among the various fractions produced by distillation of crude oil; petroleum gases, naphtha, kerosene and gas oil are the main feed-stocks for the petrochemical industry. Unconventional feedstocks are also gradually coming up like shale gas, coal, CBM and pet coke.

The two major segments for petrochemicals are basic petrochemicals and end-product petrochemicals. Basic petrochemicals are further reclassified as olefins (ethylene, propylene and butadiene) and aromatics (benzene, toluene and xylene). The feedstocks are used to derive the basic petrochemicals. These basic petrochemicals are then used to produce end product petrochemicals such as polymers, synthetic fibres, elastomers, surfactants and performance plastics.
Indian petrochemicals industry

As a downstream industry of exploration and refining business, the petrochemicals industry is a significant industry for the Indian economy. The total petrochemical market is valued at $28 Bn in FY15 and is expected to grow at rate of 9% to reach $44 Bn by FY20. Industry had registered a growth of 11% per annum in the last 5 years.

The total installed capacity of major basic petrochemicals in FY15 is 14.84 Mn metric tons per annum (mmtpa) against the total production of 14.41 mmtpa. Imports have grown at a CAGR of 12% between FY10 and FY15, whereas the exports have grown at a higher rate of 9% in the same period.

**Figure 40: Major Petro Chemicals in India- Capacity and Production (in MMTPA)**

<table>
<thead>
<tr>
<th></th>
<th>FY10</th>
<th>FY15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>11.5</td>
<td>14.8</td>
</tr>
<tr>
<td>Production</td>
<td>10.7</td>
<td>14.4</td>
</tr>
<tr>
<td>Demand</td>
<td>12.8</td>
<td>17.2</td>
</tr>
</tbody>
</table>

**Source:** Department of Chemicals & Petrochemicals

**Figure 41: Import and Export Trend of Major Petro Chemicals in India (in MMPTA)**

<table>
<thead>
<tr>
<th></th>
<th>FY10</th>
<th>FY15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import</td>
<td>2.8</td>
<td>5.1</td>
</tr>
<tr>
<td>Export</td>
<td>1.5</td>
<td>2.3</td>
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</tbody>
</table>

**Source:** Department of Chemicals & Petrochemicals
Market Outlook

The demand for basic petrochemicals is expected to grow at a CAGR of 10% to reach 22.6 mmtpa by FY20. The demand growth will be driven by olefins segment including ethylene, propylene and butadiene. Demand as well as capacity growth in aromatics such as benzene and toluene will be marginal compared to overall market size.

**Figure 42: Basic petrochemicals- Capacity & Production (in TMT)**

![Basic Petrochemicals Capacity & Production](image)

Source: Department of Chemicals & Petrochemicals

Indian end products petrochemicals market is at 14.4 Mn tons also expected to grow at a CAGR of 9.5% to reach 22.7 Mn tons by FY20

**Figure 43: End products petrochemicals: Capacity & Consumption (in '000MT)**

![End Products Petrochemicals Capacity & Consumption](image)

Source: Department of Chemicals & Petrochemicals, Crisil Research, Tata Strategic Analysis
**Key Trends**

**Market Trends**

- **Increase in global demand**: Global demand for ethylene is forecasted to grow at a CAGR of 5-6% and that of propylene to grow at a CAGR of 5.5% between period 2014 and 2020. Ethylene and propylene will continue to have major share (70-75%) of total petrochemicals demand. Growth in consumption is going to be highest in Asia with China and India being the major contributors.

- **Capacity expansion**: Between 2014 and 2019 ethylene capacity additions are expected to grow by 30 Mn tonnes globally, of which 9 Mn tonnes are expected to be added in Middle East alone. Industry structure is changing in terms of regional distribution of capacity.

- **Consolidation**: New integrated capacities are being set in Middle East which has increased its share of capacity from 11% in 2011 to 13% in 2015. The top 10 polyolefin producers account for 40-45 % of capacity. Lyondell-Basell is the market leader with mainly PP capacity of over 10 Mn tons. Dow/Union Carbide Union & Exxon Mobil are next big players with diversified portfolio. Next tier of players have less than half the capacity of leading companies.

**Figure 44: Polyolefin capacity by region (% share)**

<table>
<thead>
<tr>
<th>Region</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
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<tbody>
<tr>
<td>Asia</td>
<td>44%</td>
<td>46%</td>
<td>47%</td>
<td>48%</td>
<td>47%</td>
</tr>
<tr>
<td>North America</td>
<td>17%</td>
<td>16%</td>
<td>16%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Western Europe</td>
<td>15%</td>
<td>15%</td>
<td>14%</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>Middle East</td>
<td>11%</td>
<td>12%</td>
<td>12%</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>Others</td>
<td>12%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
</tr>
</tbody>
</table>

*Source: Department of Chemicals & Petrochemicals*

- **Depressed margins**: In FY16, the margins are expected to increase by 3% due to decline in feedstock prices. However emergence of Middle East as a major low cost olefin producer is going to put pressure on margins. Operating rates and marginal cost of supply are critical for ethylene. With large integrated complexes coming up in Middle East, economies of scale would be realized & region is to emerge as a major exporter substituting supplies from inefficient capacities of Central & Eastern Europe. Operating rates are high in Asia driven by consumption in China & India.
Key Trends

Market Trends

- **Increase in global demand**: Global demand for ethylene is forecasted to grow at a CAGR of 5-6% and that of propylene to grow at a CAGR of 5.5% between period 2014 and 2020. Ethylene and propylene will continue to have major share (70-75%) of total petrochemicals demand. Growth in consumption is going to be highest in Asia with China and India being the major contributors.

- **Capacity expansion**: Between 2014 and 2019 ethylene capacity additions are expected to grow by 30 Mn tonnes globally, of which 9 Mn tonnes are expected to be added in Middle East alone. Industry structure is changing in terms of regional distribution of capacity.

- **Consolidation**: New integrated capacities are being set in Middle East which has increased its share of capacity from 11% in 2011 to 13% in 2015. The top 10 polyolefin producers account for 40-45% of capacity. Lyondell-Basell is the market leader with mainly PP capacity of over 10 Mn tons. Dow/Union Carbide Union & Exxon Mobil are next big players with diversified portfolio. Next tier of players have less than half the capacity of leading companies.

Source: Department of Chemicals & Petrochemicals

Figure 44: Polyolefin capacity by region (% share)

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Technology Trends

- **Product switch**: Linear low density polyethylene is increasingly replacing the usage of low density polyethylene in India. Only 1 ton of ethylene is required to produce 1 ton of LLDPE whereas > 1 ton of ethylene is required to produce 1 ton of LDPE.

- **Change in feedstock mix**: With increased availability of natural gas and new gas finds, the dependency on naphtha as major feedstock for petrochemicals complexes have reduced. In Middle East, substantial capacity additions will be based on ethane as a feedstock.

Regulatory Trends

- **Reduced fiscal benefits**: As India is fast becoming a refining and petrochemical surplus nation; Government has also taken away the income tax holidays and other fiscal benefits from the industry. Only oil exploration companies now enjoy the benefits based on the profit-sharing mechanism with the government.

Key drivers

- **Low per capita consumption**: Global demand for major commodity polymers is around 192 Mn tonnes as compared to demand for polymers in India which is around 10 Mn tonnes as of 2014-15. Hence the Indian polymers industry is small constituting 5.0 per cent of the total polymer consumption. India has been growing at relatively faster than global growth rate and the share of Indian polymer industry is growing in total global production.

- **Rise in polymers demand**: In FY16 the polymer demand has grown by 9-10%, driven mainly by lower polymer prices due to fall in feedstock prices. The demand of polymers is expected to grow at a CAGR of 10% from 9.36 mmta in FY15 to reach 14.74 mmta in FY20. The high growth in demand is primarily driven by growth in packaging, infrastructure, agriculture, healthcare and consumer sectors. This domestic polymer growth will be driven by the PE/PVC/PP segments which account for more than 90% of the total polymer & elastomer demand.

- **Development of PCPIRs**: Development of Petroleum, Chemicals & Petrochemicals Investment Regions across India is also expected to induce development of industries consuming petrochemicals as major raw material. Till now PCPIRs have been approved in states of Andhra Pradesh, Gujarat, West Bengal and Orissa. The four PCPIRs together have attracted an investment of INR 1.5 lakh crore. PCPIR project in Orissa alone is expected to invite Rs. 2.3 lakh crore worth of investment from petroleum and petrochemicals sectors. Similar scale of investments is envisaged in other approved projects.
Key challenges

- **Volatility in raw material prices**: More than 50% of global petrochemical capacities are based on naphtha, a crude oil derived product. Volatility is higher in basic petrochemicals & intermediates as against downstream because of closer linkages and low trading of these products. Asia and North America are highest producers of polyolefin accounting for 47% and 15% of capacity in 2015. Volatility is Asian petrochemicals industry is higher as 70% of cracking capacity is Naptha based compared to North America where 65% of capacity is Natural gas based.

- **Increased competition**: Large capacity additions taking place in ethane rich Middle East and demand rich China. Out of the 30 Mn tons of ethylene capacity additions expected during period 2014 and 2019, 9 Mn tons is expected in Middle East alone. Since, ethane based petrochemical products are cheaper than petrochemical products in India, domestic producers are expected to witness margins pressure.

- **High entry barriers**: Given the capital intensive nature of the petrochemical plant and tariff barriers, new entrants and small and medium size companies are prohibited from easily entering into the market. Top 10 players account for 45% of the capacity. However the industry is very competitive with large number of players having smaller market share. The determinants of competition and cheap availability of feedstock, ability to offer newer better products, pricing & proximity to market.

- **Low capacity utilization**: Due to oversupply in global markets, prices of petrochemicals have taken a steep decline, thereby forcing the domestic companies to underutilize their plants operating levels. The average capacity utilization of the major basic petrochemicals has fallen from 82% levels before global economic crisis to 78% in 2014.

Key opportunities

- **Backward & forward integration**: Given the volatility of crude oil prices and India’s heavy dependency on oil imports, there is opportunity for oil and oil related companies to reap benefits of increase in presence across the value chain. For e.g. Reliance Industries Ltd. successfully backward integrated from refining and petrochemical company to oil and gas exploration. ONGC which is primarily an exploration company recently built a Greenfield petrochemical project.

- **Improved feedstock supply**: Availability of feedstock dictates the location of the plant. Domestic products are uncompetitive due to high costs of naphtha when compared with ethane based products from Middle East. One means to improve the competitiveness of the domestic products is by improving the infrastructure support as is the case in Middle East, China and Singapore. Also going forward, as more...
natural gas becomes available in India, the domestic players are likely to shift from naphtha to cheaper natural gas thereby increasing their competitiveness in the market.

- **More value-add products in portfolio:** Demand for performance plastics such as biodegradable polymers is expected to be on rise across the world including India. Given the environment concerns with traditional plastics, companies should look at expanding their portfolio and include more value add products. Focus areas are going to be modern farming through plasticulture, packaging for processed food & non-durables, better plastics for Automobiles & durables, infrastructure development, innovative products for Telecommunication and IT service sectors.

- **Increased geographical presence:** Given the capital intensive nature of the project and high costs associated in India (due to no duty waivers, no/ very less tax exemptions and high interest costs), the domestic companies may also look outside for organic and inorganic opportunities. Many western companies such as Dow, Shell, etc. are increasing their presence in energy rich countries like Saudi Arabia, Kuwait, Qatar, etc. and setting up manufacturing facilities.

**Key Investments**

a. **Reverse SEZ:** Overcoming challenge of reliable cheap feedstock

- Indian companies to invest a total of $15.2 bn. in Iran to setup an integrated petrochemical plant/ Gas cracker which would have advantages of access to cheap feedstock and utilities & proximity to Petrochemical deficient European market
- IOCL to invest in $3Bn Petrochemical plant subject to supply assurance of 1 mmtmtpa from Iran. The chemical building blocks can be exported to India for further value addition
- India is ready to invest Rs. 2 lakh crores in Chabbar port subject to attractive gas prices, as it gives sea-land access to Central Asia & Gulf. The port would be used to ship crude oil & urea. It would reduce transportation cost and freight time to Central Asia & Gulf by about a third

b. **Domestic Expansion projects:** Despite challenges, Indian petrochemicals space is attracting multiple investments

**Reliance Industries Limited:**

- Reliance Industries investing $16 Bn in expanding Petrochemical capacity & lower feed cost.
$ 4.6 Bn is getting invested in Integrated Gasification combined cycle (IGCC), $ 4.5 Bn in Refinery off-Gas cracker (ROGC), $ 5 Bn in Polyester capacity additions, $ 1.5 Bn to import ethane from US to replace high cost propane imports & naphtha.

RIL has confirmed orders worth $ 35 Mn. with Siemens Ltd. to expand J3 Petrochemical complex at Jamnagar, Gujarat

**IOCL:**

- Indian IOCL is planning a $ 0.57 Bn ethylene derivative complex, $1.5 Bn PX-PTA complex & $ 2.71 Bn petcoke gasification plant for ethanol
- Recently commissioned Paradip Refinery is designed for processing 15 MMTPA of High Sulphur heavy Crude Oil

**Brahmaputra Crackers and Polymers Ltd (BCPL):**

- Petrochemical project, executed by Brahmaputra Crackers and Polymers Ltd (BCPL) will use naphtha and natural gas from Assam’s oilfields to produce ethylene
- The project will produce 220,000 tonnes of polyethylene, 60,000 tonnes of polypropylene, 55,000 tonnes of raw gasoline and 12,500 tonnes of fuel oil annually

**Deepak Nitrite:**

- Deepak Nitrite is planning to setup one of the largest phenol-acetone plant in Dahej
- It would have 200 KT manufacturing capacity for Phenol and 120 KT for Acetone
- The total capital outlay for the project is estimated at $ 180 Mn

**Sources:**

- Department of chemicals and petrochemicals
- Crisil Research
- Industry reports
- TSMG previous reports
### Intermediates

#### Introduction

India stands a good chance in providing a lucrative market to the world as the general trend in the global petrochemicals market has shifted to the Middle-East and Asia from the West. Vertical integration from oil & gas to refining and downstream petrochemical products is among the biggest attributes of large petrochemical players. This provides such players feedstock security, scalability and economies of scale.

Petrochemical intermediates are a major segment to ensure connectivity between basic upstream building blocks and the downstream specialty chemicals. These are generally produced by chemical conversion of primary petrochemicals to form more complicated derivative products.

#### Key Segments

Petrochemical intermediates are compounds which are typically used for the manufacture of specialty chemicals, plastics, composites, fibres. The key end markets include agriculture, consumer goods, construction, electronics, packaging, pharmaceuticals and transport. The following chart gives a high level indication of the value chain.

**Figure 45: Petrochemical Value Chain**

(Source: Industry report analysis by Tata Strategic)
The major petrochemical derivatives obtained from petrochemical products are as follows:

1. **Derivatives obtained from ethylene**: These include polyethylene, ethanol, vinyl acetate, ethylene oxide (from which ethoxylates, glycol ethers and ethylene glycol are derived).

2. **Derivatives obtained from propylene**: These include isopropyl alcohol, acrylonitrile, polypropylene, propylene oxide (from which polyl, propylene glycol and glycol ethers are derived), acrylic acid (from which acrylic polymers are obtained) and allyl chloride (from which epichlorohydrin is obtained)

3. **Derivatives obtained from toluene**: These are toluene diisocyanate (from which polyurethanes are obtained), benzoic acid (from which caprolactum is obtained) and nylons are derived or made from Caprolactam

4. **Derivatives obtained from xylenes**: These are meta-xylene (from which isophthalic is obtained) and para-xylene (from which dimethyl terephthalate and terephthalic acids are obtained)

5. **Derivatives obtained from benzene**: These include chlorobenzenes, alkyl benzene used in making detergents, nitrobenzene (aniline from which methylene diphenyl diisocynate is obtained), cyclohexane (from which adipic acid and caprolactum used in making nylons are obtained) and cumene (from which solvents, polyphenols and are obtained)

### Large Import Dependency for Petrochemical Intermediates

- **Acrylonitrile & Styrene** - While acrylonitrile is largely imported in India, styrene is 100% imported. These are the key raw materials for ABS (Acrylonitrile Butadiene Styrene). The ABS industry as well as its downstream segment in India is highly consolidated.

- **Acrylates / Acrylic acid** - Acrylates are produced from acrylic acid which uses propylene as its key raw material. However, there is no production of acrylates or acrylic acid in India primarily on account of non-availability of propylene in India and the demand for both is catered through 100% imports. End use segment include Paint & Coatings which is a consolidated industry. All other end use segments like adhesives, construction chemicals, textile, leather and paper industries are fragmented industries.
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- **Epoxy resin raw materials**: Major raw materials for epoxy resins are Epichlorohydrin (ECH) and Bisphenol-A (BPA), both of which are imported. Access to quality raw material is a concern as high grade material is being used internally by suppliers.

- **Ethylene Vinyl Acetate (EVA)**: EVA is derived from the reaction of vinyl acetate monomer and ethylene. Due to availability issue of ethylene in India, EVA capacity is non-existent in India. Key end-applications are packaging of food products, tapes, bandages, footwear soles (due to its sticky nature), wires and cables.

- **Isopropyl alcohol**: Propylene is the key raw material for producing IPA. However there are concerns over the propylene availability in India as 95% of the propylene produced in India is consumed for the production of polypropylene. There is only one manufacturer of IPA in India and it currently holds 80% market share for IPA. The company is also importing IPA to meet the domestic demand in India.

- **Methylene di-phenyl di-isocyanate (MDI)**: For manufacturing MDI, aniline, phosgene and formaldehyde are the major raw materials. Currently, there is no domestic manufacturing of MDI in India. India is dependent on imports for MDI.

- **Methyl Methacrylate (MMA)**: MMA are methyl esters of methacrylic acid. Polymers made from MMA are known for outstanding transparency, resistance to outdoor exposure, light weight and high surface gloss. 95% of MMA demand is catered through imports with Singapore accounting for 60% of total imports.

- **Propylene oxide**: With only one manufacturer of propylene oxide in India, the level of consolidation is high. The remaining demand for PO is fulfilled by imports from 2-3 major players - Sumitomo - Saudi Amaroce JV, SKC and Dow.

- **Adipic acid**: Adipic acid is used for the manufacture of polyamides and is almost entirely imported in India.

**Key trends**

Rapid expansion in the refining sector and surplus availability of naphtha has supported growth in the petrochemical intermediates segment in India. Petrochemical intermediates provide a high growth opportunity driven by downstream industries. The specialty chemical industry is estimated to achieve rapid growth over the medium term and will be the primary driver for demand in petrochemical intermediates, going forward. Growth in specialty chemicals will stem from both the growth of end industries such as construction and consumer goods and the rising sophistication of end products such as passenger cars.
During 2015, overcapacity in the fibre intermediate markets led to a decline in prices and margins. Para-xylenes (PX) demand uncertainty globally along with capacity anticipations, kept markets cautious and contract prices remained unsettled for most part of the year. Feedstock fluctuations in the international markets and the steep drop in the latter part of the year led to cautious buying behaviour by the industry. In addition, severe cash crunch and longer cash cycles resulted in need-based buying.

**Challenges faced**

1. **Higher focus on bulk end products:** Over 80% of the petrochemical building blocks such as ethylene and propylene produced in India are used for the manufacture of plastics and packaging products, leaving only small volumes for the manufacture of higher value added intermediates.

2. **High import dependency:** Despite surplus naphtha within the country, large quantities of petrochemical intermediates are still being imported owing to lower prices.

3. **Technological challenges:** Several challenges are faced by Indian manufacturers of petrochemical intermediates on the technology front. However, companies like RIL have invested large sums of money on technology and product up-gradation.

4. **Lack of specialized infrastructure:** Some companies in India in the petrochemical segment lack infrastructure such as high pressure pipelines, cost effective effluent treatment plants and crackers and water desalination plants.

**Conclusion**

The petrochemical intermediates industry is a highly value-creating one. It is critical for companies in India to create an integrated petrochemical intermediates plan which would match feedstock availability with downstream and end-use demand. Companies will need to constantly focus on technology, cost improvements and safe practices, while continuing to invest in new growth opportunities. This strategy is also important in maintaining domestic market leadership in its major product lines and is a source of competitive advantage. It is hence endeavoured to formulate petrochemical intermediate clusters as frontrunners in the Make in India campaign to improve the ease of doing business, by simplifying land acquisition or environmental clearances.

**Sources:**

- Department of chemicals and petrochemicals
- Industry reports, TSMG previous reports
Fertilizers

Introduction

Agriculture holds a prime importance in the socio-economic fabric of India. The sector has remained backbone of the Indian economy and presently accounts for 15% of the country’s GDP. Nearly 58% of the rural households rely on agriculture as their principal means of livelihood. Being a source of livelihood and food security of the nation, higher growth in agriculture assumes great importance and is matter of concern. Successive Five Year plans have stressed on self-sufficiency and self-reliance in food grains production and concerted efforts in this direction have resulted in substantial increase in agricultural production and productivity.

Chemical fertilizers have played a vital role in the success of India’s green revolution and consequent self-reliance in the food-grain production. The different types of fertilisers include chemical fertilisers, organic fertilisers and bio-fertilisers. They comprise of the following basic nutrients:

- **Primary nutrients** are nitrogen (N), phosphorous (P) and potassium (K), which are required in large quantities and are normally supplied through chemical fertilisers.

- **Secondary nutrients** are required in smaller quantities vis-a-vis the primary nutrients and include calcium, magnesium, and sulphur.

- **Micro nutrients** are groups of nutrients that are essential for plant growth, though plants require them in smaller quantities. These include iron, zinc, manganese, copper, boron, molybdenum and chlorine. The most extensively used micronutrient in India is zinc sulphate.

Over the past decade, though significant strides have been made in ensuring that we produce enough to feed our people, Overcoming structural barriers that still continue to hamper the sector has become essential, in order that we remain self-reliant in the coming years, and become an agricultural powerhouse.

The amount of per capita arable land in India has consistently declined from 0.34 ha in 1950s to 0.15 ha in 2000s. With rising population it is further expected to reduce to 0.07 ha by 2030. Land under urban use has been increased by 24,000 sq. km, at the expense of arable land. This has put immense pressure on the current available arable land for the food and nutritional needs of the population.
Most of the urea production is located in the West and North. Natural gas for urea production is met through domestic gas and two LNG terminals set up in Gujarat. Key players in the fertilizer market include IFFCO, Coromandel, RCF Ltd., Nagarjuna and TATA Chemicals Ltd.

The demand for urea remained almost flat at 30.6 Mn tonnes in FY15 owing to deficient monsoon. However, the consumption is expected to grow at 1.7% CAGR to around 33 Mn tonnes during FY15 to FY20, assuming normal monsoon. Currently, urea accounts for 57% of fertilizer consumption in India. Uttar Pradesh is the largest consumer of urea with 19.9% share in the overall urea consumption of India. Though urea’s share is steady at 56-58% of the total fertilizer consumption, NBS (Nutrient based subsidy) has made non-urea fertilizer production viable. NBS allows producers to increase farm gate prices and still get a constant subsidy. A large portion of urea is still being imported. It is further expected to grow at 2% in the next three years. The current decline in international urea prices will further aid imports in the short run.

The increase in fertilizer consumption has contributed significantly to sustainable production of food grains in the country. With the limited arable land resources, and burden of increasing future population numbers, chemical fertilizers will continue to play an important role in sustaining food security in India. Therefore, scientific use of fertilizers using the limited arable land, with an emphasis on protecting the environment is the only way to improve food security and to increase crop yields.

