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TATA STRATEGIC MANAGEMENT GROUP

1927-2017 FICCI @90



A Report on

Chemical Industry with focus to Gujarat & Speciality Chemicals

September, 2017

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Federation of Indian Chambers of Commerce and Industry
Federation House
Tansen Marg
New Delhi 110001
T +91 11 23738760 (11 Lines)
F +91 11 23320714 / 23721504
E ficci@ficci.com
www.ficci.com
CIN: U99999DL 1956NPL002635

Mr. Deepak C Mehta
Chairman - FICCI National Chemical Committee
CMD, Deepak Nitrite Ltd



Message

As Chairman of FICCI Chemical Industry Committee, I am pleased to note that Federation of Indian Chambers of Commerce and Industry(FICCI) in association with the Department of Chemicals and Petrochemicals, Government of India, Government of Gujarat and iNDEXTb is organising the India Chem Gujarat 2017 with focus to Speciality Chemicals.

The Chemical industry is the integral part of the Indian economy. Over the past two decades the sector has evolved from being a basic chemical producer, to the higher ends of value chain, notably the speciality chemicals segment. The same has huge unrealised potential for the country. Specialised infrastructure, focus to R&D, availability of key feedstocks and right frame of policies can enable the country to become a global hub of quality speciality chemicals.

I am sure all stakeholders will find it useful.

(Deepak C Mehta)

Mr. Vinay Mathur
Deputy Secretary General



Federation of Indian Chambers of Commerce and Industry
Federation House
Tansen Marg
New Delhi 110001
T +91 11 23738760 (11 Lines)
F +91 11 23320714 / 23721504
E ficci@ficci.com
www.ficci.com
CIN: U99999DL 1956NPL002635

Message

Indian Chemical Market is estimated to be USD 155 Bn in FY16 and is likely to grow at 9.6% p.a. over the next 5 years to reach USD 240 Bn by FY21. At the same time, the Indian Speciality Chemicals market is expected to grow @ 13% CAGR and is expected to be of the size US $ 85 Bn by FY 2025. This will create huge opportunities for the chemical industry in India. It is important that this enhanced demand is met by domestic manufacturing, in the process not only translating the "Make in India" effort into reality, but also creating jobs in the country.

I am sure India Chem Gujarat 2017, which gives special focus to the emerging opportunities in speciality chemicals, will give a big boost to this important segment of Indian industry.

I wish the event, all the success.

Vinay Mathur

Vinay Mathur

Foreword



Manish Panchal
Sr. Practice Head- Chemical & SCM
Tata Strategic Management Group
manish.panchal@tsmg.com



Charu Kapoor
Principal- Chemicals
Tata Strategic Management Group
charu.kapoor@tsmg.com



P. S. Singh
Head- Chemicals & Petrochemicals
FICCI
prabhsharan.singh@ficci.com

From increased agricultural productivity and better cure for human diseases to smoother skin creams and sparkling toothpaste, chemicals play a vital role in everyday life. They are making 21st century living more enriching by contributing towards building energy-efficient homes, more comfortable bedding, longer-lasting paints and affordable clothing. While there are negative perceptions about the chemical industry due to concerns over sustainability and pollution, the chemical industry is working hard to find solutions for many of the issues that a rising population presents to the society.

The report highlights the importance of chemicals in everyday life by taking the reader through the key sub-segments- viz. Bulk Chemicals, Petrochemicals, Fertilizers & gives detailed focus to speciality chemicals & Agrochemicals. It analyses the impact that each of these sub segments have in terms of the critical challenges they address that contributes towards economic, social or industrial activity and impact on other sectors within the chemical industry.

Gujarat is at the forefront in chemicals industry and today known as the 'Petro Capital' of India. It contributes production of 62% of petrochemicals, 51% of chemicals and 35% of pharmaceuticals of the country's total manufacturing. Its business friendly policies have made it the first choice for investors.

It has been a good collaborative effort. As always, it was very insightful experience for FICCI and Tata Strategic (Chemicals) team to materialize this report. We hope it acts as a guiding light for the players in the chemical industry of India.