**Indian Fertilizer Industry**

India is one of the major regions contributing to the rising fertilizer demand. In terms of tonnage and value, chemical fertilizers is the largest segment (vis-a-vis organic or bio-fertilizers) supplying the primary nutrients. Presently India uses around 25 chemical fertilisers. The same can be classified into nitrogenous, phosphatic, potassic, and complex fertilisers, depending on their nutrient content. Nitrogenous fertilisers account for the bulk of consumption followed by phosphatic fertilisers.

The consumption of fertilizers decreased from 56.6 Mn tonnes in FY11 to 53.1 Mn tonnes in FY15, led by a decline in DAP and NPK consumption. The decline in fertilizer consumption was because of increase in retail prices of DAP and reduction in government subsidy. This was further aggravated by adverse climate and price issues. Market is estimated at $22 Bn and has been stagnant in the last 5 years.
India Urea Outlook

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Urea has historically been used heavily because of its relatively low price but with the government's mandate of promoting "neem urea," which is more effective in transferring nutrients to plants, the growth in consumption is expected to stay muted.

**Indian Phosphatic Fertilizer Outlook**

The eastern coast accounts for 65% DAP capacities in India. DAP has a relative share of 14.2% of fertilizer consumption. DAP consumption fell at 7% CAGR during the past five years, due to increase in retail prices from Rs 10,000 per tonne to Rs 23,000 per tonne. It is expected to grow at 2.5-3% p.a. during FY15 to FY20 period. The rise in DAP consumption was met by increasing imports. India is currently the largest importer of DAP in the world.

DAP and other complex fertilizers can be manufactured in same unit. The availability of other complex fertilizers is very limited in the international market compared to DAP availability. Hence, producers are expected to manufacture greater quantities of other complex fertilizers in the unit and meet DAP deficit through imports. International DAP prices have moderated after reaching its peak in 2008. This has made import of DAP more sustainable. Import of DAP is expected to rise from 5.7 Mn tons in FY13 to 8.7 Mn tons in FY18.

**India Potash Outlook**

Consumption of 'K' nutrient declined from 3.7 Mn tons in FY10 to 2 Mn tons in FY14. However, the demand for 'K' nutrient in India is expected to grow at a faster pace than that of N nutrient at 3-3.5% CAGR.

The demand for complex fertilizers had slowed down significantly between FY 11 to FY 13. This was mainly due to introduction of NBS (nutrient based subsidy) policy, as the government reduced subsidy and international prices increased, thus, giving sharp rise in retail prices. Also, the minimum support prices (MSP) of major crops increased at a much slower 5-7% CAGR during the period, forcing farmers to reduce application of complex fertilisers.

Despite the stagnation in consumption during the past few years, anticipation of reduction in NBS by the government pushed up sales growth in the current fiscal. It is further expected to grow with CAGR of 3-3.5 % in the coming years.

With no domestic potash reserves, India imports potash largely as potassium chloride. Between January-July, India imported 2.3 Mn tonnes of KCl, an increase of 9% compared to the corresponding period last year. Due to India's large dependence on imports, a significant change in global industry dynamics could impact Indian government's subsidy bill. The depreciation of the Indian rupee against the US dollar, subsidy issue, and the monsoon deficit may affect importers and may influence the full-year potash import figure. However, India could still try to use its big buyer advantage and get favourable terms.
Future Outlook

The overall demand for fertilizers is expected to reach 60 MnTPA by FY 20 with the growth rate of 2-2.5%. Urea demand is estimated to grow relatively slower at 2% CAGR to 33 MnTPA over FY15 to FY20. Also, government’s directive of neem-based fertilizer production would mean lower volumes would be required as it releases nitrogen content slowly into the soil and would check diversion of urea for other purposes. Non-urea fertilizers are expected to grow at CAGR of 3.5% to reach the consumption of 27 MnTPA by FY 20. The consumption will be primarily be driven by growth in NPK fertilizers and steps taken by the government such as Soil Health Card Scheme. Also, government’s efforts to increase awareness about soil fertility and farmers’ adoption of fertiliser mixtures (NPK fertilisers) instead of single nutrient fertilisers will increase in the consumption of NPK fertilizers and therefore revive the demand for complex fertilizers.

![Figure 48: Fertilizers Consumption- Future forecast (in MnTPA)](image)

Source: CRISIL, FAI, Tata Strategic Analysis

Key Trend

As agriculture is the priority sector for India, government has regulated the usage of domestic gas for fertilizers. Use of natural gas as feedstock for the production of urea is energy efficient and cheaper. The current fertilizer policy is aimed towards increasing the use of natural gas as a fuel. Government has been instrumental in this regards towards motivating companies to use the alternative option. It has also introduced the gas price pooling mechanism which will lower the gas cost for new plants that would have otherwise relied on imported LNG.
Challenges

International prices for Urea, DAP & MOP are expected to fall. This will increase the potential for imports. Also, due to low import parity price companies would not be able to reap benefits of manufacturing beyond 100% capacity. Thus the operating margins of the fertilizers companies are expected to contract. Besides this, fertilizer is second highest in terms of subsidy after food. This has led to a high Fiscal Deficit. Also, only 35% of total fertilizer subsidies reach small farmers. The rest leaks out to black market, large farmers and inefficient producer. However, the direct benefit transfer scheme (announced on a pilot basis) is likely to reduce the subsidy leakage in the long run and, also lower the government's subsidy burden over time.

Opportunities

The government is hopeful for players to develop and market innovative formulations which could be tailored to a particular local soil and crop requirements. Since the subsidy would be given on nutrient basis, players developing newer formulations will be able to rate the products based on demand.

Besides this, industry players can work closely with the Indian government to set up reverse SEZs in countries like Mozambique, Iran and Myanmar. As a part of this, the Indian company can setup a fertilizer plant which can cater to the demand of both the countries. Government has to take initiative in incentivizing the imports from these countries; also it has to work closely with these governments to safeguard the Indian investments.

Sources:
- Department of chemicals and petrochemicals,
- Industry reports, FAI, Crisil Research, TSMG previous reports

Pharmaceuticals

Global Pharmaceutical Market Overview

The global pharmaceutical market, has grown at a CAGR of 6% over the last 5 years from a value of $ 887 in 2010 to $ 1,187 in 2015. The global market is expected to slow down owing to slowing growth in developed markets and lower levels of spending expected in some of the major economies like USA. The key growth drivers in future for the global pharmaceutical industry would be:
Strong growth in emerging markets like India, China, Brazil and Russia
Aging population and rising life expectancy
Increasing access to modern healthcare
Increase in healthcare awareness
Improvement in medical practices

The global market is expected to grow at 4.5% to reach a value of $1,479 Bn by 2020.

**Figure 49: Global Pharmaceutical Market and outlook (in $ Bn)**

Source: IMS Health, TATA Strategic Estimates
Note: Figures are for Calendar year 2010, 2015 & 2020

**Indian Pharmaceutical Market Overview**

The domestic pharmaceutical market in India is estimated at $17 Bn in FY16, having grown at a CAGR of 7.2% from $10 Bn in FY11. It accounts for 1.4% of the global market for pharmaceuticals by value and 10% by volume.
In India, about 70% of the total formulations sold are for acute illness and remaining 30% for chronic illness (prolonged duration). This is true for most developing countries as compared to developed markets where the growth is led by chronic ailments.

Generic drugs account for about 75% of the total domestic market for pharmaceuticals. Currently, Anti-infective drugs command the largest share of the Indian pharma market, followed by Cardiovascular & Gastro-intestinal, Respiratory and Vitamins & Minerals. The top 5 segments contribute to nearly 57% of the entire market in 2015.

Source: Crisil, Annual reports, Tata Strategic Analysis

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**Figure 50: India Pharma Market (in $ Bn)**

![India Pharma Market](image)

**Source:** Crisil, Annual reports, Tata Strategic Analysis

**Figure 51: Major Therapeutic areas in India (% share)**

![Major Therapeutic areas in India](image)

**Source:** Indian Pharmaceutical Sector presentation 2015, IBEF
India is also a major exporter of pharmaceuticals to more than 200 countries with US, Europe and Africa accounting for more than 50% of India’s exports of pharmaceuticals. Drugs for cholesterol control, pain management, anti-coagulant, respiratory problems, liver disorders, depression and lipid regulators are highly prevalent in the global market.

**Regulatory System:**

India has an extensive regulatory system for pharmaceuticals.

- **DCA (Drugs and Cosmetics Act):** The Drugs and Cosmetics act, enacted in 1940, regulates the import, manufacture, sale and distribution of drugs in India. The Drugs and Cosmetics Rule, 1945 is an appendix to the DCA. The rules are updated and amended regularly.

- **CDSCO (Central Drugs Standard Control organization):** The national level regulator governed by the DCA plays a critical role in Clinical trials, New Drugs approval and post-marketing surveillance

- **SDRA (State Drug Regulatory Authorities):** This state level regulator handles applications for license to manufacture, sell and distribute drugs and also ensures GMP compliance by manufacturers of drugs.

Along with these central and state government authorities, the DTAB (Drugs Technical Advisory Board), Drugs Consultative Committee (DCC) and the Central Drugs Laboratory (CDL) have a role to play in the regulation of Indian pharmaceutical sector.

- **DTAB:** Under the DCA, DTAB acts as an advisory board to the CDSCO mainly on technical issues arising out of implementation of regulation

- **DCC:** Based on recommendations made under the DCA, the DCC advises the central, state governments and the DTAB on matters related to secure uniformity throughout the country in the administration of the DCA.

- **CDL:** This is a national body for quality control of Drugs and cosmetics under the DCA. It is responsible for quality control of drugs and cosmetics manufactured within the country, and also majority of drugs imported into India.

**Government of India Initiatives**

The government of India has undertaken several policy initiatives for the growth of the pharmaceutical business in India. Some of the measures adopted are:

- 850 drugs brought under price control, in an effort to improve accessibility to affordable medicines
New Bulk drug policy expected to be announced soon, to bring down imports of bulk drugs and increase domestic output.

Drug regulatory system in the country to be strengthened with an investment of INR 1,750 crore from 2015-16 to 2017-18

Government of India’s Jan Aushadhi scheme to offer more medicines and medical devices at affordable prices with 3,000 Jan Aushadhi stores expected to be opened by 2017 from the current number of 121

Govt. of India’s decision to increase FDI in existing pharmaceutical companies to 74% to encourage consolidation within the pharmaceutical industry

Bulk drug manufacturers, including both state-run and private companies, to be incentivized to encourage ‘Make in India’ programme and reduce dependence on imports of Active Pharmaceutical Ingredients (API)

A venture capital fund of Rs 1,000 crore (US$ 148 Mn) planned by Department of Pharmaceuticals to support R&D start-ups in the pharmaceutical and biotech industry

In a nutshell, the government and regulatory authorities will continue working together on:

- Rationalization of taxes
- Providing incentives for setting up manufacturing units through special economic zones and other facilities
- Providing incentives for higher in-house research and development and
- Improving quality of healthcare infrastructure and availability of medicines through the ‘Jan Aushadhi’ scheme at affordable prices.

Key challenges

While the Indian Pharmaceutical market is expected to grow at double-digit levels over the next five years, it faces certain challenges as highlighted below:

- Compliance with global cGMP standards involving continuous improvement in systems & processes and workforce training
- High level of fragmentation in the industry with top 10 companies contributing to 41% of total sales, next 10 companies contributing to 22% and remaining companies contributing to 37% of total sales
Government control on prices of pharmaceutical products
Lower spend on Research and Development resulting in lack of innovation
Lack of skilled manpower especially in Research and Development of Novel molecules
Consolidation among customers in US market

Future outlook

The Indian market is expected to grow at 12% over the next 5 years driven majorly by following factors:

- India’s huge population and growing number of stress-related diseases due to change in lifestyle
- Increasing incomes leading to increase in affordability of healthcare facilities and drugs
- Availability of better diagnostic facilities
- Increase in government spending on social sectors with a focus on healthcare
- Increased penetration of health insurance (Provision of Rs 1 lakh insurance cover per family by GOI)
Way forward

- Mergers and acquisitions in the Indian pharmaceutical industry expected to receive a major boost with the government of India's decision to increase FDI in brownfield pharmaceutical projects to 74%
- Indian pharmaceutical companies need to focus on development and improvement of capabilities in novel drugs and delivery mechanisms
- With increased government spend on Healthcare and infrastructure in rural areas, Pharmaceutical companies that have been focusing on enhancing distribution network in rural areas will have tremendous growth opportunities
- Contract Research and Manufacturing services in India is expected to continue its growth story as major pharmaceutical companies shift their focus to New chemical entities and Investigational new drugs

Sources:

- Department of chemicals and petrochemicals
- Industry reports
- IMS health
- IBEF
- Crisil Research
- TSMG previous reports

Agrochemicals

Introduction

Agriculture holds a prime importance in the socio-economic fabric of India. The sector has remained backbone of the Indian economy and presently accounts for 15% of the country’s GDP. Nearly 58% of the rural households rely on agriculture as their principal means of livelihood. Being a source of livelihood and food security of the nation, higher growth in agriculture assumes great importance and is matter of concern. Thus to accelerate high growth and ensure sustainability, combined effort in terms of technology, policies and institutional support has to be adopted.
At present the sector is yet to realize its full potential in terms of bringing in efficiencies across all the stages in the value chain. The population of marginal cultivators is now seen to increase whereas the landholdings are decreasing thus making the agriculture profession unviable for marginal cultivators. Besides this, the sector is highly susceptible to vagaries of the nature. Difficulties in adopting modern farming technologies and lack of knowhow about modern farming processes and agri-inputs are creating immense pressure on the agriculture sector to undergo transformation. Thus in the next generation agriculture practices, there is a need to do more with less and increase the yield by optimizing the available resources. Therefore it is essential to adopt modern methods to ensure more optimized and make productive usage of the resources to harness the growth potential of this sector. The following sections of the report provide an overview on the challenges faced by the Indian agriculture sector, the Indian crop protection market, next generation crop protection and crop enhancement solutions and govt. of India Initiatives.

**Need for Agrochemicals in India**

India is world’s second largest nation with a population of 1.3 Bn which is approximately 18% of the global population. The global population is expected to cross 9 Bn by 2050. Rising population has led to increasing food demand. To meet the food & nutrition needs of a growing population requires a sustainable approach that puts thrust on increasing productivity against the background of lower yields & decreasing farm sizes. It requires a push from all stakeholders - the farmer, the government and the agrochemical industry collectively so that the changing needs of the nation are met. Approximately 25% of the global crop output is lost due to attacks by pests, weeds and diseases which doesn’t predict well for farming given the critical challenges ahead and thus agrochemicals have an increasing role to play.

**Indian Agrochemicals Market Overview**

Agrochemicals can play a major role in enhancing productivity and crop protection post-harvest. They are diluted in recommended doses and applied on seeds, soil, irrigation water and crops to prevent damage from pests, weeds and diseases. Insecticides are the largest sub-segment of agrochemicals with 60% market share, whereas herbicides with 16% market share are the fastest growing segment in India. India is the fourth largest global producer of agrochemicals after the US, Japan and China. Approximately 50% of the demand comes from domestic consumers while the rest goes towards exports.

FY15 has been a challenging year for crop protection chemicals market in India as well as throughout the world.

On the global front, crop protection chemicals sales in almost all the regions declined in 2015, with the sharpest falls occurring in Europe and Latin America. Weakening herbicide
prices, varying weather including the El Nino phenomenon and weak rainfalls caused a slump in sales. One of the worst droughts was encountered in parts of Brazil and USA. Moreover, commodity prices declined worldwide, making it imperative for farmers to moderate costs. Currencies weakened against the US Dollar in several countries. Crop protection chemical purchases were postponed or not done as a result of which companies had to grapple with high inventories. As a result, exports from India increased marginally by 2.5% in FY15.

India has also had to bear the brunt of two consecutive weak monsoons. As per Economic survey of India, agriculture sector has grown by 1.1% in FY15. The country faced weak monsoons with rainfall falling 12% short of expectations. A number of states were affected due to drought like conditions, especially during the Kharif season. FY15 has been a stagnant year for Indian crop protection industry which experienced a marginal growth of 2%.

Every year in India, pests and diseases eat away on an average 15-25% of food produced by the farmers. Due to the rising population and decreasing arable land, demand for food grains is increasing at a faster pace when compared to its production. This, therefore, necessitates putting more thrust on crop productivity enhancement as well as crop protection methods. Use of crop protection chemicals can increase crop productivity by 25-50%, by mitigating crop loss due to pest attacks. Thus, crop protection chemicals are also very essential to ensure food and nutritional security.

Traditionally, agrochemicals have been manufactured through chemical synthesis but lately biochemical processes are also gaining popularity. Usually, agrochemicals involve an active ingredient in a definite concentration along with adjuvants which enhance their performance, safety and usability. The agrochemicals are diluted in recommended doses and applied on seeds, soil, irrigation water and crops to prevent the damages from pests, weeds and diseases. Therefore to improve crop performance, yield or to control pests, agrochemicals is the most relevant and reliable solution in the current context.

**Agrochemicals Classification**

Agrochemicals are substances that are manufacture, through chemicals or bio-chemical processes. They contain active ingredient in a definite concentration along with other material which increases performance and enhance safety of crops. Compared to the past the environmental and toxicological property of these chemicals has increased considerably. Research aims to improve chemicals that are not just potent but are specific for the required process while not affecting the environment in any other way.
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![Figure 53: Breakdown of Indian Crop Protection Market (% share)](image)

**Figure 53: Breakdown of Indian Crop Protection Market (% share)**

*Source: Industry reports, Analysis by Tata Strategic*

The agrochemicals can be broadly classified into five types:

1. **Insecticides**: Insecticides provide protection to the crops from the insects by either killing them or by preventing their attack. They help in controlling the pest population below a desired threshold level. They can be further classified based on their mode of action:
   
a. **Contact insecticides**: These kill insects on direct contact and leave no residual activity, hence causing minimal environmental damage. Examples include carbaryl, fipronil, pyrethrins, pyrethroids (bifenthrin, cyf luthr in, cypermethrin, deltamethrin, lambdacyhalothrin, permethrin, es-fenvalerate, tefluthrin or tralomethrin), and liquid fipronil or spinosad.
   
b. **Systemic insecticides**: These are absorbed by the plant tissues and destroy insects when they feed on the plant. These are usually associated with long term residual activity. Examples include imidacloprid, terbufos, thiamethoxam, dimethoate and dinotefuran.

2. **Fungicides**: Fungi are the most widespread causes of crop loss across the world. Fungicides protect the crops from the attack of fungi and can be of two types - protectants and eradicates. Protectants prevent or inhibit fungal growth and eradicate the pests on application. This in turn improves productivity, reduces blemishes on crop (thus enhancing market value of the crop) and improves storage life and quality of harvested crop.
3. **Herbicides**: Herbicides also called as weedicides are used to kill undesirable plants. They can be of two types - selective and non-selective. Selective herbicides kill specific plants, leaving the desired crop unharmed, while non-selective herbicides are used for widespread clearance of ground and are used to control weeds before crop planting.

4. **Bio-pesticides**: Bio-pesticides are new age crop protection products manufactured from natural substances like plants, animals, bacteria and certain minerals. They are eco-friendly, easy to use and require lower dosage amounts for same performance as compared to chemical based pesticides. The bio-pesticides category currently is a small proportion of the market but has a huge growth potential considering its non-toxic nature.

5. **Others**: Fumigants and rodenticides are the chemicals which protect the crops from pest attacks during crop storage. Plant growth regulators help in controlling or modifying the plant growth process and are usually used in cotton, rice and fruits. The Indian crop protection market is dominated by Insecticides, which form almost 60% of domestic crop protection chemicals market. The major applications are found in rice and cotton crops. Fungicides and Herbicides are the largest growing segments accounting for 18% and 16% respectively of total crop protection chemicals market respectively. As the weeds grow in damp and warm weather and die in cold seasons, the sale of herbicides is seasonal. Rice and wheat crops are the major application areas for herbicides. Increasing labor costs and labor shortage are key growth drivers for herbicides. The fungicides find application in fruits, vegetables and rice. The key growth drivers for fungicides include a shift in agriculture from cash crops to fruits and vegetables and government support for exports of fruits and vegetables. Bio-pesticides include all biological materials organisms, which can be used to control pests. Currently bio-pesticides constitute only 3% of Indian crop protection market; however there are significant growth opportunities for this product segment due to increasing concerns of safety and toxicity of pesticides, stringent regulations and government support.
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Figure 54: Major products across crop protection chemicals segment

<table>
<thead>
<tr>
<th>Molecule</th>
<th>Type</th>
<th>Application</th>
<th>Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acephate</td>
<td>Insecticide</td>
<td>Control of severe infestations of sucking &amp; chewing insects</td>
<td>Tobacco, Chilies, vegetables, fruits &amp; cereals</td>
</tr>
<tr>
<td>Chlorpyrifos</td>
<td>Insecticide</td>
<td>Control of fruit borers, stem borers &amp; leaf eating caterpillers</td>
<td>Cotton, pulses, oilseeds, rice, Etc</td>
</tr>
<tr>
<td>Dinotefuran</td>
<td>Insecticide</td>
<td>Control of Brown plat hoppers in rice</td>
<td>Rice</td>
</tr>
<tr>
<td>Fipronil</td>
<td>Insecticide</td>
<td>Control of rice stem borer, diamond moth</td>
<td>Cole crops, sugarcane, Chilli</td>
</tr>
<tr>
<td>Flonicamid</td>
<td>Insecticide</td>
<td>Control of all aphid species</td>
<td>Apples, peaches, wheat, potato, vegetables</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>Insecticide</td>
<td>Control of sucking pests-aphids, jassids, whitefly, brown planthopper</td>
<td>Cotton, rice &amp; vegetale crops</td>
</tr>
<tr>
<td>Glyphosate</td>
<td>Herbicide</td>
<td>Control of weeds and grasses</td>
<td>Variety of crops</td>
</tr>
<tr>
<td>Quizalofop</td>
<td>Herbicide</td>
<td>Control of narrow leaf weeds</td>
<td>Broad leaf crops</td>
</tr>
<tr>
<td>Hexaconazole</td>
<td>Fungicide</td>
<td>Control of powdery mildews, rusts &amp; leaf spots</td>
<td>Cereals, Oil seeds, horticultural &amp; plantation crops</td>
</tr>
<tr>
<td>Tricyclazole</td>
<td>Fungicide</td>
<td>Control of leaf blast, node blast &amp; neck blast</td>
<td>Rice</td>
</tr>
</tbody>
</table>

Source: Industry reports, Analysis by Tata Strategic

Pesticide Consumption

Andhra Pradesh (including Telangana & Seemandhra), Maharashtra and Punjab are top three states contributing to 45% of pesticide consumption in India. Andhra Pradesh is the leading consumer with 24% share. The top seven states together account for more than 70% of crop protection chemicals usage in India.

Figure 55: Pesticides- State-wise consumption in India (% share, FY15)

Source: Industry report analysis by Tata Strategic
Note: Contribution of Seemandhra and Telangana is not available
Challenges faced by the Indian Crop Protection Industry

- **Non-genuine products**: There is a significant share of non-genuine pesticides which include counterfeit, spurious, adulterated or sub-standard products. According to industry estimates the non-genuine pesticides could account for more than 40% of the pesticides sold in India in FY14. These products are inferior formulations which are unable to kill the pests or kill them efficiently. They also result in by-products which may significantly harm the soil and environment. Apart from crop loss and damage to soil fertility, use of non-genuine products leads to loss of revenue to farmers, agrochemical companies and government.

Some of the key reasons for use of non-genuine products are lack of awareness amongst the farmers, difficulty in differentiating between genuine and non-genuine products, supply chain inefficiencies, law enforcement challenges and influencing power of distributors/retailers.

- **Stringent regulations**: Stringent environmental regulations across the world are increasing the cost of developing new products and simultaneously delaying the introduction of new products in the market. For instance, in the European Union any agrochemical product if found to be mutagenic, carcinogenic or classified as an endocrine disruptor would not achieve registration or re-registration irrespective of the level of exposure generated.