Way forward For Chemical Industry

The Indian Chemical and Petrochemical sector is a focus destination for investment. Virtually all sectors of the economy are dependent on this sector. Its growth is a prerequisite for the overall development of the country. The chemical industry, with its variety of raw materials and key inputs, is one of the most diversified sectors and the mainstay of Indian industry. The Indian chemical industry, comprised of 3.4 % of the global industry and presents a huge opportunity for young and dynamic entrepreneurs. India's national manufacturing policy aims to enhance the share of manufacturing in the country's GDP to 25%, and create 100 million jobs by 2022, and the chemical industry would have a very important role in this. "The Indian chemical industry is currently estimated to be about US $ 155 billion in 2016, that is 3.4 % share of the global market. China incidentally is the largest contributor with 34% of the global share. This is a very good reason for policy makers and industry to take the lead and prepare a roadmap, with over 16500 (incl. above 500 large and medium scale. Chemical units in the state of Gujarat and over 80000 in India. The industry should increase its R&D to a proportion that should commensurate with international standards.

India's PCPIR policy would bring in world class infrastructure and global scale investments. However, with all these developments, the industry should not lose sight of sustainable development. A number of multi-national 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.

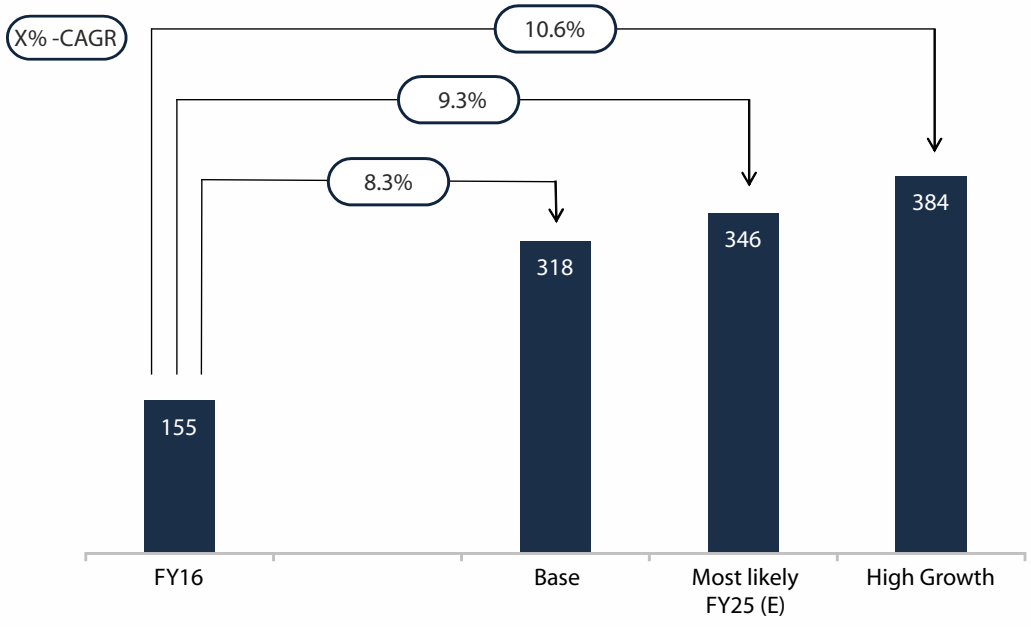
1 Executive Summary

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.

Globally, chemical industry was valued at $ 4.5 Tn in 2016 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

Figure1 : Chemical Industry Future Outlook (USD Bn)



Source: *TATA Strategic Analysis*

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Indian chemical industry is estimated to be valued at $155 Bn in 2016 and contributes 3.4% 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. 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. 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.

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.

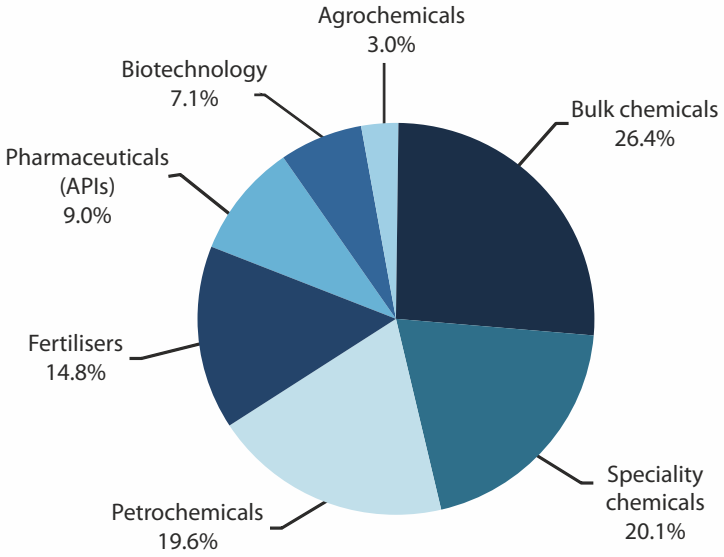
Innovation is a good way to ensure sustainability over long term and address challenges occurring due to recession, cyclicality etc. It is not constrained to R&D but applicable to the entire value chain. Innovations in market delivery, supply chain, go to market propositions etc. could help increase 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 following key segments:

Figure 2: Indian Chemical Industry Segments (FY 16)



* Includes basic organic , inorganic and other chemical intermediaries

Source: *Tata Strategic Analysis*

The key segments are:

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) industry is estimated at $41 Bn in FY16 and has seen subdued growth despite the growth in consumption, due to falling commodity prices. It is expected to grow at 5% per annum till 2025. 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 industry is valued at $30.5 Bn in FY16 and had registered a growth of 11% per annum during the FY11-FY16 period. It is expected to grow at rate of 8% to reach $61 Bn by FY25 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. **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. Industry is estimated at $23 Bn in FY16 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 3% till 2025 driven by low International prices for Urea, DAP & MOP and continued government support.

4. **Pharmaceuticals (APIs):** It includes only APIs. For the purpose of analysis, formulations are not considered to be a part of chemical industry. Indian Pharma API industry is estimated at $14 Bn in FY16. 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 for pharmaceuticals. Despite the same, pharma APIs is expected to grow at 6.8% till 2025 driven majorly by demographics, better diagnostic facilities, increased government spending and increased penetration of health insurance.

5. **Agrochemicals:** It includes insecticides, fungicides, and herbicides. Indian industry is estimated at $4.7 Bn in FY16. Prevalence of spurious products, stringent regulations, low focus on R&D, inefficient distribution system and lack of awareness among farmers remain key challenges. Industry is expected to grow at 7.5% in till 2025. This growth is primarily driven by increased planned expenditure, formation of Farmer Producer Organizations and increase in exports.

6. **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 and others. These chemicals are R&D intensive, high value and low volume chemicals. Industry estimated at $31.2 Bn as of FY16. Industry is expected to grow at 12% p.a. to reach $86.5 Bn by 2025 driven by growth in end use industry (textiles, automotive, glass, construction, paints etc.)

7. **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 industry. 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% till 2025 primarily driven by indian demographic factor, higher healthcare expenditure, increasing acceptance of bio products and strong growth in exports demand.

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.

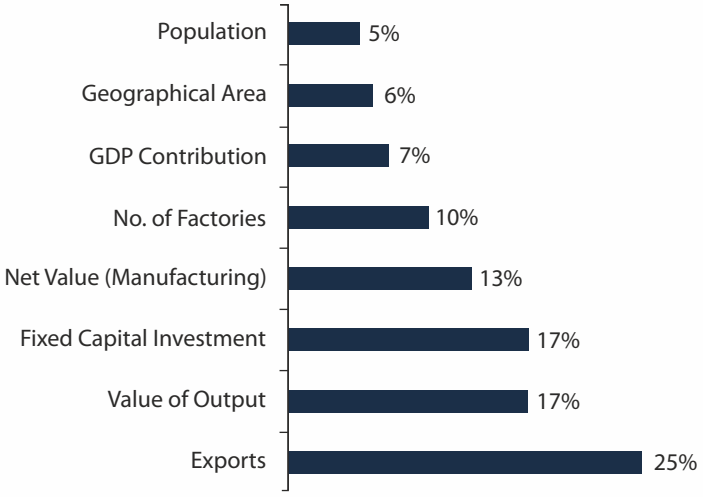
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Gujarat : An Investment Destination

Gujarat, India's western most state hails a buoyant economy, growing population and increased trade footprint. The state is in forefront to drive India's need for new and sophisticated investments.

Gujarat possess strong economic credentials, transparent business environment and a gamut of lined up projects which makes it a favourable destination for companies to invest, own and operate major infrastructure spans.

Figure 3: Gujarat's Contribution to Indian Economy (2015)



Source: *Tata Strategic Analysis*

The chemical and petrochemical industry in Gujarat is the fastest growing sector in the state's economy. Apart from having sound infrastructure facilities, skilled manpower, excellent domestic and international connectivity and availability of raw materials, a key differentiating factor for Gujarat is its focus on industrial development in the state. It has evolved as an urbanised economy ensuring easy off-take of industrial output. Gujarat is the 'Petro Capital' of India, and contributes significantly to the country's petrochemicals production (62%), chemicals production (53%) and pharmaceuticals production (45%). Gujarat contributes 25% of the country's total exports. Bulk of this goes to US, Europe and other developed nations - a clear sign of global competitiveness.

One of the leading industrialised states in India, Gujarat has become one of the most preferred locations for investments. A total estimated investment of almost USD 200 Billion is planned in Gujarat till 2020. These investments are majorly aimed at improving the infrastructure facilities. Few of them are: Dholera Special Investment Region, Logistics Park, Gujarat International Finance Tech City, Mumbai - Ahmedabad High Speed Train, Delhi-Mumbai Corridor, New Special Investment Regions, Special Economic Zones and Industrial Parks.

With land earmarked, the 80 hectare chemical logistic park is planned in the PPP mode. A JV of GIDC and IL&FS IDC is formed to select developer who will develop the park. In addition to being the first Chemical Logistics Park in India, GIDC is to start a SPV Company in JV with Kribhco Infrastructure Ltd. (KRIL) to develop a CFS in PCPIR.

In 2015, Gujarat framed an Industrial Policy to support industrial growth in the state. The policy envisions Gujarat as a globally competitive and innovative industrial destination that stimulated sustainable development and promote inclusive growth. It also aims to leverage Delhi Mumbai Industrial Corridor (DMIC) influence in Gujarat and Special Investment Regions. Multiproduct Industrial Areas have been identified along the corridors and development of 1000 hectares of land for setting up Special Investment Regions (SIR) is underway. About 62% of the area of the state is covered within the influence area of DMIC. The identified development nodes in Gujarat are:

1. Palanpur - Mehsana Industrial Region
2. Vadaodara - Ankaleshwar Industrial Area
3. Surat - Navsari Industrial Area
4. Ahmedabad - Dholera Investment Region
5. Bharuch - Dahej Investment Region
6. Valsad - Umbergaon Industrial Area

Gujarat is the leader in India when it comes to "Ease of doing business". Gujarat fares highly when it comes to setting up a business, allotment of land and obtaining a construction permit. Being among the leaders in Chemicals manufacturing in India, Gujarat has a key role to play in upcoming decade.

Infrastructure and Strategic Location

Gujarat has location advantage with strong infrastructural support. With 30.2 GW of installed power generation capacity, Gujarat is a power surplus state and has 24X7 power supply. It has over 5,100 km of rail network, mostly broad gauge, 4,971 km of national highways, 19,761 km of state highways and 52,253 km of other roads. Gujarat has 42 ports including a 1,600 km long coastline. It boasts of 18 domestic airports and 1 international airport. Further, there are a total of 74 SEZs, of which 18 are operational, 28 with formal approval, 4 with in-principle approval and 24 are notified. SEZ policy offers flexible labour laws and exit option and it receives 100% corporate tax holiday for initial 5 years and 50% of the next 5 years.

Investor friendly climate, supportive and proactive government, policy measures and incentives, support for SMEs, availability of natural resources, state leadership and growth policies, PPP (public private partnership) model etc. has together contributed to the holistic growth of the State. Besides this the presence of mega-estates in chemical manufacturing at several industrial clusters in the state has helped growth and expansion of the industry by providing an appropriate business ecosystem. Chemical clusters across the state facilitate rapid development and growth.

Major Chemical players in Gujarat

Leading Indian and multinational private organizations which have a footprint in Gujarat are Reliance, TATA Chemicals, ONGC, Dow Chemicals, Cheminova, Lanxess, India Oil (IOCL), Indian Petrochemical Corporation Limited (IPCL), Nirma, Essar, BASF, Bayer, Rallis, Novartis, Torrent, Cadila, Aarti Group and Deepak Nitrite. More than 35% of large & medium units in the state are from chemical industries and chemicals account for ~16% of employment in the state.

The PCPIR at Dahej is spread over 453 km2 of area in the Gulf of Khambhat, in Bharuch District in South Gujarat in close vicinity of other chemical estates and onsite chemical port terminal & LNG terminal. An ONGC Petro addition Ltd (OPaL) commissioned its mega petrochemical complex at Dahej in 2017 and has started production in some of its units.