- **Low focus on R&D by domestic manufacturers**: R&D for novel molecule discovery requires huge capital and manpower investments. Indian Companies spend only 1-2% of their revenues in Research and Development as against the global MNCs which invest about 8-10% of their revenues. This makes Indian manufacturers uncompetitive globally in specialty molecules.

- **Lack of education and awareness among farmers**: It is important to educate the farmers about the appropriate kind of pesticide, its dosage and quantity and application frequency. However it is not easy to reach the farmers owing to differences in regional languages and dialects and a general inertia towards adoption of newer products on account of possible risks of crop failure. The main point of contact between the farmers and the manufacturers are the retailers who don’t have adequate technical expertise and are thus unable to impart proper product understanding to the farmers. It is also very difficult for the farmers to convey their needs effectively to the manufacturers.

- **Need for efficient distribution systems**: The large number of end users and the predominantly generic nature of the market make it essential to have a strong and efficient distribution network for the crop protection market. However, the industry has been plagued by problems arising out of supply chain every year. Lack of efficient distribution system also makes it difficult for agrochemical companies to reach out to the farmers and promote their products and educate them about their benefits.
Opportunities and Key Growth Drivers for Indian Crop Protection Market

- **Contract Manufacturing and Export Opportunities**: The export of pesticides from India has seen a moderate growth over the last few years. Globally, India is the thirteenth largest exporter of pesticides. Most of the exports are off-patent products. The major exports from India happen to Brazil, USA, France and Netherlands. The key growth drivers are India’s capability in low cost manufacturing, availability of technically trained manpower, seasonal domestic demand, overcapacity, better price realization globally and strong presence in generic pesticide manufacturing (India has process technologies for more than 60 generic molecules). Due to the reasons mentioned above, India offers good scope for contract manufacturing as well.

- Post tsunami, Japanese companies are trying to build manufacturing capacities outside Japan to de-risk themselves. The Japanese companies are very particular about confidentiality and intellectual property protection and some of them have seen opportunity in India and are now creating a base here. The recent deal between Sumitomo and Excel Crop Care is a recent example. More such deals are possible in the coming years as it will give Indian companies the access to technology which they need and the global MNCs a fast track entry into the country.

- Agrochemicals worth $ 4.1 Bn are expected to go off-patent by 2020. This provides significant export opportunities for Indian companies which have expertise in the generic segment. Top 6 importing nations constitute only 44% of India's agrochemical exports. This also indicates export potential for Indian companies. In order to build a strong export base, companies could set up marketing offices in association with domestic players in export geographies. Companies could also look for strategic alliances with local companies to expand their marketing and distribution reach. Merger and acquisition opportunities could also be explored to increase their global presence.

**Figure 56: Agrochemicals going off-patent, 2016-2020 (in $ Bn)**

![Figure 56: Agrochemicals going off-patent, 2016-2020 (in $ Bn)](image)

*Source: Industry report analysis by Tata Strategic*
Growth in herbicides and fungicides: Labor shortage, rising labor costs and growth in GM crops has led to growth in the use of herbicides. The herbicide consumption in India stands at 0.4 $ Bn in FY15 and is expected to grow at a CAGR of 15% over the next five years to reach 0.8 $ Bn by FY20. On the other hand the fungicide industry in India has grown due to the growth in Indian horticulture industry, which has grown at a CAGR of 7.5% over the last five years.

Low consumption of pesticides in India: The per hectare consumption of pesticides in India is amongst the lowest in the world and currently stands at 0.6 kg/ha against 5-7 kg/ha in the UK and 13 kg/ha in China. In order to increase yield and ensure food security for its enormous population agrochemicals penetration in India is bound to go up.

Other major growth drivers for agrochemicals are-
- Formation of Farmer Producer Organizations (FPOs) to counter the difficulties faced due to land fragmentation
- Availability and dissemination of appropriate technologies that depend on quality of research and extent of skill development
- Plan expenditure on agriculture and in infrastructure which together with policy must aim to improve functioning of markets and more efficient use of natural resources
- Governance in terms of institutions that make possible better delivery of services like credit, animal health and of quality inputs like seeds, fertilizers, pesticides and farm machinery
Future outlook

Figure 58: Indian Crop Protection Industry (in $ Bn)

Source: Industry report analysis by Tata Strategic

The Indian domestic agrochemicals market provides long term growth opportunities. Indian pesticide penetration is a mere 20% of the global average. India is also emerging as a major exporter of generic agrochemicals which is likely to further strengthen with a significant number of agrochemicals worth $5 Bn going off patent over 2015 to 2020. 45% of the Indian agrochemical production is currently exported. However, growing at a faster pace, exports are expected to overtake the domestic market by 2020. Marketing and brand creation activities will continue to be of prime importance as growth drivers of agrochemical players in India. Due to expected good monsoon agrochemicals industry will experience a pick up coupled with a rise in exports. Indian herbicides and bio-pesticides markets withhold a lot of untapped potential. To summarize, the key differentiators with which we can identify winners in this segment include the ability to create brands, robustness of distribution network and strategic partnerships that provide a strong product portfolio and a robust product pipeline.

This year, monsoon in India is predicted to be better. This should help recover farm and related economic growth. El Nino effects are gradually fading in India and paving way for La Nina, which would be inductive to more rains and consequently increased farm production. This will translate into a better demand for crop protection chemicals. Input prices for crop protection chemical companies are likely to remain subdued in the near future which will impact selling prices for farmers. Due to this, while the market could grow in volume terms, but in value terms, growth would be moderate. The long term drivers like increasing
population, current low capita consumption of pesticides, decreasing arable land, focus on productivity and increasing purchasing power would continue to remain intact and will drive the global crop protection market.

This segment generated a value of $4.4 Bn in FY15 and is expected to grow at 7.5% per annum to reach $6.3 Bn by FY20. While the domestic demand is expected to grow at 6.5% per annum, exports are estimated to grow at 9% per annum during the same period.

**Sources:**
- Department of chemicals and petrochemicals
- Industry reports
- TSMG previous reports

**Specialty Chemicals**

**Introduction to Specialty Chemicals**

Specialty Chemicals are targeted towards specific end-use applications. In contrast to base or commodity chemicals, specialty chemicals are recognized for ‘what they do’ and not ‘what they are’. They provide the required ‘solution’ to meet the customer application needs. It is a knowledge and IP driven industry with raw materials cost (as fraction of net sales) much lower than that for commodity chemicals (around 50% and 75% for specialty and commodity chemicals respectively). The critical success factors for the industry include understanding of customer needs and product / application development to meet the same at a favourable price-performance ratio.

**Figure 59: Comparison: Base Chemicals Vs. Specialty Chemicals**

<table>
<thead>
<tr>
<th>BASE CHEMICALS</th>
<th>SPECIALTY CHEMICALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sold by “specification”, defined purity</td>
<td>Sold by “performance/impact”, not composition</td>
</tr>
<tr>
<td>Selection of chemical done by customer</td>
<td>Seller provides required “solution” to meet customer application needs</td>
</tr>
<tr>
<td>CSFs: Access to secure and competitive supply of raw materials, efficient operations and supply chain</td>
<td>CSFs: Price/performance ration for specific application, technical assistance, channels to market</td>
</tr>
<tr>
<td>Generally medium to high volume products with lower price realizations</td>
<td>Generally low to medium volume products with higher price realization</td>
</tr>
</tbody>
</table>

*Source: Industry report analysis by Tata Strategic
The segment can be divided further based on end-users. There are mix of end-use driven segments and application-driven segments. End-user industries include agrochemicals, personal and home care, polymer additives, water chemicals, textile chemicals and construction chemicals. Application driven segments include surfactants, flavours and fragrances and dyes and pigments. These industries cumulatively constitute over 80% of the specialty chemicals sector.

**Figure 60: Breakdown of Specialty Chemical Segment by value (% share, FY14)**

![Pie chart showing breakdown of specialty chemical segment by value]

**Source:** Industry report analysis by Tata Strategic

**Figure 61: Segment Snapshot**

<table>
<thead>
<tr>
<th>Segments</th>
<th>FY15 Market Size ($ Million)</th>
<th>Projected Growth (Till 2020)</th>
<th>Product Differentiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polymer Additives</td>
<td>477</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Personal Care</td>
<td>700</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Water Treatment</td>
<td>458</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Construction Chemicals</td>
<td>610</td>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>Paints and Coatings</td>
<td>5300</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Colorant</td>
<td>5400</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Flavours &amp; Fragrances</td>
<td>3300</td>
<td>14%</td>
<td></td>
</tr>
<tr>
<td>Surfactants</td>
<td>3000</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Textile Chemicals</td>
<td>1250</td>
<td>12%</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** Industry report analysis by Tata Strategic

*Note:* Market Size is based on 2015 figures
Specialty Chemicals Market Overview

The specialty chemicals segment (including the knowledge chemicals / agrochemicals) estimated at $28 Bn as of FY15, constitutes around 20% of the Indian Chemical industry. The specialty and knowledge chemicals industry combined has been growing at rates higher than the overall chemical industry and is expected to continue to grow at 13% p.a. to reach $52 Bn by 2020. The growth slowdown, demand contraction and recovery witnessed over the last year or so have not impacted the long-term growth prospects of the industry.

Key Growth Drivers

Changing income distribution and evolving end use market are the key growth drivers for specialty chemicals. Rapid rise of the mid income households (“Seekers and Strivers”) is expected to create a larger consumer base for products using specialty chemicals. Additionally, high growth in end use markets and evolving customer needs are expected to drive the growth of specialty chemicals. Major end use industries - textiles, automotive, glass, construction and paints- are all expected to register double digit growth rates in the next five years. Also, emerging needs in several of these end use industries is creating demand for high performance specialty chemicals driving penetration growth.
Specialty Chemicals Market Overview

The specialty chemicals segment (including knowledge chemicals / agrochemicals) was estimated at $28 Bn as of FY15, constituting around 20% of the Indian chemical industry. The specialty and knowledge chemicals industry combined has been growing at higher rates than the overall chemical industry, expected to continue growing at 13% p.a. to reach $52 Bn by 2020. The slowdown, demand contraction, and recovery witnessed over the last year or so have not impacted the long-term growth prospects of the industry.

**Figure 63: Household in India by income category (In Mn)**

<table>
<thead>
<tr>
<th>Global</th>
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<th>Seekers</th>
<th>Aspirers</th>
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<td>INR 5 – 10 Lakhs</td>
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<td>INR 0.9 – 2 Lakhs</td>
<td>&lt; INR 90,000</td>
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<td>10</td>
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<td>93</td>
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</table>

Source: NCAER, Tata Strategic Analysis

**Note**: Figures in 2020 and 2025 are estimated.

**Growth Potential and Success Factors**

Driving factors for the growth in specialty chemicals segment are multi-fold. Firstly, the growing demand from the end use industry has been key to the high growth in specialty chemicals segment. Secondly, the Chinese chemical industry is stagnating due to tightening pollution control, labour costs, and strengthening of Chinese Yuan against the American $, encouraging exports from India, being the closest international surrogate for chemical products globally. Increase in GDP and Indian population will result in consumption-driven growth in key end markets over the next decade and an increased need for better products and services. Currently, the penetration of specialty chemicals within India’s end markets is low. With an increased focus on improving products, usage intensity of specialty chemicals within end markets such as consumer durables, food additives, and surfactants will rise in India over the next decade. Also, as the economy develops, stringent regulation of products and strengthening of consumption standards, usage of specialty chemicals can be promoted.

M&A activity in this sector has been on the rise driven by various strategies such as:

- Gaining market access / increase in market share: e.g. Evonik’s acquisition of Monarch Catalysts in May 2015
- Creating a manufacturing base resulting into cost efficiencies and shifting base from the West owing to stricter environmental regulations
- Sourcing and strengthening of supply base: e.g. Mane’s acquisition of Kancor Ingredients in Nov 2014
- Access to technology: e.g. Sudarshan’s acquisition of Ekcart in Dec 2011
Upon analysis of financial performance of 40 scaled up players across base and specialty chemical segments over FY11 - FY15, we clearly see emergent leaders outperforming their peers on the back of differentiated and niche offerings. The figure above illustrates the relative position of these 40 players.

Each bubble is representative of companies in base or specialty chemicals segment. Companies indicated in the top right quadrant are those that have demonstrated growth rates and profitability above their segment averages and form part of our high performance segment. On an average, majority of the specialty chemicals players have shown higher profitability as compared to their base chemicals counterparts.

**Innovation in Specialty Chemicals**

For a specialty chemicals company to develop a competitive position globally, innovation is the key to future growth and profitability. The focus of specialty chemical company should be on developing innovative products while taking the most optimum and value creative path from laboratory to market. Sustainability is an important driver of innovation. Research into sustainable products and processes that make efficient use of resources is an integral element of innovation strategy for a Specialty chemical company. Companies should look beyond changing feedstock. Chemical production involves
large expenditures. Thus, specialty companies should test modular production technologies as it involves setting up small production facilities.

**Road Ahead**

Given India’s potential to emerge as a global specialty chemicals hub, companies could explore how best they could participate in this growth story. A detailed growth strategy formulation would need to be based on each company’s respective strengths and focus areas. Emerging trends in consumer industries call for innovation and development of local products/solutions based on understanding of the unique needs of the Indian consumer. Also, the development of strong channels to effectively reach out to customers is of immense strategic significance. Establishing leadership position in sustainable growth through an integrated approach across the value chain could help create positive differentiation. This would not only help companies create value through green product/process innovation but also generate end consumer pull through ingredient branding in "green products".

India has signed multiple Free Trade Agreements (FTAs) with various countries leading to either no import duty or negligible import duty on a host of chemicals. This tends to make this industry in India less competitive and hence players are required to build capacities which bring in economies of scale. However, it is to be noted that China is cleansing its environment and has mandated shut down of some of its plants. As a consequence, import of specialty chemicals from China to India has declined. Besides, Indian manufacturers have started steadily capturing markets in China and in other markets. Finally the development of chemical/petrochemical infrastructure/clusters through PCPIRs (Petroleum, Chemicals and Petrochemicals Investment Regions) could enable companies to establish effective upstream linkages for increased cost effectiveness.

**a. Polymer Additives**

**Introduction**

Polymer additives are specialty chemicals added to the base polymer or plastic resins to enhance certain properties, improve processing or merely change its colour. Additives can also be used to improve the characteristics of polymers such as strength, lustre, durability or heat sensitivity. Polymer additives comprise less than 1% of the total weight of the end product. Globally the major end-use industries for plastics and polymers utilising specialty polymer additives include construction, automobile and white goods. The Indian polymer additives market as of FY15 is estimated at $ 477 Mn and has been growing at a CAGR of 10%.
Types of Polymer Additives

1. **Plasticizers**: Plasticizers are additives which are added to a synthetic resin to produce or promote plasticity & flexibility and to reduce brittleness. Applications include usage in PVC products, particularly the ones used for cables and wires.

2. **Heat stabilizers**: Heat stabilizers protect plastics from the degrading effects of heat. Their major applications include usage in PVC products for construction, such as window profiles, pipes and cable ducts.

3. **Antioxidants**: These are substances that inhibit oxidative degradation (across manufacturing, processing and end-use stages) of polymers / plastics in order to reduce changes in colour, physical and mechanical properties, such that they are within acceptable limits.

4. **Others**: Other polymer additives include light stabilisers and flame retardants. Light stabilisers protect polymers (especially polypropylene and polyethylene) from the long term degradation from UV component of light. Flame retardants inhibit, suppress or delay development of flames to prevent spread of fire.

Plasticizers form the largest segment with 42% market share followed by heat stabilizers with 22% market share. From the applications perspective, PVC consumes the maximum amount of additives, accounting for 40% of the total market followed by poly-olefins with 20%.

**Figure 65: Product Share (%), FY14**

Source: Industry reports, Analysis by Tata Strategic
Demand and Supply Scenario

Indian polymer additives market has been growing at a CAGR of 9.7% in the last five years and is estimated at $477 Mn as of FY15.

The organized segment has over 30 players and is dominated by multinational companies like Clariant Chemicals India Ltd., BASF, Lanxess India Private Ltd., Baerlocher India Ltd., Akzo Nobel Chemicals (India) Limited and Dow Chemicals. Major domestic players include KLJ Group, Fine Organics and HPL Additives.

BASF, after its acquisition of Ciba, has become the market leader in higher margin segments such as flame retardants, light stabilizers and antioxidants. Within plasticizers, there are a large number of unorganized players, leading to price competition and resultant margin pressure. Most Indian companies offer plasticizers, however, some large players are moving towards differentiated high value segments. Companies like Pluss Polymers and HPL Additives are focusing on bringing niche innovative products in the value added segments.

Projected Growth and Drivers

The market for polymer additives is expected to grow at a CAGR of 10.7% to reach $793 Mn in FY20. Key market drivers include:

- Growth in the particular end-user markets: e.g. growth in plastic demand due to increased usage in packaging, construction and automotive sectors
- With the tightening of environmental norms, both globally and in India, the polymer additives market is shifting to environmentally safe, higher value products
The European Union legislation, REACH exempts polymers supplied to European nations from being registered. However, all monomers and other ingredients present in the polymer (constituting over 2%) need to be registered. Thus, European manufacturers as well as importers of polymers need to register all such raw materials. This would impact several polymer additives as well, potentially increasing the cost of manufacturing.

**Penetration of plastics**: Increasing penetration and acceptability of plastics in almost all sectors of the Indian economy like transportation, automotive, consumer appliances, packaging and construction has significantly increased the demand for high performance plastic materials, which can be produced by the usage of plastic additives. The Plasticulture industry is also expanding, owing to various benefits of using plastics in this industry.

**Need for increased focus on innovation**: The polymer additives segment is moderately capital intensive and requires significant investments to stay competitive. R&D and new product development is largely the domain of global giants. As a product matures, it tends to get commoditised and its margins fall, thus to succeed in this segment it is important to stay ahead and focus on launching innovative products.

**Price competition in less differentiated segments**: Most of the global polymer additive companies are already present in India with their product range largely focused on high margin segments. Most of the Indian companies face price
competition in less differentiated segments. However, there are a few players focusing on differentiated segments by investing in product innovation. As the traditional segments mature and stagnate with declining profitability, it would be important for them to make a move towards newer opportunities.

- **Regulatory trends**: Development of environment friendly additives is a major challenge being faced by the industry. Increasing demand for environment friendly additives by domestic market together with regulations such as REACH on exports is forcing players to adopt such products. Strict regulation on additive use in plastics is expected to drive demand and increase sales.

b. **Personal Care Ingredients**

*Introduction*

**Figure 68: Personal Care Ingredients industry snapshot**

The market for personal care ingredients is broadly classified into commodity, fine chemical, and specialty chemical ingredients. Specialty ingredients are further classified as active and inactive ingredients based on their functionality in consumer products.

**Inactive Ingredients**

Personal Care inactive ingredients refer to those ingredients that provide physical and process able properties to a formulation as opposed to active properties. These include ingredients such as surfactants, preservatives, colorants and polymer ingredients.
1. Active Ingredients

Personal Care active ingredients refer to those ingredients that add active property to a product that result in benefits to the end user as opposed to the formulation. These include ingredients such as anti-ageing ingredients, exfoliators, conditioning agents and UV agents.

The Indian personal care ingredients market is valued at $700 Mn in FY15 with active ingredients accounting for 40% of the total market.

**Demand & Supply Scenario**

Personal care ingredients market has grown at a CAGR of 11.8% in the period 2010-15 to reach $700 Mn. Rising income, increased availability and wider product portfolio of companies has led to growth in personal care products and thereby personal care ingredients.

**Figure 69: Personal Care Ingredients market size (in $ Mn)**

![Chart showing market size from FY10 to FY15](image)

*Source: Industry reports, Analysis by Tata Strategic*

This market has been dominated by global majors such as BASF, DSM and Merck. Some of the larger Indian players in the personal care ingredients industry are Kumar Organic Products Limited and Sami Labs. Kumar Organic focuses exclusively on synthetic active ingredients while Sami Labs focuses on natural active ingredients.

**Projected Growth & Drivers**

Personal Care Ingredients market in India is expected to grow at 13.6% to reach $1,325 Mn by FY20. Key growth drivers include:
Active Ingredients

Personal care active ingredients refer to those ingredients that add active property to a product that result in benefits to the end user as opposed to the formulation. These include ingredients such as anti-ageing ingredients, exfoliators, conditioning agents and UV agents.

The Indian personal care ingredients market is valued at $700 Mn in FY15 with active ingredients accounting for 40% of the total market.

Demand & Supply Scenario

- Positive market outlook: Improvement in economic environment and increasing purchasing power of the Indian population
- Growing penetration: The penetration of personal care products in India has been very small compared to developed or even other developing economies. However, a rapid increase in the adoption of personal care products, especially in rural markets is expected, going forward
- Movement towards premium products: India is witnessing increasing consumption of higher end, discretionary and prestige products, which typically use higher value active ingredients driving growth in the ingredients market. For instance, nearly 50% of the total new launches in the personal care space were premium brands driven by increase in disposable income, rising young working population and growth in organized retail

Key trends and future outlook

- Innovation driving growth: Differentiation and innovation are critical for players to maintain profitability and prevent commoditization of ingredients. Regulatory environment is another driver of innovation, as a number of synthetic active ingredients have been banned across the globe citing potential health hazards. Ingredient manufacturers need to focus on R&D to develop safer natural or synthetic ingredients to replace such products.
- Stricter regulatory compliance: Compliance with various international regulations is critical for Indian companies exporting to developed countries, particularly to USA or European Union. For exports to the USA, some categories of personal care ingredients require FDA approval. For European Union, personal care ingredients will fall under the
purview of REACH from 2018. Owing to such regulations, additional costs on Indian manufacturers are bound to be imposed but are necessary for establishing product acceptance for exports.

- **Client relationships**: Building strong relationships with clients based on differentiated product offerings is critical for players to be able to prevent squeezing of prices by customers and thus to maintain their financial profile. Further, collaboration with customers is essential to develop customized ingredients for their current portfolio and product pipeline.

- **R&D focus**: A strong product portfolio to cater to both the domestic as well as the export market has been developed by players that have invested in R&D. To succeed in this segment companies need to develop a strong product portfolio and build lasting relationships with personal care product manufacturers.

c. **Water Treatment Chemicals**

**Introduction**

Water treatment chemicals are used for a wide range of industrial and in-process applications such as reducing effluent toxicity, controlling Biological Oxygen Demand (BOD) & Chemical Oxygen Demand (COD) and disinfecting water for potable purposes. In some developing countries, chemical water purification is conducted at household level to provide safe drinking water. In developed countries and urban centres of developing countries, this is generally done at the municipal level by civic authorities or by water management organizations.

Industrial applications of water treatment chemicals largely entail waste water management, and enhancing efficiency of industrial equipment by minimizing corrosive and other adverse impacts of water.

Based on their application and action, water chemicals are classified into coagulants, flocculants, biocides, disinfectants, algaecides, defoamers, neutralizing agents, oxidants, oxygen scavengers, pH adjusters, boiler water chemicals, resin cleaners and scale inhibitors.

As of FY15, the Indian water treatment chemicals market is estimated at $ 458 Mn. Coagulants and flocculants form the largest segment with 38% market share followed by biocides and disinfectants with 19% market share. Apart from use in potable water, the customer base is widespread across diverse industries ranging from large power plants, refineries and fertilizer factories to pharmaceuticals, food and beverages, electronic and automobile companies.
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The growth of these segments is driven by their end-use applications. Coagulants and flocculants are used for waste water management and are replacing traditional products such as alum. Driven by high growth industrial and municipal water treatment, coagulants and flocculants are expected to grow at the fastest rate.

Demand and Supply scenario

The Indian water treatment chemicals market grew at a CAGR of 12% between FY10 and FY15 to reach $ 458 Mn in 2015.

The largest consumer of water (76% of the total water consumption in India) has been irrigation. Industrial, household and other segments constitute 24% of the total consumption. In the water treatment chemicals market, most players are integrated end to end water solutions providers or are in process of expanding in the value chain. This also implies that most water project players have their own water chemical manufacturing capabilities as well. The industrial and municipal water treatment sectors are driving the growth of water chemicals in the short term and long term respectively.
Projected Growth and Drivers

The market for water treatment chemicals is expected to grow at a CAGR of 13.8% to reach $874 Mn in FY20. Key market drivers include:

Figure 73: Water Chemicals- Future forecast (in $ Mn)

- Increasing urbanization and rising living standards leading to municipal usage of water chemicals
- Increased awareness about quality of drinking water and its impact on health
- On the industrial side, the largest end-use sector is power and energy. Given the power deficit faced by India and the upcoming power projects, this sector will continue to drive growth
- The tightening of environmental norms on industrial effluents and their strict implementation by the Central Pollution Control Board is also fuelling growth in water chemicals
- Awareness among end users about recycling water, and cost effectiveness of recycling water in the long term

Key Trends & Future Outlook

- **Shift towards advanced products**: The market for water treatment chemicals has seen a shift from the traditional products to technically more advanced products. For example, coagulants and flocculants are replacing traditional products like alum. In the corrosion and scale inhibitor market, there is an on going shift from the traditionally used heavy metal based products to the ones which have better environmental profiles. Manufacturers are increasingly producing patented formulations with exclusive rights that offer customized solutions in a particular market.

- **Stricter government regulations**: The market is expected to grow in light of stricter government regulations in industrial and institutional domains. Innovative products catering to niche applications are likely to help market participants build / sustain their competitive edge.
Growing urbanization: With growing urbanization, the demand for both water treatment of municipal water supply and industrial wastewater treatment is expected to rise. Many global players in the water chemicals space are already present in India. Indian companies in this space have also grown and are exporting innovative solutions across the world. Unlike some other specialty chemical segments in India, water-chemicals are largely an organized market with integrated players. With water projects and solutions providers having an established in-house water chemical manufacturing capability, it would be imperative for the pure-play companies to either integrate forward or develop strong partnerships with solution providers.

d. Construction Chemicals

Introduction

Construction Chemicals, as the name suggests, are chemical compounds used in construction activities, be it residential, non-residential or non-building. These compounds belong to a niche specialty segment of the chemical industry and can be used either in existing construction projects to speed up the work or in new construction projects to impart durability and strengthen the structures. Although Construction Chemicals account for 2%-5% of the project cost, the benefits realised are far more than the increase in the cost of the project. Some of these chemical products help in minimizing the quantities of cement and water used in the construction. These compounds impart chemical as well as physical properties in applications such as cross-linking or phase change (from liquid to solid). Construction chemicals are essential for high quality concrete and for promoting the improvement of concrete performance. They also increase the life of construction work and impart additional protection from environmental hazards. Based on end use applications, these compounds can be broadly classified into five categories as shown in the figure below.

Figure 74: Classification of Construction Chemicals

Source: Industry reports, Analysis by Tata Strategic

Note: PCE: Polycarboxylic ether; SNF: Sodium Naphthalene Formaldehyde; SMF: Sulphonated Melamine Formaldehyde
Broadly, construction chemicals can be divided into five major segments. The market is largely driven by concrete admixtures, which accounted for 42% of the total market in 2014. Flooring and waterproofing chemicals are the next big segments with a share of 14% each. Other segments include sealants, grouts and adhesives which together account for 18% of the total construction chemicals market.

**Figure 75: Construction Chemicals product share (%, FY14)**

The overall market is fairly consolidated but there is considerable fragmentation of individual products and application areas. The top 5 players account for 50% of the market; the rest being accounted for by small and unorganized players. Fosroc, SIKA India & BASF SE are the leading players in the Indian construction chemicals market.

**Projected Growth and Drivers**

The market for construction chemicals is expected to grow at a CAGR of 12.4% to reach $1,095 Mn in FY20.

**Demand and Supply scenario**

The market, boosted by the investment in construction sector, has been growing at a CAGR of 13.8% from $320 Mn in 2010 to reach $610 Mn in 2015.

**Figure 76: Construction Chemicals market size (in $ Mn)**

The share of flooring is high in Indian market as compared to the developed world while India has a low share in tiling, sealants and waterproofing. The difference in structures of the Indian and the global markets highlights the lack of awareness about the long term benefits of specialized construction chemicals. Only products such as concrete admixtures that provide immediate tangible benefits (such as reduction of the amount of concrete and/or water used thus savings costs) are popularly employed.

**Key growth imperatives for industry players could be highlighted as:**

- **Strong marketing and increased customer awareness**: Effective marketing of products has proven to be essential to make users aware of their applications and benefits. Investing in programmes to educate construction contractors about the benefits of using superior construction chemicals, in terms of lower project completion time and ease of usage is a key growth driver. It is imperative to maintain long-term relationships with customers and exert influence over channel partners to retain foothold in the industry.

- **Skill development among workers**: Providing technical training to workers about appropriate usage of these chemicals in construction will ensure correct application and better results, reinforcing the customers’ belief in the utility of construction chemicals. Industry and academia could tie-up to provide dedicated courses/training on construction chemicals in engineering institutes as well as ITIs.

- **Product innovation**: Product innovation requires adherence to international standards. Focus on sustainability / green aspects, corrosion issues (which takes almost 3% of national GDP) will require innovation. Focus on development and marketing of innovative products (e.g. silicon-based sealants) is thus a key driver for growth.
The overall market is fairly consolidated but there is considerable fragmentation of individual products and application areas. The top 5 players account for 50% of the market; the rest being accounted for by small and unorganized players. Fosroc, SIKA India & BASF SE are the leading players in the Indian construction chemicals market.

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Right value proposition: Companies with products providing right value proposition are likely to capture significant share of the market. Given the low awareness and price sensitive nature of the market, it will be challenging to get consumers to accept more expensive products. Thus product innovation must also focus on creating products with wide applications.

Adoption of modern techniques of delivery: Construction chemical companies could focus on adopting modern techniques of delivery such as on-site mixing of concrete and energy consumption in buildings by effectively liaising with the government and the construction industry. The ability to deliver the product at the consumer’s doorstep would be key to success for construction chemicals players.

Government and regulatory bodies could play an important role in driving the growth of industry by focusing along the following lines:

Increase infrastructural investments: Government's initiatives towards infrastructural development are one of the major factors driving the growth of construction chemicals industry. The construction industry is witnessing support from World Bank & ADB. All the projects funded by these organizations necessitate the use of construction chemicals. 100% FDI in real estate sector would also significantly drive the growth of construction chemicals.

Policies for promotion of construction chemicals: Indian government’s initiative towards favourable policies like National Building Code and Green Building is estimated to boost the growth in construction chemicals market.

Define quality standards: Government and regulatory bodies could come together to define set quality standards for the industry. This would dampen the growth of low quality, cheap construction chemicals and incentivise players to invest in the industry.

Key Trends and Future Outlook

Growth in urban housing sector: Cement consumption across India is projected to grow at a CAGR of 7% between FY15 and FY19. It is driven by the improvement in economic growth, and better execution of housing and infrastructure projects. Over the next five years, the housing sector would remain the largest end-user of cement, followed by the infrastructure sector.

Increasing penetration of construction chemical products: The penetration level of construction material is currently very low in India as compared to other countries. However, construction chemicals are finding increased usage driven by:

- Increase in awareness about quality construction materials such as performance-enhancing products among consumers and builders.
- Increased construction activities triggered by urbanization and development of rural areas which are still largely untapped markets.
Use and access to foreign technology and the entry of foreign companies in the construction chemicals sector has eventually resulted in quicker growth of the construction chemical sector. Today several projects funded by multilateral agencies like ADB and World Bank have made use of good quality construction chemicals mandatory.

Architects and consultants have realized the importance of quality construction chemicals and they generally tend to specify trusted brands of construction chemicals.

- **Increasing compliance chemicals with international manufacturing standards**: Indian construction industry is fast adopting best practices from across the world and implementing consumer standards matching with international standards. This will help increase the current penetration levels of construction.

a. **Paints and coatings**

**Introduction**

The Indian paint industry is can be broadly classified into 2 segments:

1. **Decorative Paints**: This segment primarily caters to the residential and commercial buildings and accounts for 73% of the total paint industry. Enamels are the most widely used followed by distempers and emulsions. On the basis of product composition, decorative paints are of two kinds – water based and solvent based.

2. **Industrial paints**: This segment includes paints used in automobiles, auto ancillaries, consumer durables, containers, etc. This segment requires technological expertise and therefore it is largely served by the organized sector. It accounts for 27% of the overall market.

**Figure 78: Decorative paints segment wise breakup (%) FY14**

![Decorative paints segment wise breakup](image)

Source: Industry reports, Analysis by Tata Strategic
Demand and Supply Scenario

The Indian paint industry, valued at $5.3 bn., has been growing at a CAGR of 9.3% over the last five years. The paint industry is highly consolidated with 65% market captured by the organized sector.

![Figure 79: Paints and Coatings market size (in $ Bn)](source: Industry reports, Analysis by Tata Strategic)

The major players in the paint industry are Asian Paints, Kansai Nerolac, Berger Paints and ICI. In the decorative segment, Asian Paints is the market leader followed by Berger and Kansai Nerolac. Kansai Nerolac is the market leader in industrial paints followed by Berger and Asian PPG.

![Figure 80: Decorative paints market share by value (%), FY14](source: Industry reports, Analysis by Tata Strategic)

Projected Growth and Drivers

- Low per capita consumption: The per capita consumption of paints in India is very low at around 4 Kg.
- Growth in automotive industry: Growth of automotive paint industry is directly linked to the growth of passenger vehicles and commercial vehicles (expected CAGR >15%).
- Real estate growth: Rapid growth in residential and commercial real estate with regulation permitting 100% FDI flow.
- Untapped rural market: There is a shift in rural demand from cement paints to better quality paints.

![Figure 81: Paints and Coatings-Future forecast (in $ Bn)](source: Industry reports, Analysis by Tata Strategic)

Apart from better than expected economic growth, the boost to demand in the near term can also come from fall in inflation levels as it will have a positive effect on customer’s wallet and boost his disposable income. The paints sector is raw material intensive, with over 300 raw materials (50% petro-based derivatives) involved in the manufacturing process. Since most of the raw materials are petroleum based, the industry benefits from softening crude price.

Key Trends & Future Outlook

- Strong growth expected: Decorative paints segment is expected to witness higher growth going forward. The fiscal incentives given by the government to the housing sector have immensely benefited the housing sector. This will benefit key players in the long term. Although the demand for industrial paints is lukewarm it is expected to increase going forward. This is on account of increasing investments in infrastructure.
Projected Growth and Drivers

The paint industry is expected to grow at a CAGR of 9.7% in the next five years. In the decorative paints segment, water based paints are expected to drive growth. The key growth drivers of the paint industry are detailed below:

- **Low per capita consumption**: The per capita consumption of paints in India is very low at around 4 Kg
- **Growth in automotive industry**: Growth of automotive paint industry is directly linked to the growth of passenger vehicles and commercial vehicles (expected CAGR >15%).
- **Real estate growth**: Rapid growth in residential and commercial real estate with regulation permitting 100% FDI flow
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**Figure 81: Paints and Coatings-Future forecast (in $ Bn)**

![Graph showing future forecast](image)

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**Key Trends & Future Outlook**

- **Strong growth expected**: Decorative paints segment is expected to witness higher growth going forward. The fiscal incentives given by the government to the housing sector have immensely benefited the housing sector. This will benefit key players in the long term. Although the demand for industrial paints is lukewarm it is expected to increase going forward. This is on account of increasing investments in infrastructure.
- **Outlook for automotive paint manufacturers is positive**: Domestic and global auto majors have long term plans for the Indian market, which augur well for automotive paint manufacturers like Kansai Nerolac and Asian-PPG. Increased industrial paint demand, especially powder coatings and high performance coatings will also propel topline growth of paint majors in the medium term.

- **Plant capacities across India at peak levels**: All the key players are almost done with capacity expansion and have started production from new plants. Asian Paints' plant in Khandala, Maharashtra has recently got commissioned. Besides, it has initiated a project to double capacity at Rohtak plant in Haryana. Kansai Nerolac's capacity expansion plans at Jainpur and Bawal has culminated. Berger Paints has also commissioned its water based paint plant at Hindupur in Andhra Pradesh. Its powder coating plant at Jejuri has also been commissioned.

- **Macroeconomic factors**: Volatility of the Indian currency and international oil prices and worries about a normal monsoon continue to be major challenges facing the paint industry.

**f. Colorants**

**Introduction**

Colours have an inherent element of value addition to a wide variety of products like textiles, leather, paper, food products, cosmetics, plastics, paints, inks and high-tech applications like optical data storage (CDs, DVDs), solar cells, medical diagnostics (CT Scan, angiography), security inks, lasers, photo dynamics etc.

Colorants market is sub categorized into dyes & pigments. There are 12 types of dyes, classified on the basis of the usage.

**Figure 82: Classification of colorants**

- **Dyes**
  - Soluble substances used to pass color to the substrate
  - Major end use industries are textiles and leather

- **Pigments**
  - Insoluble substances and are in powdered or granular form
  - Impart color by reflecting only certain light rays
  - Major end use industries are paints and inks

*Source: Industry reports, Analysis by Tata Strategic*
The important dyes are basic dyes, azo acid and direct dyes; disperse dyes, reactive dyes, sulphur dyes, vat dyes, organic pigments, naphthols and optical brighteners. Pigments can be broken down into organic pigments (azo, phthalocyanines blues and greens, and high performance pigments) & inorganic pigments (titanium dioxide, iron oxide, and others).

**Figure 83: Classification of dyes and pigments**

**Application of Dyes & Pigments**: Dyes predominately find application in textiles. Almost 80% of production goes into textile industry. The other end applications involves paper, adhesives, art supplies, food and beverages, ceramics, construction, cosmetics, glass, paints, plastics and soap. The most common application of pigments is in paints & coatings, automotive finishes, emulsion paints and distempers. Besides this pigments are also used in printing inks, polyester textiles and plastics like PVC, rubber and synthetic polymers and nylons, cosmetics and paper.

**Demand-Supply Scenario**

The market size of the Indian colorants industry is estimated to be $ 5.4 Bn in FY15. The overall installed capacity and production of dyes & pigments was 456 kT and 285 kT respectively, as of FY15. In FY 15, the exports contributed to nearly 85% of the total consumption which again highlights the tremendous growth potential of the overall industry.
The main user industries, namely, Paint and Coatings and Textile, will continue to grow because of increase in discretionary spending. The changing customer preferences, boom and expansion of infrastructure would create new market opportunities for the dye industry. The industry is likely to see many new dyeing technologies coming into the market with the help of good technical expertise and R&D achievements. Globally the high usage of cotton, polyester and the banned vat and azo dyes in some of the countries have paved the way for reactive and disperse dyes. It is expected that in future these two dyes would lead the market.

The pigment industry has moved from a low-growth and regulated environment to an increasingly mature core industry. As organic and inorganic pigments are intrinsically linked to the growth of construction industry, they are expected to see a significant growth. Automotive paints and personal care segments, on the back of increasing disposable income of a growing middle class provide opportunity for growth. Due to increasing environmental consciousness, use of eco-friendly colorants such as low impact dyes is emerging. Moreover, after the REACH (Registration, Evaluation, Authorization and Restriction of Chemicals) regulation, costs of handling effluents have increased. As a result, a large number of companies have begun to relocate their operations to the Asian markets, particularly India and China.

**Key trends and future outlook**

**Market Trends**
- High performance products

The market for pigments is highly fragmented, with presence of several large companies with low profit margins. Hence a high degree competition prevails in the global pigments market. Also, high capacity for manufacturing of commodity pigments continues to result into intense price competition in the commodity segments market.

Out of the overall colorant production in the country, 80% of the capacity is located in Maharashtra & Gujarat owing to high concentration of end use industries, proximity to feedstock and also proximity to ports. Thus with huge capacity to manufacture, this is an export focused industry. With context to the Indian players, the focus is on high performance pigments for value added applications, largely catering to international markets.

**Regulatory Trends**
- Stricter environmental laws

Regulatory changes in China have led to a favourable scenario for the Indian players. Approximately 375 polluting facilities across various manufacturing segments, including dyes and textiles were shut down in 2014 itself. Also, many small dye manufactures in China have closed operations due to higher cost involved in the regulatory compliance. The market is therefore seen to be moving to next largest manufacturing region, India. With excess capacity in hand and compliance with international quality and environmental standards, Indian players are poised to benefit from this situation.

**Projected Growth & Drivers**

The market size of the overall colorant industry is estimated to grow at a CAGR of 10.7%. The growth will be primarily driven by high growth in the textile industry. Also many Chinese plants have been shut down due to implementation of stringent environmental laws which again leads to shift of supply from China to India and giving rise to exports, thereby causing overall growth of the segment. Strong economic growth and rising per-capita income will lead to a steady increase in demand for the overall colorant industry.

**Figure 84: Colorant industry market size (in $ Bn)**

**Source:** Industry reports, Analysis by Tata Strategic

Within India, the major players in the pigments industry are Sudarshan Chemicals, Golchha Pigments, Tata Pigments and Clariant India while in the dyestuff industry, companies such as are Atul, Clariant India, Kiri dyes, and IDI are large players present in the organized sector.

**Figure 85: Colorant industry- Future forecast (in $ Bn)**

**Source:** Industry reports, Analysis by Tata Strategic

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Knowledge and Strategy Partner

HANDBOOK ON INDIAN CHEMICAL INDUSTRY

- Technological Trends - Commoditization

For certain specialty dyes & pigments, there is significant technology and process know-how involved which can offer high differentiation and thus more profitability for the manufacturers. Since majority of dyestuffs are commodities, there is not much product differentiation and duplication of products is easy. To counter the same, global manufacturers are investing in research and development to improve the specialty end of their portfolio. There is also a trend towards providing colour solutions rather than just a colorant. Collaborations with equipment manufacturers are being undertaken to provide integrated solutions to customers. The colorant industry is likely to see many new technologies coming into the market with the help of good technical expertise and R&D achievements.

Sources:
- Department of chemicals and petrochemicals
- Industry reports
- NCAER
- TSMG previous reports

Bio-Tech

Introduction

Biotechnology uses biological processes, organisms or systems to develop products for improvement of human life. The biotechnology market consists of the development, manufacturing and marketing of products based on advanced biotechnology research. It encompasses globally relevant themes like food, energy, healthcare among others. The biotechnology industry is divided into 5 key sub-segments.

1. Bio-Pharma: Biopharmaceuticals are medical drugs derived from life forms. They are proteins (including antibodies), nucleic acids (DNA, RNA or antisense oligonucleotides) used for therapeutic or diagnostic purposes, and are produced by means other than direct extraction from a biological source. Bio-pharma includes products made by fermentation, animal cell culture and plant cell culture.

2. Bio-Agri: Bio-agriculture includes analysis of Genetically Modified (GM) seeds, molecular markers and related products. Hybrid seeds are not considered part of Bio-agriculture.

3. Bio-Industrial: Bio-industrial segment consists of enzymes used for industrial purposes in detergents, leather, paper, foods & beverages, starch, textile and various
other industries. Other segments like bio-fuels and bio-plastics are also included as a part of bio-industrial segment.

4. **Bio-informatics**: Bio-informatics is usage of computer software tools for database creation, data management, data warehousing and data mining for molecular biology applications.

5. **Bio-Services**: Bio-services consists of clinical research, contract research and custom manufacturing for Bio-pharma products.

**Biotechnology Value Chain**

![Figure 86: Biotechnology Value Chain](image)

Source: Industry reports, Analysis by Tata Strategic

1. **Research and Development**

Discovery: Discovery involves identification of a target gene or chemical. The target is manipulated into possible solutions, and then validated using cell and tissue studies. The nature of target, chemical or gene sets biotechnology apart from the pharmaceutical industry. A supporting process of the Discovery chain is the administrative and legal processes required to establish Intellectual property rights.
Product Development:

In pre-clinical testing, toxicology tests are conducted on the promising compounds. The drug then undergoes clinical testing before it enters the market. The clinical testing usually consists of three phases:

**Phase I:** Product is tested on a small healthy control group

**Phase II:** Product is administered to a small group of ailing patients

**Phase III:** Product is administered to a large group of patients to verify the safety, effectiveness, and optimum dosage regimens of the drug

After the drug has passed through the clinical trial stages, a new drug application (ANDA) has to be filed with the FDA for approval to market the drug. Further studies if required may be performed in stage IV to explore the drug’s capabilities.

2. Manufacturing

Manufacturing involves production of drugs for clinical trials and scaled-up production of drugs ready for the market. Cell-culture is the first step involved in the manufacture of biotechnology products. The key ingredient in the drug is the protein derived from cell-cultures. The key requirement is to create a medium favourable to the culture of cells so as to induced them into producing proteins. In the next stage, these proteins are purified, and the post-purification stage is called formulation.

The manufacturing process requires state-of-the-art facilities and requires thorough FDA inspection. These stringent conditions of manufacturing require biotech companies to perform manufacturing development and clinical development in tandem for successful product development.

3. Sales

For biotechnology products, marketing and sales is done mostly through trade shows. Television advertisements, journal advertisements, company magazine advertisements, as well as Biotechnology Industry Organization (BIO) can be used to promote a product.

Global biotechnology market

The global biotechnology market was estimated at $355 Bn in 2015 having grown at a CAGR of 10% from $221 Bn in 2010. It is estimated that the global market will grow at a CAGR of 11% to reach $600 Bn by 2020.
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**Global Biotechnology Market**

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**Source**: Industry reports, Analysis by Tata Strategic

**Note**: Figures are for Calendar year 2010, 2015 & 2020

Globally, the Bio-pharma industry is a major contributor to the Biotechnology industry with a market share of about 51%, followed by Bio-Industrial with a market share of 30%.

**Figure 87: Global Biotechnology market (in $ Bn)**

**Figure 88: Global Biotechnology Industry segments**

<table>
<thead>
<tr>
<th>Biotechnology Market Size ($ Bn)</th>
<th>Market share (%)</th>
<th>CAGR (2015-2020)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bio-Pharma</strong></td>
<td>180</td>
<td>51%</td>
</tr>
<tr>
<td><strong>Bio-Industrial</strong></td>
<td>105</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Bio-services</strong></td>
<td>35</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Bio-Agri</strong></td>
<td>30</td>
<td>8%</td>
</tr>
<tr>
<td><strong>Bio-informatics</strong></td>
<td>5</td>
<td>1%</td>
</tr>
<tr>
<td><strong>TOTAL: $ 355 Bn</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Source**: Industry Reports, TATA Strategic Estimates

**Note**: Bio-industrial includes Industrial enzymes, Bio-fuels and Bio-plastics
The increasing prevalence of diseases like cancer, Hepatitis B, and other orphan disorder is expected to drive the market for Bio-pharmaceuticals. DNA sequencing and cell-based segment is expected to witness lucrative growth till 2020 due to rising research and development initiatives by various pharmaceutical and biotechnological companies.

Further, increasing demand for agricultural and food products like cotton, wheat, sugarcane, beans owing to growing population base in countries like India, China and US is expected to generate demand for genetically modified products. There’s also the need to develop pest-resistant crops, and crops with ability to withstand unfavourable climates which will drive the market for GM crops across the globe.