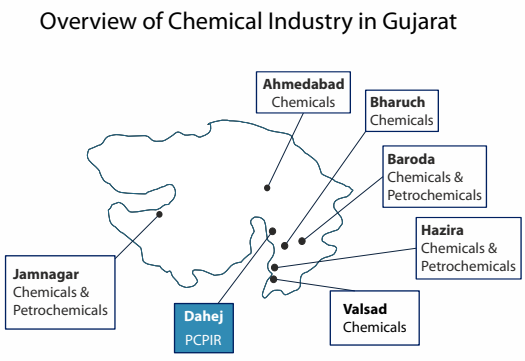
The PCPIR at Dahej is an excellent example for other upcoming Investment Regions, since it has already set-up country's largest dual feed cracker unit and has production capacity in Ethylene (1100 KTPA) and Propylene (340 KTPA). It is in the process of operating 100% of its PP plant capacity. The PE plant also is expected to run at full capacity from its current 50% level by second half of 2017.

OPaL has started exporting to Singapore, with the first consignment shipped containing Butadiene. The company plans to export more products, like benzene, etc. to other countries as well and will float tenders for the same.

Figure 4: Leading Chemical Companies in Gujarat



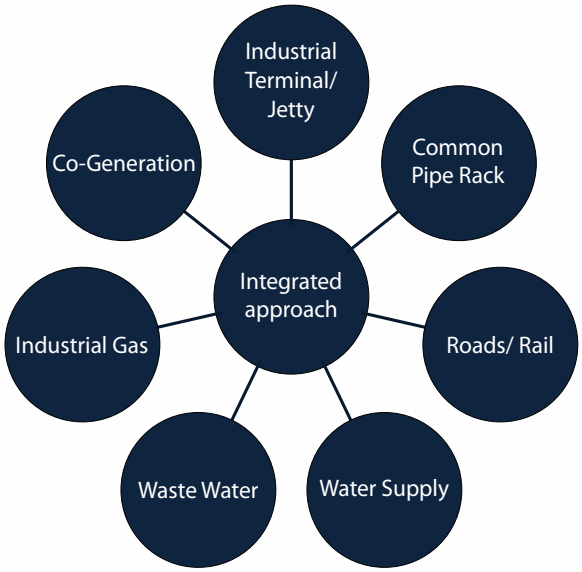
Figure 5: Overview of Chemical Industry in Gujarat



Thus, along with its robust business environment, policy support by government, strong talent pool and entrepreneurial culture, the state is poised to further build on its leadership position in the chemical industry in the way ahead.

Way Forward: Key to Growth of Gujarat as a Chemical Hub

Figure 6: Integrated Approach



Source: *Tata Strategic Analysis*

The strong & robust infrastructure, focused & supportive policies and growing downstream industries are helping the chemical industry to contribute to the Gujarat growth story. However, there is a need for the state to compare itself with international examples like a Jurong Island and ensure that State and Central departments and agencies work seamlessly to help achieve the goal of integrated development. This would serve well in ensuring that future phases and projects of similar scale are not plagued with the issues and challenges of the present.