The factors contributing to the growth of Bio-services include increased activity in the R&D, outsourcing and M&A space along with expiration of patents. Government organizations in the developed economies are also increasingly assigning projects for contract research. While North America and Europe currently hold a majority of the market, Asia Pacific is expected to be the fastest growing industry as the cost of developing drugs in these countries is significantly lower. The Bio-informatics market is expected to be the fastest growing market with increased Government funding and growing use of bio-informatics in drug discovery and biomarkers development processes.

**Indian Biotechnology Market Overview**

India is one of the top 12 Biotech destinations in the world, and ranks second in Asia after China. The Indian biotech industry currently accounts for about 3% of the global market and has more than doubled in size in the past five years from $4.4 Bn in FY11 to $11 Bn in FY16 growing at a rate of 20%.

![Figure 89: Indian Biotechnology market (in $ Bn)](image)
Key Segments

Bio-pharma is the leading segment in Indian biotech industry while bio-services & bio-agri have been the fastest growing.

Figure 90: Indian Biotechnology Industry segments

<table>
<thead>
<tr>
<th>Biotechnology Market Size ($ Bn)</th>
<th>Market share (%)</th>
<th>CAGR (FY16-FY21)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-Pharma</td>
<td>7.04</td>
<td>64%</td>
</tr>
<tr>
<td>Bio-Services</td>
<td>1.98</td>
<td>18%</td>
</tr>
<tr>
<td>Bio-Agri</td>
<td>1.54</td>
<td>14%</td>
</tr>
<tr>
<td>Bio-Industrial</td>
<td>0.33</td>
<td>3%</td>
</tr>
<tr>
<td>Bio-informatics</td>
<td>0.11</td>
<td>1%</td>
</tr>
<tr>
<td><strong>TOTAL: $ 11 Bn</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: IBEF Biotechnology Report, 2016

Bio-Pharma

The Bio-pharmaceutical segment accounts for the largest share of Indian Biotech industry with a market share of 64%. The bio-pharmaceutical sector includes biologics like vaccines, bio-similars, therapeutics, diagnostics, regenerative medicines and medical technology, and is also known for being major supplier of Active Pharmaceutical Ingredients (APIs) and generic drugs across the globe. Vaccines and bio-similars constitute the largest component of the Indian bio-pharma segment. It is this segment which is expected to take India to the next level as a hub for global biologics including their development and manufacturing.

India is the largest producer of vaccines of which the recombinant Hepatitis B vaccine stands first. Major players like the Serum Institute, Bharat Biotech, Shanta Biotech and Panacea Biotec contributing to India’s emergence as a leading hub for vaccine manufacturing and suppliers to global institutions such as WHO and UNICEF. The drug classes for bio-similars in India comprises of human insulin, human growth hormone, granulocyte colony stimulating factor (G-CSF), Erythropoietin and Streptokinase.

Ranbaxy, Cadila Healthcare, Lupin, Wockhardt and Dr Reddy’s are among the major Indian pharmaceutical companies operating in the bio-pharma segment. The in-vitro diagnostics market has emerged as one of the best segments in the Indian healthcare industry. Various
factors like rising prevalence of diseases, improving affordability of patients, and increasing penetration of health insurance has contributed substantially to the growth in demand for diagnostic services in India.

Regenerative medicine or stem cell research in India is still at a nascent stage with around 40 organizations, both public and private, involved in various aspects of research and development. Public funded institutions have been supported by the Department of Biotechnology (DBT) and the Council of Scientific & Industrial Research (CSIR).

**Bio-Services**

The Indian contract research market can be broadly divided into services provided for new drug development (research involving clinical trials) and those provided to undertake bioavailability/bioequivalence (BA/BE) studies to assess the bioequivalence of generic drugs. India has emerged as a leading destination for clinical trials, contract research and manufacturing activities owing to the growth in the bio-services sector. Newer therapies are anticipated to be launched in the next few years, prominent among which are monoclonal antibodies products, stem cell therapies and growth factors. The country’s huge population makes it amongst the world’s largest markets for vaccines. In 2015, Bharat Biotech launched Rotavac vaccine in India; three doses of the vaccine can prevent the Rotavirus diarrhoea in infants.

**Bio-Agri**

India has the fourth largest area covered under genetically modified crops. India is the 4th largest adopter of biotech crops in the world after USA, Brazil and Argentina.

<table>
<thead>
<tr>
<th>Country</th>
<th>GM Area (Mn hectares)</th>
<th>Top Biotech crops</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>73.1</td>
<td>Maize, Soybean, Cotton</td>
</tr>
<tr>
<td>Brazil</td>
<td>42.2</td>
<td>Soybean, Maize, Cotton</td>
</tr>
<tr>
<td>Argentina</td>
<td>24.3</td>
<td>Soybean, Maize, Cotton</td>
</tr>
<tr>
<td>India</td>
<td>11.6</td>
<td>Cotton</td>
</tr>
<tr>
<td>Canada</td>
<td>11.6</td>
<td>Canola, Maize, Soybean</td>
</tr>
</tbody>
</table>

*Figure 91: GM Crop Area by country*

*Source: International Service for Acquisition of Agri-Biotech Applications 2015*
In India, 11.6 Mn hectares of area is covered under genetically modified crops which are majorly dominated by Bt cotton. However, there is a strong lobby against adoption of Bt food crops in India, limiting segment growth. Despite a moratorium on Bt-Brinjal, various other crops like Rice, Maize, Mustard etc. are under advanced stage of GM trials.

Apart from genetically modified (GM) crops, bio-fertilizers, bio-fuels and bio-pesticides are also contributing to the growth of the Indian agri-biotech market. Also bio-agriculture is an emerging scientific area which is useful for breeding nutritious, high-yielding and less resource input-demanding crops.

The domestic market potential, combined with scientific infrastructure in agriculture, rich bio-diversity and skilled human-power is poised to make India an important global base for Bio-agri research in the next decade.

**Bio-Industrial**

Indian enzymes industry is witnessing a marked shift in focus from traditional segments like detergents, starch, textiles and leather towards newer applications like the fast growing packaged F&B segment. Bio-fuels and Bio-plastics are also seeing increasing interest and investments and are expected to be large markets in the future.

India currently has a marginal share in the global market for industrial enzymes. Hence, there is an opportunity in focused R&D and knowledge-based innovation in the field of industrial enzymes, which can innovatively replace polluting chemical processes into eco-friendly processes that also deliver environmental sustainability.

**Bio-Informatics**

India was the first country in the world to establish a Biotechnology Information System (BTIS) network in 1987. This facilitated development of bioinformatics that has provided support to the biotechnology sector.

Bio-informatics is currently the smallest segment with just 1% market share. However, it is expected to grow at more than 30% over the next 5 years. The convergence of the life sciences with information technology is creating a particular opportunity for India. With 10 per cent of the global professional and skilled bioinformaticians, Indian bioinformatics companies can play a significant role in critical areas such as data mining, mapping and DNA sequencing. The country has well-established strengths in the information technology area, and with the advent of low-cost, whole genome sequencing and the growing role of molecular diagnostics in both precision and preventive medicine, there is a proliferation of data creating demand for bio-informatic analysis. There are also opportunities in functional genomics, proteomics and molecule design simulation.
**Major Players**

Serum Institute of India is ranked as India’s No. 1 biotechnology company, manufacturing highly specialized life-saving biologicals like vaccines using cutting edge genetic & cell based technologies, antisera and other medical specialties. It generated revenues of $595 Mn in FY15. It is mainly involved in manufacture of:

- Bacterial vaccines
- Viral vaccines
- Recombinant & Combination vaccines
- Other vaccines

It is also involved in marketing of Gonadotrophins along with other pharmaceutical products

**Regulatory Structure**

A multi-regulatory structure has been established to approve bio-tech products related to health and crops ensuring human and environmental safety.

Department of Biotechnology (DBT) constituted under the Ministry of Science is the nodal agency for policy promotion regarding R&D, International Co-operation and manufacturing activities. DBT is supported by six competent authorities viz. Recombinant DNA Advisory Committee (RDAC), Review Committee on Genetic Manipulation (RCGM), Institutional Biosafety Committees (IBSC), Genetic Engineering Approval Committee (GEAC), State Biotechnology Coordination Committee (SBCC) and the District Level Committee (DLC). The RCGM established under the Department of Biotechnology (DBT) supervises research activities including small scale field trials, whereas approvals for large scale releases and commercialization of GMOs are given by the GEAC, established under the Ministry of Environment and Forests (MoEF). It is mandatory for every institution engaged in GMO research to establish an IBSC to oversee such research and to interface with the RCGM in regulating it. The SBCCs and DLCs have a major role in monitoring safety and control measures in the various industries/institutions handling GMOs.

**Growth drivers**

**Demand Driven drivers**

- India’s huge population which provides a large market for Biotech products and services
- Higher healthcare expenditure
Increase in usage of Bio-agri products

Strong growth in export demand and rise in medical tourism

**Strong Government Support**

- The Regional Centre for Biotechnology Bill, 2016 approved in Lok Sabha, aims to provide the status of national importance to the Regional Centre for Biotechnology, for facilitating transfer of technology and knowledge and making it a hub for biotechnology expertise in the Asian region.

- A Cooperation agreement signed with the European Molecular Biology Organization (EMBO) to strengthen scientific interaction and collaborative research between India and Europe

- GOI aims to scale-up the number of start-ups in biotechnology sector to 1,500-2,000 over next two to three years from 500 currently

- Government of India planning to launch a venture capital fund of Rs 1,000 Crore (US$ 146.72 Mn) under the department of pharmaceuticals, to support start-ups in the research and development in the pharmaceutical and biotech industry

- Under the 12th Five Year Plan, the Government of India plans to strengthen regulatory science and infrastructure, which involves setting up of Biotechnology Regulatory Authority of India (BRAI) and a central agency for regulatory testing and certification laboratories.

- Foreign Direct Investment (FDI) up to 100 per cent permitted through the automatic route for Greenfield and through the government route for Brownfield, for pharmaceuticals

**Collaborations and Acquisitions**

Recent alliances and acquisitions in the Biotechnology space has generated huge value for the Indian Biotechnology industry

**Figure 92: Mergers and Acquisitions in Biotechnology space**

<table>
<thead>
<tr>
<th>Period</th>
<th>Acquirer</th>
<th>Target</th>
<th>Value of Deal ($ Mn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct ’15</td>
<td>Recipharm</td>
<td>CMO Nitin Lifesciences</td>
<td>110</td>
</tr>
<tr>
<td>Jul’15</td>
<td>Lupin Limited</td>
<td>Gravis pharmaceuticals LLC</td>
<td>800</td>
</tr>
<tr>
<td>Dec’14</td>
<td>Leaders Group Asia Ltd</td>
<td>Dr Datsons Labs</td>
<td>NA</td>
</tr>
<tr>
<td>Oct’14</td>
<td>B Braun Singapore Pte Ltd</td>
<td>Ahicon Parenterals (India) Ltd</td>
<td>7.89</td>
</tr>
<tr>
<td>May’14</td>
<td>Cancer Genetics Inc</td>
<td>Bioserve Biotechnologies</td>
<td>1.9</td>
</tr>
</tbody>
</table>

*Source: IBEF, Biotechnology Report, 2016*
Infrastructure:

- 12th Five Year Plan plans to set up 3-5 bio-clusters including technology incubators, technology parks, innovation centres and entrepreneurship development units
- India’s central government and state governments, with support from private players, are developing new infrastructure facilities, especially for biotechnology parks
- The government is developing three major biotech clusters at Mohali in Punjab, Faridabad in Haryana, and Bengaluru in Karnataka.
- An agri-biotech cluster is also planned in Pune (Maharashtra) and Kolkata (West Bengal)

Future Outlook

**Figure 93: Indian Biotechnology market future outlook**

The year-on-year growth of the biotech market is expected to accelerate in near future on the back of high demand for vaccines, CROs, bio-pesticides, bio-fertilizers, biosimilars, biofuels and bio-therapeutics both in India and at the global level and take-off of various mega initiatives by state governments and Department of Biotechnology. Backed by the previously discussed growth drivers, Indian biotechnology industry is expected to grow at 23% and reach $31 Bn by FY15.
Process, Plant and Machinery

INDUSTRY OVERVIEW

The process plant machinery sector in India caters to a wide range of process industries like oil and gas, petroleum refining, fertilizers, chemicals, petrochemicals, oleochemicals, pharmaceuticals, metal processing, cement, paper, sugar, food processing and water treatment.

The industry is equipped with modern machinery, in addition to competent engineers and labour, and produces sophisticated equipments and systems like: high pressure reactors, pressure vessels, columns, towers, heat exchangers, multi tubular reactors, evaporators, crystallizers, dryers, road/rail tankers, storage equipments, mineral beneficiation equipments, rotary kilns and separators, etc. for the domestic as well as the global markets.

The process plant and machinery industry evolved primarily on the basis of the requirement to set up core process industries in India post-independence. It had its genesis through the various public sector units set up under the aegis of the Department of Heavy Industry during the early 1950’s and 1960’s. Subsequently as the liberalization policy was pursued by the government, private sector companies like L&T (HED) and Godrej & Boyce (PED) ushered in the next phase of growth for the industry.

Liberalization has helped the sector, granting it access to global markets. The industry today is equipped with state of art processes to engineer and fabricate various complex process equipments across different grades of materials of construction. The plant sizes of these process industries have also increased and at times are comparable or even larger than global plant capacities.

INDUSTRY LANDSCAPE

Process plant & machinery is a highly capital as well as labor intensive sector with a strong engineering orientation and products are mostly custom built. Hence economies of scale have less relevance.

Being heterogeneous, the industry is also very fragmented. Industry studies show that about 65% of the players in this sector are small and medium enterprises. The remaining larger size companies operate on a higher technological platform compared to the others based on their expertise and infrastructure facilities.

The major hubs for process plant and machinery industry in India are at Delhi-NCR, Maharashtra and Gujarat. International companies have traditionally entered India through joint ventures like Atlas Copco, Alfa Laval, J.L. Smith, Sulzer etc.
Internationally renowned consultants in process industries like Flour Daniel, Bechtel, Foster Wheel, LG, Daelim, Jacobs, Uhde and Toyo engineering have offices in India. They are increasingly using the Indian process plant manufacturer’s expertise in engineering and manufacturing for outsourcing. Indian companies are also positioning themselves as a low cost manufacturing hub by aligning themselves and working together with these consultants.

**Market and Trade**

As the Indian chemical industry integrates with the global chemical industry, the present day plants are far more complex and larger in capacity. Indian manufacturers are no longer confined to fabrication alone and have a strong presence across the entire value chain. They are catering to the needs of the customers, from design and engineering at the back-end to erection and commissioning at the front-end and are competing with global majors for Engineering, Procurement and Commissioning (EPC) contracts.

**Figure 94: Demand & Trade process plant & machinery**

<table>
<thead>
<tr>
<th></th>
<th>Value (INR Crores, FY 15)</th>
<th>5-year CAGR</th>
<th>3-year CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand</td>
<td>24,149</td>
<td>12.3%</td>
<td>0.2%</td>
</tr>
<tr>
<td>Production</td>
<td>18,900</td>
<td>3.4%</td>
<td>1.6%</td>
</tr>
<tr>
<td>Exports</td>
<td>7,684</td>
<td>23.3%</td>
<td>14.8%</td>
</tr>
<tr>
<td>Imports</td>
<td>12,933</td>
<td>120.9%</td>
<td>10.7%</td>
</tr>
</tbody>
</table>

*Source: Industry reports, Analysis by Tata Strategic*

Source: National Capital Goods policy 2016 by GOI, Ministry of Heavy Industries & Public Enterprises

The demand for Process machinery was INR 24,149 Crores in FY15, about 9% of total demand for capital goods in India which stood at INR 281,566 Crores. While the demand has witnessed an overall growth of 12% over the last five years, the industry has witnessed a negligibly small negative growth of 0.2% for the last 3 years, owing to following reasons:

- Slow growth in world economy leading to slowdown in investment cycle
- Projects help up for Government clearances
These factors held up projects in refinery, petrochemical and fertilizer sector. The oil and gas industry is the largest end-user market for the process plant equipment industry. Process plant equipment finds wide application in refineries and gas processing plants in critical processes such as phase separation, oil processing and storage, gas processing, and oil and gas metering and transport. On the other hand, pumps, valves and steel pipes form an integral part of both upstream and downstream equipment. These are used extensively for transporting crude oil from oilfields to refineries, as well as in marketing and distribution.

Key process plant equipment used in the oil and gas industry:

- Pressure vessel
- Cryogenic storage tank
- Columns
- Boilers

The sectors like pharmaceutical, food & beverages, cosmetics, etc have, however, generated demand mainly for capacity enhancement and replacement.

Imports met about 54% of the total demand for process machinery in India in FY15. Indian companies have been losing market share to companies in Korea since the FTA was signed with Korea. Korean raw material and component manufacturers offer preferential prices to domestic capital manufacturers. The Domestic industry is also being affected by huge imports for second hand machinery into India. There is currently no restriction on the age of the machinery. Old machinery is also imported to various SEZs without payment of taxes and duties. The machinery is then refurbished for further use.

Other key challenges for the process plant and machinery industry include:

- Lack of manpower as fewer young graduates opt for traditional engineering streams
- Compliance with quality & schedule expectations of international customers
- Lack of innovation in the Indian process plant and machinery sector

**Future Outlook**

The demand for plant machinery in India is expected to grow at a rate of 5% from FY15 to FY18 to INR 28,000.
Future outlook (Indian process plant & machinery)

The key growth drivers for the industry are expected to be:

- **Make in India initiative by the GOI** which is expected to drive investments in the chemical and allied sectors like chemicals, petrochemicals, fertilizers, textiles, leather chemicals, etc
- **Innovation in machinery** to get a major boost with the Government’s focus on ‘Zero effect, Zero defect’ and intelligent water management through Clean Ganga initiative
- **Total investments** in manufacturing pegged at $1.35 Tn, with infrastructure investments pegged at $1 Tn as per 12th five year plan
- **Skill India mission**, an initiative by GOI to raise skill penetration of the country will help provide the much-needed skilled labour for the process plant machinery in India

**Sources:**

- Industry reports
- TSMG previous reports
Thought Notes

Opportunities in India in the evolving Global Petrochemical Industry

The global Petrochemical industry is changing with shale gas discovery in the USA, anaemic growth in developed economies and emergence of Asia as a major consumption hub. This creates both challenges and opportunities for India. Competitive import from North America in basic olefins is a challenge for the industry. Utilizing the presence of a large number of refineries in India, opportunity exists to make competitive products like aromatics and propylene derivatives as Govt. promotes domestic manufacturing to substitute large scale imports says Tata Strategic Management Group.

USA Shale looks east for Market

The global economy is on a narrow path of slow and fragile recovery. Asia has been the major growth driver of the global economy in last two decades and is expected to remain so going ahead. Chemical sales in Asia have increased from $880 Bn in 2007 to $1,100 in 2012, constituting nearly 33% of the Global market. Asian demand has been primarily met through domestic production and imports from the Middle East. However, the future could be very different on account of large shale gas discoveries in USA and investments planned utilizing this low cost gas. Competitive North American producers will be able to tap into the growing demand of Asian market. This may create further challenges for the domestic industry in Asia which is currently based on Naphtha as feedstock.
The following four trends are likely to play a key role in the evolving global dynamics in chemical industry going ahead:

1. USA to become a major manufacturing and processing hub
2. Western companies looking to expand their presence in Asia
3. Asian producers exploring different product slates from naphtha feedstock to remain competitive
4. Increased usage of alternate sources of feedstock (e.g., coal to olefin in China)

India Opportunity in Petrochemicals

Figure 2: High Severity FCC units and Aromatics Complexes in India

Source: Analysis by Tata Strategic
India has been a major growth market for petrochemicals. In the last decade it has grown at an impressive 12% p.a. Domestic production growth has lagged consumption opening up a major market for imports. To reduce the high current account deficit, Indian Govt. intends to increase the share of manufacturing from current 16% of GDP to 25% of GDP by 2022. Domestic manufacturing is hence being promoted through formulation of a new policy for setting up National Manufacturing Investment Zones. Indian Govt. has recently increased import duty on polymers from 5% to 7.5% to encourage domestic production.

Emphasising on cluster based approach, Govt. of India is also setting up PCPIRs; the progress has however been slow.

**Figure 3: Petrochemical Opportunities in India**

![Figure 3: Petrochemical Opportunities in India](image)

*Source: Tata Strategic Database*

Multinational companies who are looking to serve the Indian market for the long term need to explore setting up a manufacturing unit in India. India is short in natural gas. At the same time there are a large number of refineries in India which offer attractive downstream manufacturing opportunities. These can be globally competitive and provide the right entry options for MNCs. PX-PTA complex downstream from a refinery, propylene derivatives and py-gas derivatives are a few such opportunities. The right location and a local partner can help new entrants overcome challenges related to infrastructure and the complex regulatory approval process in India.

**Aromatic Complex for PX-PTA**

Ethane based crackers cannot produce Aromatics. India is a large market for polyester and hence for PTA. Growth in the synthetic textiles industry is a key demand driver for polyester. Raw material for PX-PTA units is available either from naphtha cracker or refinery (naphtha). 3 PX-PTA units have been set up in India downstream from refineries (Figure 2). Mitsubishi PTA has setup a large scale PTA plant in Haldia using imported PX. Based on announced capacity...
additions plans, India is still expected have a supply shortfall of 2 Mn Tonnes of PTA by FY21. This is an opportunity that large MNCs can address through a tie up with a refinery in India for naphtha. There are medium to large scale refineries in India who will be willing to explore such a possibility. JBF has got the licence for BP’s latest generation technology to set up a 1.25 MnTPA PTA plant in Mangalore. This plant is backward integrated to MRPL refinery. Similar such arrangements can be made to utilize India’s advantage as a naphtha surplus country.

**Propylene Derivatives**

Upcoming crackers globally are based on natural gas (ethane). Propylene yield from natural gas is low. Fluid Catalytic Cracking (FCC) units of refineries are a good source for propylene. Propylene output from High Severity FCC (HS-FCC) is higher (propylene yield is 20%) than normal FCC. Two refineries in India already have HS-FCC units (Figure 2) and there is potential for such units in other refineries as well. Propylene from these units can be used to make propylene derivatives (other than Polypropylene). With growing captive consumption Indian market has reached critical size in many C3 derivatives (Figure 3) and some are expected to reach inflexion points in next 5 years. However, production in India is either minimal or non-existent.

This is an opportunity which companies with interest in downstream petrochemicals can address. BPCL is in talks with technology providers to make some of these derivatives by setting up a HS-FCC unit in its Kochi refinery. IOCL is setting up a HS-FCC at its Paradip refinery. Other similar units can be set up through a JV between a technology provider and a refinery in India.

**Value-Potential from Py-gas in Naphtha Cracker**

Naphtha crackers in India would have to look at optimizing their product mix to remain competitive. In basic polymers like PE, naphtha crackers would find it difficult to compete with the gas crackers in North America and Middle East. There is opportunity to explore products which can only be made from a naphtha cracker e.g. C5 to C12 derivatives. The Py-gas stream accounts for 19% of total output from a naphtha cracker. Various value-added products that can be extracted from py-gas are listed in Figure 4.

**Other Opportunities**

Other specific opportunities include use of alternate feedstock and setting up R&D centres in India.

*Alternate Feedstock* - Off-gas from large scale refineries in India could be a competitive feedstock.
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## Other Opportunities

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### Alternate Feedstock

- Off-gas from large scale refineries in India could be a competitive feedstock. Reliance is already exploring setting up a cracker from off-gas in Jamnagar. India is also one of the largest producers of certain bio-feedstock like castor oil. Polyamide, engineering plastic can be made from castor oil.

Investment in R&D- India has a vast pool of scientists which can be leveraged to set up R&D centres in India. Major specialty chemical companies including BASF, DuPont, DSM and Dow Chemical have already set up R&D or technology centres in India. India’s R&D capability was one critical success factor for the development of the API industry in India. The same strengths can be leveraged to replicate the API success story in specialty chemicals and downstream petrochemicals.

## Conclusion

The evolving global petrochemical outlook has opened up specific opportunities in India. With support from Government, which is encouraging domestic production, the Indian industry can certainly look to explore these options. These opportunities also provide an attractive entry options for petrochemical MNCs. Partnership opportunities with refineries/naphtha crackers can be explored to establish a presence in India in these opportunities.

## References

1) Tata Strategic Chemicals Database
2) Crisil Research
3) Opportunities in Petrochemicals by K Jhalaria at Third India Annual Chemical Outlook, 2010
4) Investment Promotion in Petrochemical Sector in India, FICCI
5) Unlocking Value Potential from Naphtha Cracker By-Product Streams by GTC
6) Chemical Weekly

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**Figure 4: Upgrade Options from Py-Gas of Naphtha Cracker**

<table>
<thead>
<tr>
<th>C5-C12</th>
<th>Products</th>
<th>Market Size in India (2012, TPA)</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>C5</td>
<td>Piperlene, Dicyclopentadiene</td>
<td>5,000</td>
<td>Hydrocarbon, Resins → Adhesives, Paints, Rubber</td>
</tr>
<tr>
<td>C7</td>
<td>Toluene</td>
<td>4,00,000</td>
<td>TDI → Polyurethane</td>
</tr>
<tr>
<td>C8</td>
<td>Xylene</td>
<td>20,00,000</td>
<td>PX → PTA</td>
</tr>
<tr>
<td>C9</td>
<td>Resin Oil</td>
<td>5,000</td>
<td>Hydrocarbon, Resins → Adhesives, Paints, Rubber</td>
</tr>
<tr>
<td>C10</td>
<td>Naphthalene</td>
<td>60,000</td>
<td>Dyes, SNF, Beta-Naphthol, H-Acid</td>
</tr>
<tr>
<td>C11-C12</td>
<td>Aromatic Solvents</td>
<td>5,00,000</td>
<td>Paint, Detergent, Pharma</td>
</tr>
</tbody>
</table>

*Source: GTC, Tata Strategic Database*
Future Growth of Indian Chemical Industry
mired due to availability of building blocks

The chemicals value chain is an intricately linked chain where downstream segments depend on key feedstocks such as naphtha, natural gas and petrochemical building blocks to grow. The development of a globally competitive, diversified petrochemical intermediate industry and further downstream segments such as specialty chemicals, plastics, compounds & composites and fibers depend on access to the right feedstock at the right prices. As we stand on the cusp of a disruptive development, there is an immediate need to access critical feedstocks and develop a roadmap to address pertinent challenges faced by Indian Chemical Industry says Manish Panchal, Karthikeyan K S and Sonal Sapale of Tata Strategic Management Group.

Introduction

Today global chemical industry size is $ 3.9 Tn and it comprise of over 80,000 products. The wide variety of chemicals produced can be broadly classified into two categories viz. Commodity & Petrochemicals and Fine & Specialty Chemicals.

As we see in above figure these two categories are intricately linked to each other, where technologically intensive high value added petrochemicals intermediates and specialty chemicals industry being dependent on the upstream segments for access to key commodity chemicals. Thus Commodity & Bulk petrochemical industry with strong supply positions and competitive pricing is essential for the growth and indigenous manufacture of petrochemicals intermediates and specialty chemicals.
The Indian Chemical Industry at a Glance

The Indian Chemical Industry is estimated to be $139 Bn in FY’14 and it accounts for only 3.4% of the global chemicals industry despite its large size and significant GDP contribution. It comprises of bulk chemicals (which includes basic organic, inorganic and other chemical intermediates), petrochemicals, specialty chemicals, APIs, Fertilizers and Agrochemicals.

The demand over the past 5 years has grown from 35 MnTPA to 44 MnTPA in FY’14 whereas the supply has grown at a slightly lower rate of 5% and reached 37 MnTPA in same period. This has given rise to imports of major chemicals and petrochemicals which have grown at 11% from 8 MnTPA to reach 13 MnTPA whereas exports have grown at a lower rate as compared to imports at 9% in that period.

As an optimistic case the Indian Chemicals industry is expected to grow at 9% over the next five years to reach value of $214 Bn by FY19. Even if we consider base case of 7% growth rate the industry will be estimated to reach $195 Bn by FY19 and hence supply through indigenous manufacture of chemicals needs to be increased at a rapid pace in order to sustain this growth.

India: Feedstock Scenario

Feedstocks used in petrochemical complexes typically include naphtha, natural gas and other unconventional feedstocks like shale gas, bio-ethanol, petroleum coke, coal, etc. The major factors influencing the selection of feedstock are Energy Consumption, Investment required, availability, price, yield and by-products.

In India 60% of the existing cracker capacities are naphtha based with the balance based on gaseous feedstocks including natural gas, LPG and other gaseous feedstocks. Major crackers based at RIL, IOCL, HPL, GAIL, etc. use naphtha as a feedstock. India is expected to remain a naphtha surplus country with the naphtha based crackers being more competitive for production of higher olefins. However since the naphtha availability is spread across the country, effective consolidation of naphtha remains a critical aspect in making it attractive for downstream processing.

The other major feedstock is natural gas and India has proven reserves of 1,355 bcm of which roughly 2/3rd of the reserves are located in offshore fields. The other sources include major finds by RIL, ONGC, GSFC in offshore KG basin area and also finds in the north-eastern states of Assam, Nagaland, Arunachal Pradesh and Tripura.
Moreover, since domestic gas production is much lower than demand, the government has prioritised various end-use sectors for supply of domestic gas. Sectors where the prices are regulated, such as fertilisers, and sectors where affordability is a constraint, like power, are given higher priority whereas sectors whose products are market determined (industrial users, refineries), are given lower priority.

Other petrochemical building blocks derived from naphtha/natural gas include ethylene and propylene which can be converted into a wide variety of petrochemical intermediates and downstream specialty chemicals. Demand for ethylene has increased by 7.2% CAGR from 2009-10 to 2014-15. Demand for ethylene is based on end use demand which is mainly driven by Polyethylene (PE), Polyvinyl Chloride (PVC), Mono Ethylene Glycol (MEG) and Ethylene Oxide (EO). Bulk of Ethylene (80%) is converted into bulk plastics (PE, PVC). Similarly majority of propylene produced in India is converted to polypropylene (96%) while the rest is converted to intermediates which include: propylene oxide, acrylonitrile, isopropanol, 2-ethyl hexanol and phenol.

Other unconventional feedstocks which are yet to be explored in India include petcoke, coal and shale gas.

Petcoke can be gasified and used to manufacture synthetic natural gas and as liquid it can be used to fuel power plants. Gasification is a favourable technique which can be harnessed to use petcoke thus leading to capture most of the energy content. Though the production costs associated with pet coke are considerably low because it is a by-product of the refining process, due to higher capital cost makes it less attractive in comparison to the conventional feedstocks.

India has total estimated reserves of coal to the tune of 61 Bn Tonne across the length and breadth of the country. Carbon from low grade coal is 33 times less costly than carbon from crude oil. Coal to olefins offers significant environmental advantages as it is a wet, low severity thermochemical process. Variety of commodities including methanol, ammonia, etc. can be produced from syngas which is the primary output of coal gasification. Production of syngas through gasification systems leads to easier removal of sulphur (SOX) and nitrous oxides (NOX) which is another advantage of coal gasification. But due to delay in coal block allocations, high capital costs with relatively long time horizons, sensitivity to crude oil prices and pressure on water resources (an efficiently run plant producing 1 MT of olefin would need 30 MT of water), the coal reserves in India are yet to be capitalized for gasification purpose. Taking into consideration the advantages and challenges, the Indian government should encourage both public and private sector enterprises to develop CTO projects for the medium term through financial incentives, land allocation and transparent coal block allocation.

Coal based methane (CBM) is emerging as an alternative feedstock for production of light olefins through methanol route. India boasts vast CBM reserves, estimated at around 2.60 Tn m3. CBM can be used as a feedstock for fertilizer, steel plants, methanol production and as an auto fuel in compressed natural form. The products produced from CBM are...
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environmentally superior to many fuels because they are free of aromatics, nitrogen and sulphur and have a high cetane number. Despite rich potential offered by CBM in meeting India’s supply needs, key challenges delaying the development of CBM are the sustainability of production, domestic gas prices, as well as the development of midstream infrastructure.

Shale gas is an untapped resource in India with deposits being possibly much larger than the conventional gas deposits. The unlocking of domestic shale gas can help India meet its growing energy demand. Shale gas will have a multiplier effect on the economy. It is expected that for every $1 investment in the shale gas industry will have a new income generation capability of up to $5. The major barriers to shale gas extraction are the depth of shale gas deposits as well as much of the gas being found in populated areas. Also though India's reserves of shale gas are estimated to be 63 tcf, the technology for extracting shale gas in Indian terrain is not yet proven. Currently pilot studies are being carried out in Damodar valley and about 30 wells are expected to be explored in next 2-3 years.

**Imperatives for improving India's feedstock scenario**

Securing feedstock is a critical input towards achieving self-sufficiency for India’s chemicals and petrochemicals industry. A key imperative would be for the industry to take steps towards addressing its disadvantaged feedstock position which can be done through major policy interventions and also government focus. We believe one way to address this challenge is to look at the major feedstocks required by the country and taking steps to secure them.

A multi-step strategic roadmap involves looking at the following feedstocks to address India’s inadequacies in feedstocks by focusing on the major petrochemical building blocks - ethylene & propylene and aromatic feedstocks as also exploits India’s strengths in alternate feedstock such as rapeseed & castor oil and biomass. The strategic roadmap would aim to address the challenges in the following manner:

**Ethylene**: Currently only about 20% of ethylene produced is available for its downstream derivatives, an increased availability and allocation of ethylene for downstream chemicals can lead higher availability of its derivatives like ethylene glycol which is required for the manufacture of Polyester fiber, PET bottles and other products, fatty alcohols which are further used in detergents, cosmetics and pharmaceuticals, and several other products.

Gas (Ethane) is cheaper by 40% compared to naphtha for each tonne of ethylene production. The new Shale gas revolution has turned USA from a gas importing country to a gas exporting country. Also Middle East has low-cost raw material sources with a good ethane-butane mix, which will yield higher priced ethylene and other chemicals.

Hence the industry can look at correcting its situation by increasing ethylene production through securing off-take agreements with upcoming crackers in the USA & the Middle
east; investing in derivative units downstream of a cracker (examples of derivatives include PE, MEG) as also through investing in an integrated complex.

**Propylene:** Currently India has only two Fluid Catalytic Cracking (FCC) Units. Globally also upcoming crackers are based on ethane from which the propylene yield is low. Setting up more FCCs in existing refineries would help increase output of propylene as typically propylene output from high severity FCCs is around 20%.

The Indian market has reached a critical size in various propylene based derivatives. With only 4% of propylene manufactured in India available for conversion to derivatives while majority of propylene is converted to polypropylene, further growth of the downstream propylene derivatives industry hinges on the availability of the feedstock to industrial users. Petrochemical intermediates which are more or less 100% imported currently and can be made in as import substitute includes oxo-alcohols, acrylic acid and other acrylates, super absorbent polymers which can benefit from ease of access to propylene.

**Aromatics**

The Indian petrochemical industry faces a deficit in production of aromatics like Styrene, Xylene and Toluene. Styrene for example is 100% imported by India. India is one of the biggest markets for polyester driven synthetic fibres and hence, demand for terephthalic acid and para-xylene will grow. Thus there is a need to boost aromatic production.

**Figure 4: Aromatics from Naphtha Cracker Py-gas**

![Figure 4: Aromatics from Naphtha Cracker Py-gas](image)

Source: Tata Strategic Database
With surplus in naphtha, the naphtha crackers in India would have to look at optimizing their product mix to remain competitive. In basic polymers like polyethylene, naphtha crackers would find it difficult to compete with the gas crackers in North America and Middle East. However there is opportunity to explore products which can only be made from a naphtha cracker e.g. C5 to C12 derivatives.

Also Toluene and higher aromatics can be extracted from the Py-gas stream from the naphtha cracker which accounts for 19% of total output from a naphtha cracker and is primarily used for gasoline blending in India.

Alternate Feedstocks Opportunities exist across the oleo chemical based specialty chemicals industry in India which can be harnessed by exploiting India’s strengths in Rapeseed oil, Castor oil and Biomass.

**Figure 4: Opportunity in Oleochemicals Value Chain**

India is a major producer of High Erucic acid content rapeseed oil which can be utilized to make higher chain fatty acids, alcohols, amines and their derivatives. It also is the number one producer of castor oil which can be utilized to make sebacic acid, higher alcohols, polyamides and plasticizers. Biomass can be used to manufacture a wide variety of chemicals including and not restricted to manufacture of organic acids, textile fibres, polymers, adhesives, lubricants & greases and soy based inks.

Reverse SEZ is an alternate approach towards achieving self-sufficiency of basic building blocks apart from investing in indigenous manufacture. In order to meet the feedstock supply gap in a sustainable manner, Indian companies can either explore the possibility of setting up downstream plants and cracker in the countries rich in these resources or invest in these plants and secure an off-take agreement.

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**Sources**
1. Tata Strategic Chemicals Database
2. Crisil Research
3. CII Report on Indian Specialty Chemicals Industry: Feedstocks and Standards
4. Draft National Chemical Policy, Ministry of Chemicals & Fertilizers
6. CII Report on Key Feedstock for Specialty Chemicals
Select regions globally such as Mozambique, Iran & Myanmar can be good investment options for us as they are resource rich but lack technical know-how, capital or both to build their own industry. All the three countries are rich in natural gas and a source of cheap natural gas. Iran is also rich in crude.

Several Indian companies are exploring the possibility of investing in these countries. The chemical & petrochemical industry is still at the nascent stage in all these three countries. Indian companies can share know-how, provide capital or build their own plants to reap economic benefits. As there is a cheap availability of feedstock, Indian companies can explore the following:

- Setup a gas cracker to produce ethylene and its derivatives. These can be sent to India for the manufacture of further downstream value added products. For example, India is a net importer of MEG. And it can be manufactured in these countries and can be sent to India for the manufacture of PET or Polyester fibres.
- Co-invest in upcoming plants and secure an off-take agreements
- Co-invest in an integrated complex in Iran
- Setup fertilizer plants in these countries to cater to demand both at these geographies as well as India
- The roadmap towards achieving self-sufficiency across the chemicals value chain for the Indian Chemical industry is challenging in many ways. Addressing feedstock availability for major petrochemical building blocks and key commodity chemicals is a step in that direction and securing this address requires a concerted approach from building capacities for indigenous manufacture of these products.

Sources

1. Tata Strategic Chemicals Database
2. Crisil Research
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4. Draft National Chemical Policy, Ministry of Chemicals & Fertilizers
6. CII Report on Key Feedstock for Specialty Chemicals
Acquisitions: Route to growth in Indian Specialty Chemicals

The highly fragmented Indian specialty chemicals industry currently has revenues of USD 30 Bn and is expected to grow 14% per annum over the next decade. It is observed that companies who have invested in product development have grown rapidly and have also expanded globally. Hence, these companies become attractive for large global players and equity investors. Recent M&A transactions in the specialty chemicals space show that most specialty chemical companies were able to attract valuations in excess of 10X EBITDA multiples. The pace of deal making activity is expected to continue with attractive valuations as India is the preferred investment destination in Asia, say Manish Panchal, Karthikeyan K.S., and Kiran Dukare of Tata Strategic Management Group.

Industry: Current State

Specialty chemicals are relatively high value products compared to commodity chemicals. In today’s highly competitive environment, specialty chemicals have the potential to help end use sectors to differentiate their products with respect to the competition. These chemicals play an important role in several end use industries such as dyes & pigments, flavors & fragrances, leather, construction, paper and personal care segments.

India will see a surge in domestic consumption of specialty chemicals driven by its demographic dividend and increasing disposable income. This will change the landscape of the Speciality Chemicals market in India which currently has revenue of $ 30 Bn and is expected to reach $ 80 Bn by 2023. At 14% CAGR specialty chemical industry is expected to grow much faster than India’s GDP growth.

The factors contributing to high growth in Indian Specialty Chemical industry are:

- Buoyant domestic demand due to high growth in end use industry and possible inflection points in several segments in the near future
- Encouraging export opportunities due to bleak forecasts for Chinese chemical industry (owing to increasing cost pressure, tightening pollution control norms and appreciation of Chinese Yuan against $)
- GOI initiatives like proposed changes in customs & excise duty rates on certain inputs/ raw materials to reduce costs and improve competitiveness of domestic industry in sectors like specialty chemicals & petrochemicals
- Technology up-gradation fund (TUF) and National Innovation Fund for chemical industry
Stable IPR regime with well-defined IPR policy makes India a preferred destination for knowledge based chemicals and R&D centre

**Figure 1: Market growth till FY20- projections (% p.a.)**

Mergers & Acquisitions have been playing a critical role in shaping the industry and in the past 5 years, several large and medium sized specialty chemical companies have used the acquisition route for growth. Hence, Equity investors are also actively looking at investment opportunities in this space as they see exits with attractive valuations. TATA Strategic analysis shows that 2015 has seen multiple deals in the specialty chemicals space with valuations in excess of 10X EBITDA.

**Figure 2: Some recent transactions in Specialty chemical space in 2015**

<table>
<thead>
<tr>
<th>Investee Sector</th>
<th>Investee</th>
<th>Investor Company</th>
<th>Deal Year</th>
<th>Deal Type</th>
<th>Stake %</th>
<th>Deal Value (INR Cr)</th>
<th>Revenue Multiple (EV/R)</th>
<th>EBITDA Multiple (EV/EBITDA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arena Chemicals</td>
<td>SH Kelkar &amp; Co.</td>
<td>Blackstone</td>
<td>2015</td>
<td>Exit through IPO</td>
<td>100%</td>
<td>2,400</td>
<td>4.7X</td>
<td>24.8X</td>
</tr>
<tr>
<td>Specialty Chemicals</td>
<td>RESINoya</td>
<td>ASTRAL</td>
<td>2014</td>
<td>Stake Buy</td>
<td>70%</td>
<td>213</td>
<td>1.6X</td>
<td>22.0X</td>
</tr>
<tr>
<td>Oleo Chemicals</td>
<td>Farex, Fairtex, Lohia, IFC</td>
<td></td>
<td>2015</td>
<td>Agreed Stake Buy</td>
<td>45%</td>
<td>130</td>
<td>1.9X</td>
<td>11.2X</td>
</tr>
<tr>
<td>Agro &amp; Pharma Ingredients</td>
<td>ASTEC</td>
<td></td>
<td>2015</td>
<td>Stake Buy</td>
<td>7%</td>
<td>34</td>
<td>1.9X</td>
<td>11.1X</td>
</tr>
<tr>
<td>Specialty Chemicals</td>
<td>Vartak Organic, Vikal Organics</td>
<td>IFC</td>
<td>2015</td>
<td>Stake Sale</td>
<td>3%</td>
<td>60</td>
<td>2.5X</td>
<td>10.3X</td>
</tr>
<tr>
<td>Agro Chemicals &amp; Seeds</td>
<td>Gharda Agrochem, Dhara Agritech</td>
<td></td>
<td>2015</td>
<td>Stake Sale</td>
<td>4%</td>
<td>95</td>
<td>2.8X</td>
<td>18.4X</td>
</tr>
</tbody>
</table>

**Source:** VC Circle, DealCurry, TSMG Deal Tracker
Opportunities in specialty chemical industry for M&A

According to Tata Strategic estimates, there are 540 specialty chemical companies in India having annual revenues between $20 Mn to $200 Mn. Close interactions with these industry players reveal that a large number of companies show the following traits:

- The companies in the sector have a strong domestic presence and an in-depth understanding of customer needs. Over the years, companies have fine-tuned their products thereby making them unique in terms of value proposition for Indian market and neighbouring geographies.

- Several companies, though small in size, have established unique positioning and are today leaders in their product segments. As a result, revenues from exports are higher than domestic revenues for such companies.

- Numerous companies lack resources and know-how to scale up operations. With access to the right technology, technical expertise and other resources they can provide better solutions and value proposition for the Indian market.

- A significant portion of specialty chemical companies in India are family owned businesses and some of the 1st generation entrepreneurs are facing a succession void due to unwillingness of 2nd generation to join the business. Such owners are looking for strategic buyers who may give better valuation.

Because of the above factors, several speciality chemical companies are looking for alliances, partnerships, and exit options. This offers attractive options for chemical companies looking to enter into high margin downstream businesses. They can take the M&A route to gain access to new technologies and customer segments.

Why M&A Route?

Figure 3: Most common reasons behind M&A in Specialty chemicals space

<table>
<thead>
<tr>
<th>Reasons behind selling stake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidation of product portfolio</td>
</tr>
<tr>
<td>Good exit opportunities for PE/VCs</td>
</tr>
<tr>
<td>Succession issues</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reasons behind acquisitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faster expansion of product portfolio</td>
</tr>
<tr>
<td>Trading companies can venture into manufacturing</td>
</tr>
<tr>
<td>Stronger presence across the value chain</td>
</tr>
</tbody>
</table>

Source: Tata Strategic Research
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**Why M&A Route?**

- **Speed to market** - Several domestic specialty chemical players have built an established network of distributors and channel partners across the vast geographic landscape of India. These companies also have a team of skilled people and possess required licences and clearances. The M&A option provides an opportunity to leverage these strengths and create a pan-India presence from day one. Several large domestic and global manufacturers have realized this advantage.

The recent agreement by Clariant to acquire Vivimed’s personal care business and German chemical distributor Brenntag’s agreement to acquire the speciality chemicals distribution business of Pioma Chemicals are good examples of how global speciality chemical player use acquisitions to increase their presence in emerging markets and add synergies to their product portfolio and customer base.

- **Integrated presence along value chain** - M&A provides both backward integration option to secure feedstock or intermediates and forward integration into downstream products to build an integrated presence in the value chain. For example, Arkema acquired Ihsedu Agrochem in 2012 to get access to castor oil since India is one of the largest producers of castor oil in the world. Through this Arkema was able to secure consistent access to castor oil for manufacturing bio-based polyamides at competitive prices.

- **Product-portfolio expansion** - Most of the upstream chemical segments are generally low-margin high volume commodity businesses. Many companies in such segments are often looking to expand into downstream specialty segments which may give higher margins.

- **Acquisitions for financial return** - Many private-equity and financial investors have shown keen interest in investing and acquiring speciality chemical companies as they are less prone to business cyclicality and offer higher return on investment.

While growing through M&A does offer significant benefits, only the successful M&A’s create sustainable value. Therefore, it is imperative for companies to ensure that they adopt a proven approach for M&A activity. TATA Strategic recommends the following levers for successful M&A’s.

**Figure 4: Levers for successful M&A**

*Source: Tata Strategic Research*
Levers for successful M&A

Various levers are necessary for a successful M&A in India

1) **Define strategic intent** - A decision for pursuing M&A should be based on a clearly defined strategic intent. As mentioned earlier, speed to market, access to select segments or raw materials could be some examples. But, there could be specific needs such as brand acquisition, getting access to technologies, adjacencies etc. An in-depth evaluation on why the company needs to make an acquisition and whether the strategic intent is in line with its global vision and aspirations is a must.

2) **Target Screening** - It is said that "Well begun is half done". This is particularly true in case of identification of right M&A targets. While specialty chemical companies in India are aplenty, understanding their business realities is the key to decide whether they can be part of a shortlist of candidates for acquisition. Moreover, the targets identified should be in line with the acquirer’s defined strategic intent. Companies being shortlisted should be gauged on their willingness to be acquired or partner beforehand as in some cases the owners do not wish to lose control. The above activities when performed rigorously can lead to potential targets where the chances of completing the acquisition are high.

3) **Business Due Diligence** - Several Indian companies have small scale compared to global standards and operate in niche space. Hence a detailed evaluation of the company’s business needs be done to establish the actual benefits to the acquirer. While it is a given that financials need to be looked at in detail to avoid overpaying, other aspects such as product quality, EHS compliance, technical and functional capabilities and track record of the company etc. are critical in evaluating such companies. This helps the acquirer in taking the right decision.

4) **Valuation** - Valuation is the most important step of the M&A process. Companies use various methods of valuation, namely, discounted cash flow analysis, comparable companies’ method, precedent transactions method. However the final valuation would depend on the synergies that the combined entity would derive.

5) **Successful post-merger integration** - As most companies are family run businesses, the execution team has been built over many years. In such cases, the integration needs to take into account that no unwarranted fears regarding lay-offs, restructuring, reporting relationships in employees creep up. Since many of the specialty chemical companies are structured differently as compared to global companies, organizational structure, roles and responsibilities needs to be appropriately defined for a smooth integration.

Conclusion

India’s specialty chemical industry has the potential to grow at a rapid pace. The highly fragmented promoter driven industry will have to consolidate for better efficiency and scale. We believe specialty chemical industry will become a hot bed for M&A. There are several hidden jewels which one can find in this space. Going forward, select companies with the right attributes would get attractive valuation for exit. Likewise, acquiring companies who rigorously evaluate potential candidates, can realize great value from their moves.
Reverse SEZ – An opportunity for Indian Petrochemical Industry

Current Scenario

Natural gas demand in India is expected to grow from 242 Mn cu m/day in fiscal 2012-13 to 378 in 2016-17 and 516 Mn cubic meters/day in fiscal 2021-22. India is projected to import 38% by 2016-17. Approximately, 19% of the natural gas demand was met through imports in 2012-13.

LNG imports were projected to rise sharply from 44.6 Mn cu m/day in 2012-13 to 143 Mn cu m/day (38% of total imports) in fiscal 2016-17. The domestic price of natural gas in $4.2/mmbtu and is expected to increase further in the coming years. Natural gas, which is an essential feed stock for many Fertilizers and Petrochemicals is allocated to priority sectors like Power, Fertilizer, CGD, Refinery, Petrochemicals in that order. Therefore, petrochemical industry has to depend on imported gas which is expensive.

Natural Gas is a major feedstock for the production of ammonia and majority of the ammonia produced is used in the manufacturing of fertilizers. It is also the feed stock for gas cracker which produces ethylene. Ethylene is in turn used in the manufacture of Polyethylene, Mono Ethylene Glycol (MEG), PVC, Styrene etc.

The Possibility

In order to meet the supply gap in a sustainable manner, Indian companies can either explore the possibility of setting up downstream plants and cracker in the countries rich in these resources or invest in these plants and secure an off-take agreement.

Select Indian companies have started investing in resource rich countries across the globe. For example, Reliance Industries have invested considerably in US Shale Gas assets in order to have access to competitively priced natural gas. Select regions globally such as Mozambique, Iran & Myanmar can be good investment options for us as they are resource rich but lack technical know-how, capital or both to build their own industry. These countries are also low on priority for other countries due to their macroeconomic situation. This can be an opportunity for Indian companies wherein help can be provided to these countries to develop their Chemical & Petrochemical industry by providing capital/ sharing technical know-how and in return get access to gas at competitive prices.

Mozambique

Mozambique is rich in natural gas with 0.12 Tn cubic meters of proven reserves. The country has large onshore and offshore sedimentary basins that contain natural gas resources, but much of it is unexploited.
India is the 8th largest investor in Mozambique and has existing trade relations which can be further leveraged. ONGC Videsh and Oil India Ltd. have taken 20% stake in the Andarko-led consortium in the north of Mozambique where large quantities of natural gas have been discovered at a cost of US$ 5 bn.

The petrochemical sector in Mozambique is largely under developed. This offers an opportunity for Indian companies. They can explore the possibility of setting up a gas cracker and also fertilizer plants since agricultural sector in Mozambique is growing at a rapid pace.

**Iran**

Iran is rich in crude and has 9.5% of the total reserve making it 4th largest in the world. It is also rich in Natural Gas with 33.6 Tn cubic meters of the total reserve accounting for 18% of the global reserve. Multiple sanctions imparted by US & EU have severely impeded investments in Oil & Gas exploration and production.

India is the fourth largest importer of crude in the world. During 2012-13, Iranian supplies made up for 7.2 per cent of the India's oil imports and for Iran, India is the third largest buyer of oil. Recently, Iran has offered India a new production sharing regime for oil exploration. This is a new development as Iran only offers service contracts to foreign companies.

Iran has been primarily focusing on the exploration & production of Oil & Gas. The petrochemical industry is in its nascent stage. The government is focusing on developing its petrochemical industry to curb inflation & create jobs. Several Indian companies are already taking advantage of the low natural gas price in Iran. For instance, Rashtriya Chemicals and Fertilisers (RCF), Gujarat Narmada Valley Fertilisers & Chemicals (GNFC) and Gujarat State Fertilisers & Chemicals Ltd (GSFCL) are planning to jointly set up Urea and chemical plants in Iran with an estimated investment of Rs 7,500 - 8,000Cr. They are expected to source natural gas at a price as low as $3/mmbtu.

Indian companies can plan to invest in an integrated petrochemical complex or setup an ammonia based fertilizer plant to take advantage of cheap natural gas. Such projects can be undertaken by the companies to manufacture the products at a lower cost compared to that of manufacturing it in India.

**Myanmar**

Myanmar is rich in natural gas and has 0.2 Tn cubic meters of reserves, most of which is untapped. Its reserve to production ratio stood at 17 in 2012 which implies that if extracted at the current exploration rate, the reserves will last for next seventeen years.

India has extensive trade relation and also a free trade agreement with Myanmar. Reliance Industries and Oil India have bid and won three gas blocks in Myanmar recently. GAIL, OVL & ESSAR have already invested in Oil & Gas blocks in Myanmar.
Myanmar is an agricultural country with 36% of its GDP coming from this sector. It imports 30% of its total fertilizer consumption. Having access to cheap natural gas, ammonia based fertilizer plants can be set up here by Indian companies. Fertilizer manufactured can be consumed internally and also be exported to India. Additionally, setting up a gas cracker and related derivatives could be an option which can be explored in Myanmar.

**Way Forward**

All the three countries discussed here are rich in natural gas and a source of cheap natural gas. Iran is also rich in crude. Select Indian companies have seen these opportunities and have either already invested or exploring the possibility of investing in these countries. The chemical & petrochemical industry is still at the nascent stage in all these three countries. Indian companies can share know-how, provide capital or build their own plants to reap economic benefits. As there is a cheap availability of feedstock, Indian companies can explore the following:

a. Setup a gas cracker to produce ethylene and its derivatives. These can be sent to India for the manufacture of further downstream value added products. For example, India is a net importer of MEG. MEG can be manufactured in these countries and can be sent to India for the manufacture of PET or Polyester fibres.

b. Co-invest in upcoming plants and secure an off-take agreements

c. Co-invest in an integrated complex in Iran

d. Setup fertilizer plants in these countries to cater to demand both at these geographies as well as India

The Indian government can encourage such investments by incentivizing the import of products manufactured from such locations. A thorough and detailed study has to be done in order to develop a workable reverse SEZ model. The Indian government has to work closely with the governments of these countries to implement this model and provide sufficient protection to the companies investing in these countries.

**References**

1) Tata Strategic Specialty Chemicals Tracker
2) M&A activity in Indian Chemical Sector - Bloomberg Database
3) Chemical Weekly
4) Relevant business articles in Mint, Business Standard, Financial Express and Economic Times e-newspaper regarding M&A transactions
5) VC Circle
Strategies for Indian Agrochemical Companies to address Global Agrochemical Demand

Reinventing Portfolio

1. Product Opportunities: Indian companies need to reinvent their portfolio to meet the changing demand, and options can be in Bio Pesticides and Herbicide markets which are expected to grow at more than the average global agrochemical market growth. The key growth drivers are:
   a. Bio-pesticides:
      i. Increasing demand for residue free crop protection products,
      ii. Easy registration compared to conventional pesticides
      iii. Stringent regulations and increasing concern of safety and toxicity aspects
      iv. Lower cost of development [Significantly less ( $6 to $10 Mn) compared to synthetic pesticides ( $ 150 Mn to $ 200 Mn)]
      v. Lower product development time (3-4 years compared to 7-8 years in traditional pesticides)
   b. Herbicides:
      i. Increasing labor costs
      ii. Labor shortage

2. Export Opportunity: Indian exports are expected to increase from $ 2 Bn in 2013 at 15% CAGR to reach $ 4.1 Bn by 2018. The key growth drivers for exports are
   a. Growing market of off-patent products - Increasing share of generic and off-patent agrochemicals provide significant export opportunities to Indian players
      i. The percentage share of generic products has increased from 33% in 2000 to 52% in 2013 while the share of patented products has decreased from 30% in 2000 to 22% in 2013
      ii. Agrochemicals worth $ 6.3 Bn are expected to be taken off patent list by 2020. This provides significant opportunities for Indian players to increase their global presence
   b. Other key drivers for exports are
      i. Cheap labor and low processing costs
      ii. Strong presence of India in generic pesticide manufacturing
      iii. Availability of excess capacity
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      ii. Strong presence of India in generic pesticide manufacturing
      iii. Availability of excess capacity

Inorganic Growth Opportunities

Growth through inorganic route has been a trend amongst Agrochemical companies to expand their presence. The top 3 global companies constituted 60% of market in 2012 as compared to 35% in 1998. Indian companies can look at various inorganic growth opportunities to expand their global presence. The various inorganic growth opportunities which Indian companies can explore are:

1. Companies can look at vertical integration opportunities into seeds and bio-technology which are upcoming growing segments. Some of the international players which followed this route are
   a. Syngenta - Acquisition of MayAgro Seeds, MRI, Devgen
   b. BASF - Acquisition of enzyme biotechnology company Verenium
   c. Monsanto - Acquisition of Dieckman Seeds (parts), Rosetta Green, Agradis

2. Companies can also consolidate presence in existing businesses, enter new segments and obtain access to new geographies through inorganic growth opportunities. Some of the notable examples are
   a. Acquisition of Isagro’s insecticide business by Cheminova
   b. Acquisition of ISEM’s fungicide technologies by Belchim Crop Protection
   c. Acquisition of biopesticide companies - AgraQuest by Bayer, Pasteuria Bioscience by Syngenta, Becker Underwood by BASF

3. Several companies have also entered strategic alliances and partnerships for marketing and distribution needs. Some of the examples are
   a. Acquisition of Alpha Biopesticides by De Sangosse Group for marketing synergies
   b. Marketing tie-up for distribution of fungicides between Nissan Chemicals and Insecticides India
   c. Distribution alliance between DuPont crop Protection India and Punjab State Cooperative Supply and Federation
The top 6 importing nations constitute 45% of India’s exports. The penetration of Indian exports to these countries is still low as most of the imports are from neighbouring geographies. In order to increase their geographic presence Indian companies can adopt following strategies

1. Strategic alliances for expanding the marketing and distribution reach
2. Set up marketing offices in association with domestic players in mentioned geographies
3. Look for M&A opportunities to increase presence
Margin Improvement a Necessity for Indian Construction Chemicals

The construction chemical industry in India has grown from 1,400 Cr in 2007 to reach 3,600 Cr in 2013. The rapid growth is expected to continue and the industry is estimated to reach 9,500 Cr by 2020. However, low profit margins, high industry fragmentation, lack of awareness and absence of regulations continue to drag the sector of its potential. While fragmentation in the industry is likely to get addressed from inevitable consolidation in the market in coming years, immediate need for companies is to improve their margins and have a business model which provides expected margins consistently say Manish Panchal, Charu Kapoor and Binay Agrawal of Tata Strategic Management Group.

Introduction

Construction Chemicals, as the name suggests, are chemical compounds used in construction activities. These compounds belong to specialty segment of the chemical industry and can be used either in existing construction projects or in new construction projects either to impart specific properties to the structures or to make construction more efficient. Based on end use applications, these compounds can be broadly classified into five categories

<table>
<thead>
<tr>
<th>Segments</th>
<th>Sub-segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete Admixtures</td>
<td>Ligno based, *SNF &amp; SMF based, *PCE based</td>
</tr>
<tr>
<td>Water Proofing</td>
<td>Polyurethane based, Bitumen based, Polymer - SBR, Acrylic</td>
</tr>
<tr>
<td>Flooring Compounds</td>
<td>Epoxy Floor hardeners, Polyurethane coatings, Polyurea based</td>
</tr>
<tr>
<td>Repair &amp; Rehabilitation</td>
<td>Cementitious repair mortars, polymer repair mortars, epoxy based resin mortars</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Sealants, Grouts, Adhesives</td>
</tr>
</tbody>
</table>

*PCE: Polycarboxylic ether; SNF: Sodium Naphthalene Formaldehyde; SMF: Sulphonated Melamine Formaldehyde

A growing market

Indian construction chemicals industry currently stands at INR 3,600 Crores and has grown at a CAGR of 17% from 2007 to 2013. Admixtures constitute majority of the market with 42% share. Flooring and waterproofing agents constitute 14% share each. Chemicals for repair and rehabilitation constitute 12% of the market while adhesives and sealants constitute the remaining 18% of the market.
Key Growth Drivers

Going forward, the industry is expected to maintain its growth momentum driven by untapped potential of the market and growth in construction industry over the next 5-7 years. Also, increasing awareness and adoption of international standards would lead to usage of higher performance products. Moreover, changing regulatory environment which incentivises energy efficient/green buildings and discourages the usage of on-site concrete mixing in metros and tier 1 cities is further expected to increase demand.

As per TATA Strategic estimates, the industry is expected to grow at a CAGR of approx. 15% till 2020 to reach INR 9,500 Cr. Growth rate can increase to CAGR of 20% if certain regulation like off-site concrete mixing becomes mandatory.

Challenges still remain

The industry faces multiple challenges which can impact the growth rate of the industry. Consumer awareness in India is low regarding benefits of construction chemicals when used appropriately. High value products have limited demand and are used only by premium construction projects. Furthermore, industry lacks in relevant consumer standards for construction. All this has resulted in a under developed market in India when compared to other countries, such as China, which accounted for 42% of the global construction chemicals consumption in 2012.
Figure 1: Construction Chemical Markets, India (INR Cr)

Key Growth Drivers
Going forward, the industry is expected to maintain its growth momentum driven by untapped potential of the market and growth in construction industry over the next 5-7 years. Also, increasing awareness and adoption of international standards would lead to usage of higher performance products. Moreover, changing regulatory environment which incentivises energy efficient/green buildings and discourages the usage of on-site concrete mixing in metros and tier 1 cities is further expected to increase demand. As per TATA Strategic estimates, the industry is expected to grow at a CAGR of approx. 15% till 2020 to reach INR 9,500 Cr. Growth rate can increase to CAGR of 20% if certain regulation like off-site concrete mixing becomes mandatory.

Challenges still remain
The industry faces multiple challenges which can impact the growth rate of the industry. Consumer awareness in India is low regarding benefits of construction chemicals when used appropriately. High value products have limited demand and are used only by premium construction projects. Furthermore, industry lacks in relevant consumer standards for construction. All this has resulted in a under developed market in India when compared to other countries, such as China, which accounted for 42% of the global construction chemicals consumption in 2012.

Figure 2: Chemicals Market Overview

The one major challenge from the supply side is that the construction chemical industry is highly fragmented with the top 7 players accounting for 50% of the market; next 20 players 25% and the remaining 25% comprises of small and unorganized players. Low capital investments, high growth rates and localized nature of the business are the key reasons for high fragmentation. Such situation along with absence of standards leads to price wars between manufacturers and lower margins for the overall industry.

Future Possibilities

Figure 3: Construction Chemicals Market, India (INR Cr)

TATA Strategic expects the construction chemicals market to shift towards consolidation in the future. The market is expected to grow to INR 9,500 Cr by 2020 with top 7 players accounting for INR 5,700 Cr. With the presence of large MNCs, vying for their position in the fast growing market, we expect the awareness levels to improve. The number of players competing is expected to reduce and the industry is likely to move to an improved EBITDA margin levels.
Strategic Imperatives

While consolidation will happen over time, in the short to medium term, improving margins is the need for the sector to ensure sustainability of business. We have detailed below four key levers which can help companies improve their margins.

a. Understand Value Chain

- Companies need to understand the value chain in detail and explore how to position their products. Margins for a company can significantly increase if their products are sold in company’s own brand verses products being sold as generics.
- Companies also need to evaluate where in the value chain they can provide value added products. There are several opportunities but success depends upon strength of company’s technical sales team and their brand recall across focus regions.
- Our estimates reveal that backward integration can improve the EBITDA margin by 5-10% and therefore evaluating possibilities of backward integration will be a crucial factor in developing a more profitable business model.

b. Evaluate Operational Costs

- Both direct and indirect costs need to be evaluated and benchmarked against industry standards. This will help identify specific areas of improvement for companies vis-à-vis overall industry and companies can focus their efforts on improving selected metrics. Such focused optimization exercises yields better results in the short to medium terms.
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c. Assess Product Portfolio

- Companies understand that their product portfolio plays a critical role in determining the overall EBITDA margins. However, given the intense competition, it is imperative for companies to understand at a deeper level pricing strategy of their products. To achieve right pricing in market, several factors need to be understood such as price elasticity of their products vis-à-vis demand, any existing or upcoming discontinuities in the market, and available variants of their products.
- It is often seen that number of products sold by companies are too large. This leads to a large but ineffective portfolio. Companies need to move their business model to a portfolio which is in tune with the requirements of Indian market and has “just enough” products given companies capability to manufacture and serve the market.
- TATA Strategic analysis shows that companies enjoyed higher EBITDA margins (14-18%) when targeting specialty segments as compared to players serving only the major segments like Admixtures. Therefore, companies need to determine which specialty segments should be their focus and why.

d. Evaluate Customer Segments

- Not all customer segments have the same decision making pattern. Companies need to critically assess their focus customer segments and cater to segments which are willing to pay a premium consistently. A segment which may look attractive today may not be the same six months later if the entry barriers are too low. For example: premium infrastructure and premium real estate projects give more importance to construction quality than cost and thus are willing to pay a premium for quality construction chemical products. TATA Strategic analysis shows that players focusing on these segments were able to achieve a higher EBITDA margin of 12-15%.
Since Indian market has a relatively low base for construction chemicals, companies, while defining their focus customers' segments also need to evaluate which other countries/geographies should they focus to ascertain critical mass which is required to make their business sustainable.

**Way Forward**

The construction chemical industry has shown a healthy growth in the past and is expected to continue this growth in the future. However, high industry fragmentation and lack of awareness among end users pose a considerable challenge for the companies. Low entry barriers and lack of standards create fly by night operators which depress the overall margins for the segment. While consolidation in the segment will happen over a period of time, immediate need for companies is to improve their margins and have a business model which provides expected margins consistently. TATA Strategic has identified four key levers to improve margins which are-

i. Understanding value chain

ii. Operational costs benchmarking

iii. Product portfolio optimization

iv. Focus customer segments

Depending on companies’ current business model and capabilities, they can improve their profit margins by focusing on one or more of these levers.
Strategies for Indian Pharma in a volatile world

Fragmented Indian pharmaceutical market is facing high volatility and uncertainty. Increasing number of drugs in NLEM and price controls, changing FDI Policy, compulsory licensing, aggressive acquisition investments by MNCs, and declining global generic market opportunity is creating a new normal. Pharmaceutical companies need to re-visit their traditional growth strategies to succeed in a volatile world, say Manish Panchal, Charu Kapoor and Mansi Mahajan of Tata Strategic Management Group.

Indian Pharmaceutical Market

Figure 1: Key industry trends impacting Indian Pharmaceutical Market

Indian pharmaceutical industry is valued at $ 12 Bn in 2013. The market is primarily driven by exports to regulated as well as semi-regulated markets. Currently, India exports drugs to more than 200 countries and vaccines and bio-pharma products to about 151 countries. Globally, India ranks 3rd in terms of volume and 14th in terms of value.

Indian pharmaceutical industry is fairly fragmented with top 10 companies contributing to 41% of total sales. The next ten companies contribute to 22% of sales while the remaining companies contribute to 37% of the total sales. Urban regions (Metros and Tier I cities) contribute to about 60% of total sales while the remaining country contributes to the
balance 40%. Tier I cities are growing at 10% p.a. while rural areas are growing at 14.5% p.a. The growth has been driven by increased access to healthcare, improved infrastructure and greater penetration of pharmaceutical companies into Tier 1 cities and rural areas.

**Changing market dynamics**

The year 2013 has seen deceleration of industry growth rate from 16.6% in 2012 to 9.8% in 2013. During the year, the industry faced a different type of regulatory headwind; the patent office ruled against the intellectual property rights for several notable drugs, including Pfizer’s Sutent, Bayer’s Nexavar, etc. A still more daunting challenge for MNCs operating in India has been compulsory licensing and uncertainty about patent validity. Domestic companies, on the other hand, have been equally impacted by the Drug Prices Control Order and the ensuing stalemate of stocks stuck at various levels in the distribution chain. The Parliamentary Standing Committee recommended multiple mandatory conditions for allowing FDI in brownfield projects while allowing 100% FDI in Greenfield projects.

Industry estimates show that generic drug user fee amendments in USA, compulsory licencing and national pharmaceutical pricing policy have increased the legal expenditures of the top 10 drug makers in India by 50% in the past three years. NPPP is expected to lead to value erosion to the tune of INR 1,600 Cr post implementation for the year 2013-14.

With the notification of the order, the NPPP 2012 comes into effect and 348 drugs under NLEM, which account for 60 per cent of total domestic pharmaceutical market amounting to nearly INR 29,000 Cr, would come under price control.

**Figure 2: Levers for success**

These factors, coupled with general elections in 2014 and a host of high-profile M&A deals and aggressive investments by MNCs in India clearly indicate that the industry is going through a period of significant volatility and uncertainty which has created a new normal for the companies.
In such an uncertain playing field, it is imperative for companies to ask “How do we grow our business from here?” Companies will need to reinvent their business model or take on some disruptive new approach as traditional strategic approach would have limitation in this transient world.

**Strategies for success in uncertain and volatile environment**

TATA Strategic analysis suggests that companies which quickly adapt to the uncertain and volatile environment will be the possible winners in 2014 and beyond. Going forward, the companies will need to build their business using one or more of the following five levers:

**Review product portfolio**

The new pricing mechanism as specified in the NPPP 2012 would impact near term earnings of companies. The companies most affected will be the ones with higher dependence on Indian market, premium pricing approach and having higher share of acute therapy segment. On the other hand, the impact of the new policy would not be substantial on companies that have sizeable share of earnings from regulated markets, especially U.S. generics. Therefore, it will be vital for companies to re-look at its geographic spread and to re-new their portfolios by focusing on; therapeutic class synergies, increasing share of prescription, adding innovative and better margin products.

**Build customer centricity**

To succeed in such a complex environment, companies will need to take a customer centric view to re-look at the value proposition for each major customer segments. For each customer segment in the value chain, be it channel partners, practicing physicians, or direct patients, companies need to look at building distinctive forms of customer connect through advanced mechanisms of sales force engagements, consolidation of field force, strengthen marketing channels with adoption of digital marketing, and organize patient education programs. Companies should not just promote their products but see themselves as a disease prevention and management company.

**Strengthen operational capability**

Companies will need to revisit their operations to ensure that no complacency has set in. The legacy processes might be driving up costs due to outdated technologies or high e-factor1. Companies will need to focus on process innovations by adopting latest technologies such as micro reactors or critically evaluating and reducing the number of process steps. Furthermore, benchmarking of manufacturing processes and supply chain optimization will help in establishing the extent of improvement required to be achieved by the company.

**Value creation by JV / M & A**

Companies need to look for inorganic value creation and speed to market opportunities. Alliances could help in deeper customer and market penetration with value creation
happening in many forms such as co-production to reduce compliance costs, co-
marketing through use of common marketing channels and co-promotion to reduce 
advertisement & promotion costs by leveraging common distribution channels. It will 
also help companies to capitalize on licensing opportunities presented by international 
pharmaceutical players as they increasingly invest in emerging economies. Recent JV / 
M&A activities as highlighted in Figure 3 highlight the consolidation trend in the 
industry.

Organizational agility

To successfully respond to uncertainty, companies will have to create a culture of agility 
and innovation. They will need to take a fresh look at their organizational structure, 
especially the number of layers in the organization, the relationship between business 
units, and the mix of organizational boundaries. They will need to significantly redefine 
business processes to enable quick decisions and lower cycle times while also meeting 
increased compliance requirements. The leadership team and senior management will 
also have to be trained to accept the new normal as a "way of life" and respond to change 
quickly.

Way forward

The regulatory environment in the pharmaceutical sector is more challenging now than 
ever before. To meet the new normal, companies will have to invest in re-establishing 
their competitive position. Optimization of product portfolio to target high return 
products and building distinguishing capabilities to stay ahead of competition would be 
the key to success.

Figure 3: Recent JV / M&A in Indian Pharma

References

1. CII India Pharma Inc. report 2012
2. IBEF Pharmaceutical industry report 2013
3. ICRA report on pharmaceutical industry 2013
4. Web articles - Express Pharma, Pharma bioworld, Forbes
Both domestic and multi-national players will need to look at inorganic growth opportunities including value creation through partial carve outs as it would play a key role in defining the long term sustainability of the companies. The winning companies will be the ones which analyze their competitive position and meet the rapid changes happening in the industry by evaluating and speedily implementing the five levers outlined above.

**References**

1. CII India Pharma Inc. report 2012
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Crop Protection Chemicals industry—
Imperatives of growth

By Mr. P S Singh
Head, Chemicals & Petrochemicals, FICCI

1. The Indian Population currently stands at about 1.3 billion which is about 18% of the global population with only about 2.4% of land being available. The same is expected to reach 1.6 billion by 2050. Keeping pace with these growing numbers, the country will not only have to raise its agriculture production but also the productivity as land availability will not increase. Crop Protection Chemicals or Agrochemicals are an important input for facilitating pre & post-harvest management.

2. The future of Crop Protection Chemicals industry is bright. It is expected to grow at a CAGR of 7.5% between FY 15 and FY 20 to reach USD 6.3 Bn. Approximately 50% of the demand comes from domestic consumers while the rest is exported. This is also an indication of the competitiveness and quality of the crop protection chemicals produced in the country.

3. In coming years, agrochemical industry should focus on developing new processes and products with sustainability as the core principle. This requires developing a collaborative platform in which the academia, government and regulatory bodies, farmers associations, manufacturers and farmers come together to promote safe and judicious usage of pesticides. Going ahead, opportunities for the Indian crop protection industry will come from exports, higher production of generic products, product portfolio expansion, and growth in herbicides and fungicides.

4. As a trend, the need for safe and effective use of crop protection chemicals will further increase to brace with larger climatic variations and emergence of new invasive insects, weeds and diseases. Hence, it is important for companies to invest today in science and practices which promote safe and judicious use of crop chemicals. Judicious use of pesticides implies using the right product, with correct dosage and with correct application methodology. When used judiciously, the products deliver maximum impact on the target species. Therefore, it is critical for both the government and for Crop Protection Chemicals manufacturers to work closely with the farmers and farmers associations to educate them on safe and judicious use of existing pesticides as well as advancements happening in products on a regular basis.

5. Internally, crop protection products manufacturers can also consider performing a process and environmental impact audit of their existing products and adopt green
chemistry practices. To move to "green practices", in the short term, companies can implement zero discharge solutions, adopt COD reduction techniques and develop collaborative platforms. In the medium term, companies can implement solvent recovery practices, explore alternate green solvents, evaluate biocatalysts and microwave chemistry technology. Over the long term, companies may also focus on developing biopesticides, implement process innovation to achieve a better material balance and build symbiotic relationships with key stake holders. Embracing farmers to promote judicious usage of crop protection products will be an appropriate way to develop a long term sustainable business model in Crop Protection Chemicals.

6. For a sustainable growth it is imperative for crop protection chemicals manufacturers to adopt green chemistry processes, develop new products which are nearly 100% green and increase their focus on educating and training the farmers for proper usage of Crop Protection Chemicals. Focus on Green Chemistry will help the companies to design new products and processes with sustainability as the core principle. Over the long term, this will help the companies to differentiate themselves and build competitive advantage. Government should also look to curb the menace of spurious pesticides.

7. However, the industry cannot implement the green chemistry practices in isolation. It is imperative to build a collaborative ecosystem in which the academia, industry, government and regulatory bodies come together and create opportunities for the industry, academia and the Entrepreneurs to test, scale-up and commercialize their ideas in the domain of green chemistry practices. Ideas or concepts with potential should be nurtured and adequate support should be provided for scale-up and commercialization. This would encourage creation of inventions and innovations.

8. With Government’s current campaign on ‘Make in India’ which has a special focus on the chemical industry and aims to turn the country into a global manufacturing hub, good infrastructure and adoption of cluster approach (in which like minded industry shares common infrastructure and thus bringing down the over-all cost). Government could also consider giving same excise treatment to crop protection chemicals, as to fertilizers and seeds as all of them facilitate the agriculture sector.

9. The future indeed is bright for Indian Crop protection chemicals industry, as a facilitator of the Indian agriculture as also of national economy.
A Window to Plasticulture

By Mr. P S Singh
Head, Chemicals & Petrochemicals, FICCI

1. Right usage of water is becoming increasingly important given the fact that India currently supports nearly 17.84% of the world population, with 2.4% land and 4% of water resources. At the same time, monsoons are also becoming erratic. The resultant is alarming fall in ground water levels. At present, irrigation consumes about 84 per cent of total available water. As per Economic Survey of India February 2016, although water is one of India’s most scarce natural resources, India uses 2 to 4 times more water to produce a unit of major food crop than does China and Brazil.

2. As per International Water Management Institute, during the past decade, groundwater in various parts of the country, esp. beneath the northern Indian states of Punjab, Haryana & western UP has fallen at an alarming level. This will impact the food security of the nation as the region also happens to be its food bowl. The given map shows the groundwater withdrawals as a percentage of groundwater recharge.

3. The resultant is alarming fall in ground water levels placing at risk, the national food security mission. It is imperative that the country gives focus to efficient usage of water in Agriculture. As per World Resources Institute, 54% of India faces high to extremely high water stress.

4. Plasticulture - Need of the Hour

Plasticulture viz: the use of plastics in agriculture, horticulture, water management and related areas provides an answer to the problem. The usages of plastics not only maximize the output of farms but also optimize the input factors thereby leading to high productivity of crops along with efficiencies in time and cost involved. It is estimated through appropriate adoption of micro-irrigation technologies can result in water saving up to around 50-70%. Consumption of fertiliser is also reduced...
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<table>
<thead>
<tr>
<th>S.No.</th>
<th>Plasticulture Applications</th>
<th>Water Saving (%)</th>
<th>Water Use Efficiency (%)</th>
<th>Fertilizer Use Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drip Irrigation System</td>
<td>40-70</td>
<td>30-70</td>
<td>20-40</td>
</tr>
<tr>
<td>2</td>
<td>Sprinkle Irrigation System</td>
<td>30-50</td>
<td>35-60</td>
<td>30-40</td>
</tr>
<tr>
<td>3</td>
<td>Plastic Mulching</td>
<td>40-60</td>
<td>15-20</td>
<td>20-25</td>
</tr>
<tr>
<td>4</td>
<td>Greenhouse</td>
<td>60-85</td>
<td>20-25</td>
<td>30-35</td>
</tr>
<tr>
<td>5</td>
<td>Shade nets</td>
<td>30-40</td>
<td>30-50</td>
<td>Under Trial</td>
</tr>
<tr>
<td>6</td>
<td>Plastic Tunnel</td>
<td>40-50</td>
<td>20-30</td>
<td>-do-</td>
</tr>
<tr>
<td>7</td>
<td>Farm Pond Lined with Plastic Film</td>
<td>100</td>
<td>40-60</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

Source: NCPAH

1. The growing use of plastics in different segments of economy has been very useful. The use of plastics esp. in agriculture has helped farmers increase crop production, improve food quality as also in more efficient usage of water resources.

2. In order to meet the food grain requirements of the nation, the agricultural productivity and its growth needs to be sustained and further improved. Given the limitation of the important input, viz: water, Plasticulture can play a very important role in same.

3. Plasticulture (viz: the use of plastics in agriculture, horticulture, water-management, food grains storage and related areas) is a good answer to this challenge of water shortage. It can play an important role in facilitating judicious usage of water. It is estimated that appropriate applications of micro-irrigation technologies can result in water saving up to 50-70%. At the same time, consumption of fertilizers is also reduced thru Fertigation. Plasticulture applications offer a multitude of benefits and are considered most important indirect agricultural inputs which results in moisture conservation, water saving, reduction in fertilizer consumption. It also helps in precise application of water & nutrients, and use of innovative packaging solutions help in increasing shelf-life and during collection, storage & transportation of fruits and vegetables.

4. A promising way forward, to increase productivity while conserving water (more for less), is to adopt micro irrigation methods. In drip irrigation for example, perforated pipes are placed either above or slightly below ground and drip water on the roots and stems of plants, directing water more precisely to crops that need it through fertigation. The resulting improvement in net farm incomes is substantial.
it. An efficient drip irrigation system reduces consumption of fertiliser (through fertigation) and water of the plant and hence there is less wastage. Yields of crops also went up - up to 45 per cent in wheat, 20 per cent in gram and 40 per cent in soybean. The resulting improvement in net farm incomes is substantial. Until now micro-irrigation techniques, owing to high fixed costs of adoption, have mostly been used for high value crops. However, recent research has shown its feasibility even in wheat and rice.

5. Due to their versatility, and imperviousness to water, Plastics save significant amounts of energy and water resources and emit lower quantum of greenhouse gases. They have already displaced many traditional materials, such as wood, leather, paper, metal, glass and ceramic, in most of their former uses.

- **Plasticulture applications** are one of the most useful indirect agriculture inputs with huge unrealized potential such as:
  - **Water Management**- Lining of canals, ponds & reservoirs with plastics film/Drip & sprinkler irrigation system/Water conveyance using PVC & HDPE pipes & Sub-surface drainage
  - **Nursery Management**- Nursery bags, Pots, Pro-trays, Root trainers, Coco peats, Hanging baskets, Plastic trays, etc.
  - **Surface cover cultivation**- Soil Solarisation/Plastics Mulching
  - **Controlled environment agriculture**- Greenhouses/Shade net houses/Plastic tunnels/Plant protection nets
  - Innovative Packaging Solutions- Plastic crates, bins, boxes, leno bags, unit packaging nets etc/CAP covers, controlled atmospheric packaging (CAP) & modified atmospheric packaging (MAP)
  - Organic Farming- HDPE vermin bed

6. **Benefits of Plasticulture Applications**-

Same can help the country to meet both food and nutrition needs at a time when population growth is @ +1% per annum with depleting natural resources such as land & water.

7. While the usage and benefits of plastics are manifold, the sector has an image issue (which can be linked to inappropriate civic handling of waste). The myth regarding the polluting characteristic of plastic needs to be addressed in a very scientific manner. If plastics can be collected and disposed off or recycled as per laid down guidelines/rules, the issue of plastic waste can be suitably addressed.
In fact, there is good potential for industries based on re-cycling of plastics waste.

8. However, the quantum of usage of plasticulture applications is still limited in India. Out of total 126 million hectares (mha) of area under cultivation in the country, an area of 69.6 million hectares holds potential for micro-irrigation. At present only about 7.5 million hectares is covered by micro-irrigation. This indicates huge gap/potential for micro-irrigation in the country.

9. In a recent survey conducted on the GoI scheme for National Mission on Micro Irrigation (NMMI), it is highlighted that scheme has performed well in terms of reduction in input cost to the tune of 20% - 50% along with energy savings. Approximately 7.4 mha have been covered under GoI scheme.

10. Incidentally the enhanced application of plasticulture concept will also create opportunities for the Indian plastic industry. Plastics such as PVC, LDPE, LLDPE, HDPE, PP, PTFEE etc find good applications in the sector. As we are aware, there is a huge unrealised potential of further growth of plastic industry as indicated by the present very low per capita consumption level in the country. The same is only about 10 kgs in India compared to world average of 28kgs and about 109 kgs in USA.

11. Concluding, it can be stated that the plasticulture applications hold huge importance because of their relationship to water conservation and national food security. A very focused campaign to create awareness about its usage (thru demonstration centres) in which farmers are partners will be helpful. At the same time, there is need to ensure availability of quality products based on good standards by industry. There is also need for bringing out literature on the subject in regional languages, which may also include case studies. These steps will go a very long way in promoting the idea of plasticulture in India.
Executive Summary

About the study

With this study, Tata Strategic has attempted to assess organisational culture trends across various industry sectors using the Organisational Culture Assessment Instrument (OCAI)\(^1\). According to the OCAI, there are four major cultures – clan, adhocracy, hierarchy and market. Any organisation culture would be a combination of the above said cultures. Though many organisations have used OCAI, either independently or with help of consulting partners, there is no comparative data currently available providing a cross-industry snapshot. This study attempts to create a reference point across various industries.

Study Methodology

This study was conducted in two phases. First, an online survey was conducted to capture the perceptions of business leaders about the organisations culture and map their organisational culture profile based on their inputs. Second, qualitative discussions were held with select participants and industry experts to understand the trends in the industry.

Respondent Demographics

A total of 96 organisations, represented by the top leadership, participated in the survey. The participants were from automotive, engineering, BFSI, chemical, healthcare, pharma, IT, logistics, manufacturing, metals, power, infrastructure, consulting, telecom, FMCG, and consumer durables sectors. The survey witnessed a healthy mix of respondents from small sized organisations, with turnover
less than INR 500 Cr, mid-sized organisations, turnover between INR 500 Cr and INR 1000 Cr, and large organisations, with turnover of more than INR 1000 Cr, participating in the study.

**Organisation Culture**

Ravasi and Schultz$^2$ state that organizational culture is a set of shared assumptions that guide what happens in organizations by defining appropriate behaviour for various situations. It is also the pattern of such collective behaviours and assumptions that are taught to new organizational members as a way of perceiving and, even, thinking and feeling. Thus, organizational culture affects the way people and groups interact with each other, with clients, and with stakeholders. In addition, organizational culture may affect how much employees identify with an organization. Schein$^3$, Deal$^4$ and Kennedy$^5$, and Kotter$^6$ advanced the idea that organizations often have very differing cultures as well as subcultures.

**Key Highlights of the study**

- 100% of the respondents agreed that an organisation culture aligned with strategy has a significant contribution to business growth
- 87% of industry leaders plan their culture with their evolving business plans
- Companies with strong strategy-culture alignment reported 2.4 times more profitability than companies with no strategy-culture alignment.
- While 69% of the respondents claimed that their organisational culture is aligned to their current business strategy, rest did not believe so
- The major reason cited by business leaders for the lack of alignment is the intangible nature of culture
- Close to 33% of the respondents admitted that the culture existing in their organisation is not something they had envisioned as a business leader. In case of organisations with turnover of more than INR 500 Cr, the number is as high as 50%
- Clan culture is the most prominent culture profile in Indian organisations
- The dominance of clan culture in the organisation decreases with increase in the turnover of the organisation
- The dominance of market culture increases with increase in turnover of the organisation
- Adhocracy and hierarchy culture are the least prominent culture profiles in India
- None of the respondents with turnover below INR 1000 Cr have reported hierarchy as their dominant culture profile
Section III

Key Findings
Impact of Strategy-Culture alignment on Profitability

The profitability of an organisation is dependent on varied factors ranging from the nature of the industry, industry growth cycle, macro economic conditions, management prowess, company’s growth stage etc. Besides these, organisational culture often plays a silent but extremely critical role in shaping an organization’s profitability.

Through our data deep dive, we found intriguing insights on the correlation between the level of alignment of an organisation’s culture to its strategy and profit margins. Organisations which reported very high strategy-culture alignment realised 6.7% incremental profit margin vis-à-vis organisations with no strategy-culture alignment.

Figure 7: Impact of strategy-culture alignment on profitability

The profit margin of respondents reporting highest strategy-culture alignment was found to be 11.5% while that of respondents with no strategy-culture alignment is mere 4.8%.
Culture as a Planned Endeavour

The importance of organisational culture in business performance is still an unexplored area within organization effectiveness in India. Every organization possesses a unique culture, regardless of the importance attached to it. The presence of an organizational culture is felt by both management and workforce alike.

As part of this study, we explored whether Indian organisations value culture and would make significant investments towards building the right culture for their organisations. We asked each of the respondents if the culture in their organisation is something they had envisioned as a business leader. The response is as follows:

Figure 8: Alignment of the existing culture with envisioned culture – Sector – wise responses

<table>
<thead>
<tr>
<th>Sector</th>
<th>Disagree</th>
<th>Not Sure</th>
<th>Agree</th>
<th>Strongly Agree</th>
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<tbody>
<tr>
<td>Services</td>
<td>13%</td>
<td>25%</td>
<td>50%</td>
<td>13%</td>
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<tr>
<td>Power &amp; Infra</td>
<td>13%</td>
<td>13%</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>Metals</td>
<td>17%</td>
<td>57%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>17%</td>
<td></td>
<td>83%</td>
<td></td>
</tr>
<tr>
<td>Logistics</td>
<td>50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT/ITES</td>
<td>10%</td>
<td>20%</td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>Healthcare &amp; Pharma</td>
<td>25%</td>
<td></td>
<td>50%</td>
<td>25%</td>
</tr>
<tr>
<td>Consumer &amp; Retail</td>
<td>18%</td>
<td>27%</td>
<td>36%</td>
<td>18%</td>
</tr>
<tr>
<td>Chemical</td>
<td>17%</td>
<td>5%</td>
<td>59%</td>
<td>9%</td>
</tr>
<tr>
<td>BFSI</td>
<td>13%</td>
<td></td>
<td>58%</td>
<td>8%</td>
</tr>
<tr>
<td>Auto &amp; Engineering</td>
<td></td>
<td>60%</td>
<td></td>
<td>40%</td>
</tr>
</tbody>
</table>

With the exception of the auto and engineering sector, at least 17% of the organisations in each sector have responded by saying that the current organisation culture is not something they envisioned as a business leader at the onset. All the organisations in auto and engineering sector claimed that the culture prevalent in their organisation is something they envisioned as a business leader. This only indicates the relative importance given by the business leaders in each sector to develop a right culture for their organisation.
The alignment of existing culture with envisioned culture profile may be due to coincidental business decisions rather than planned action by the business leader. In our qualitative discussions with certain leaders, we found that most of the leaders indicated that they attempted to attain the desired culture in their organizations through conscious business decisions, albeit largely ad–hoc.

Figure 9: Alignment of the existing culture with envisioned culture – Response variation with the size of organization

<table>
<thead>
<tr>
<th>Turn Over of INR 500-1000 Cr</th>
<th>13%</th>
<th>22%</th>
<th>17%</th>
<th>50%</th>
<th>13%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reported More Misalignment</td>
<td>50%</td>
<td>67%</td>
<td>56%</td>
<td>7%</td>
<td>55%</td>
</tr>
<tr>
<td>Between Existing Culture</td>
<td>13%</td>
<td>17%</td>
<td>11%</td>
<td>43%</td>
<td>11%</td>
</tr>
<tr>
<td>And Envisioned Culture</td>
<td>13%</td>
<td>11%</td>
<td>12%</td>
<td>21%</td>
<td>11%</td>
</tr>
</tbody>
</table>

The statistical trends of the data deep dive suggests that a clear correlation of organisations with turnover of INR 500-1000 Cr are more likely to have misalignment. Hence, as businesses grow dynamically in scale and revenue, the focus on culture continues being low priority leading to a misaligned and ad–hoc culture profile – till it reaches a stage where planned action is taken to smoothen problems.

87% of Leaders¹ across all industry segments have reported that they have planned their culture to their current profile, i.e. the ‘vision’ they had envisaged when they had planned towards business strategy as well. This proves that leaders invest actively in attaining the culture profile most suitable for them, complimenting their planned business strategy.

Notes:
For the purpose of this study - ‘Leaders’ refer to the respondents with maximum market share in their respective industry sectors.
Industry-wise culture profile: Chemical

68% of the respondents from the chemical sector claimed that their organisation culture is aligned with their business strategy. The culture profile of the respondents claiming an aligned culture with strategy and of the total universe show minimal deviance.

The aggregate culture profile of the chemical industry appears quite balanced, with clan profile scoring slightly higher than other culture types.

During our discussions with business leaders, a few key characteristics of this sector that emerged were: it is quite a heavily regulated industry, with scarcity of skilled workforce, both in terms of blue and white collar.

Some of the key people practices which have been shared by the business leaders from chemical industry are as follows:

- **Performance Management System**: Metrics are oriented towards compliance and adherence to quality standards.
- **Training**: Training programs are predominantly technical and functional; very few participating organizations had a robust behavioural and personality training program.
- **Cross functional experience**: Many of the participants reported structured programs emphasizing built with an objective of developing cross functional experience leading to in-house development of senior and middle level leadership.

Figure 10: Aggregate Culture Profile of Chemical Industry

- culture profile of total respondents
- culture profile of respondents with aligned culture

All the participating organisations from chemical sector have annual turnover ranging from INR 50 Cr to > INR 1000 Cr.

Respondents from chemical industry are bulk and specialty chemicals manufacturers.
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TATA STRATEGIC MANAGEMENT GROUP
About Tata Strategic

Founded in 1991 as a division of Tata Industries Ltd, Tata Strategic Management Group is the largest Indian own management consulting firm. It has a 50 member strong consulting team supported by a panel of domain experts. Tata Strategic has undertaken 1000+ engagements, with over 300 clients, across countries and sectors.

It has a growing client base outside India with increasing presence outside the Tata Group. A majority of revenues now come from outside the group and more than 20% revenues from clients outside India.

Tata Strategic offers a comprehensive range of solutions covering Direction Setting, Driving Strategic Initiatives and Implementation Support.

Our Offerings

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Revenue Enhancement</th>
<th>Operational Efficiency</th>
<th>Organization</th>
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<td>• Competitive Strategy: Entry/Growth</td>
<td>• Adjacent Products</td>
<td>• Supply Chain Optimization</td>
<td>• Strategy- Culture Alignment</td>
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<td>• M &amp; A Support</td>
<td>• Underserved Segments</td>
<td>• Workforce Productivity</td>
<td>• Change Management</td>
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<td>• New Biz Models</td>
<td>• Sales Effectiveness</td>
<td>• Throughput</td>
<td>• Family Governance</td>
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<td>• Customer Journey</td>
<td>• Service levels</td>
<td>• Talent Management</td>
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<td></td>
<td>• Route to Market</td>
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</table>

Drive Implementation & Change

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<table>
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<tr>
<td>• Revenue</td>
<td>• Profit</td>
<td>• Cycle Time</td>
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<tr>
<td>• Term Sheet</td>
<td>• Volume</td>
<td>• Service level</td>
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<tr>
<td>• Market Share</td>
<td>• Key Milestone</td>
<td>• Costs</td>
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**About FICCI (Federation of Indian Chambers of Commerce and Industry)**

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India’s struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India’s business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.
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