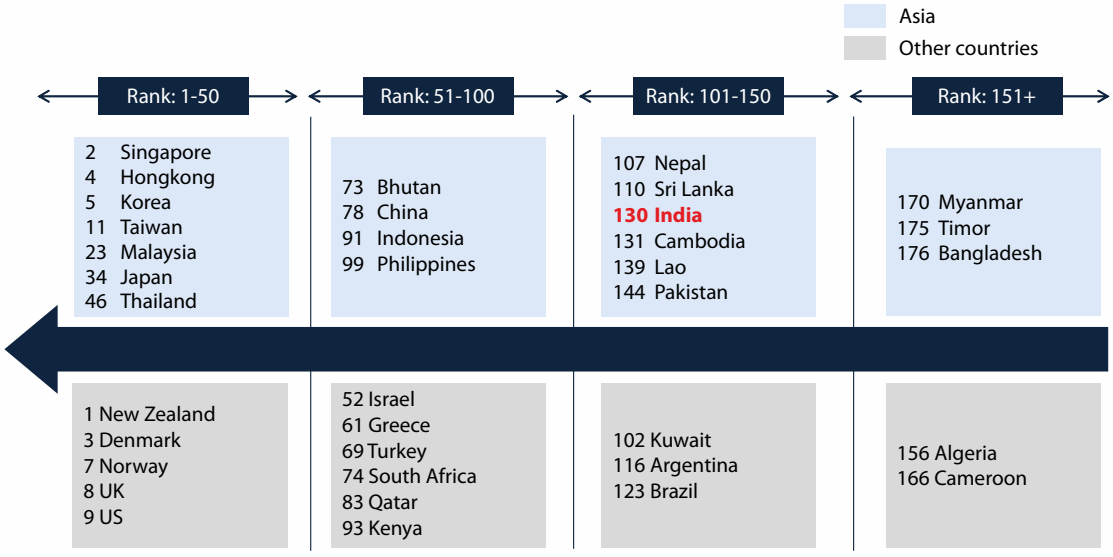
3

Making India the Investment Magnet for Chemicals: Strategic Imperatives

India's Current Ease of Doing Business (EODB) Situation

The ease of doing business represents the reforms that a country has undertaken on various issues like infrastructure, legal systems, etc., over a couple of decades or even more. It is more intricately associated with corresponding macroeconomic variables. It has repercussions on business environment. For eg. Among leading chemical manufacturers, India has the lowest FDI. Major MNCs, which have made investments in Asian countries such as Thailand, Korea and Singapore, which do not have the market or feedstock advantages that India has, have remained very passive in India. Hence it becomes important to assess our current positioning with respect to EODB and arrive at actions on how to improve the same.

Figure 7: Global Rankings: Ease of Doing Business (2017)



Source: *World Bank Group*

Ease of Doing Business in Indian States

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Thus, along with its robust business environment, policy support by government, strong talent pool and entrepreneurial culture, the state is poised to further build on its leadership position in the chemical industry in the way ahead.

Way Forward: Key to Growth of Gujarat as a Chemical Hub

Figure 8: Key Result Areas

No.	Key Result Areas	Reform category	
1	Starting a Business	• Access to Information & Transparency Enablers • Single Window for information & Approvals • Online single window system	
2	Land & Construction	• Information on availability of land • Land allotment • Property Registration	• Construction Permits • Building Plan approval • NOC before commencement of construction
3	Environmental Regulations	• Environmental Registration • Environmental Impact assessment • Consent to Establish under Environmental pollution regulations	• Consent to Operate under Environmental pollution regulations • Authorization under Hazardous Waste Management Regulations
4	Labour & other regulations	• Labour regulation enablers • Registration & grant of licence for factories • License for Boilers • License for contractors under Contract Labour Regulations • Registration for Shops & Establishments	• Renewal of Factory license • Renewal of Boiler license • Renewal of license under Contract Labour Regulations • Renewal under for Shops & Establishments
5	Provision of Utilities	• Obtaining Electricity connection • Obtaining Water connection	
6	Taxation	• Online Tax return filing • Online tax payment	• Online Tax enablers • Registration for Tax
7	Inspections	• Inspection for Tax • Inspection for Buildings/ factories • Compliance inspection by Environmental Authorities • Compliance Inspections under Wage regulations	• Compliance Inspections under Factory Regulations • Compliance Inspection under Shops and Establishments regulations • Compliance Inspection under Contract Labour Regulations
8	Contracts/ Dispute resolution	• Commercial Dispute Resolution Mechanism • Paper-less courts	

- The DIPP & MCI circulated to all States/UTs3 in October 2015, a 340 point BRAP4 to increase transparency & efficiency of various Government regulatory functions and services for business in India
- The result of the Assessment of Implementation of Business Reforms 2015-16 by States/UTs released on 31.10.2016 (assessment from July 1, 2015 to June 30, 2016)
- At least 32 States and UTs submitted evidence of implementation of 7,124 reforms, with national implementation average at 48.93%

- Data for assessment submitted on BRAP portal reviewed by World Bank team & validated by DIPP's team

Key Findings

As per published information, Andhra Pradesh leads in implementation of reforms based on Business Reform Action plan 2016 followed by Maharashtra and Gujarat (Ref: Figure 9)

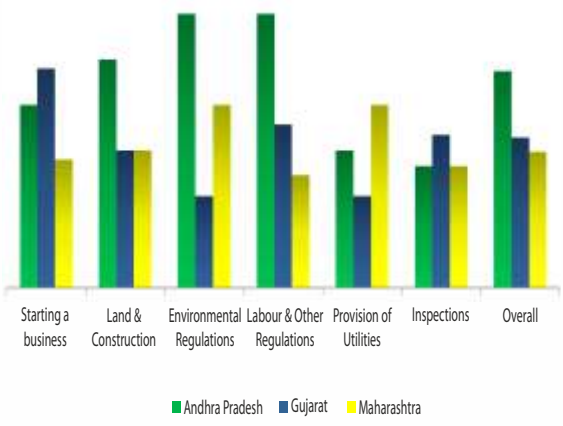
Figure 9: Reform implementation status of key states

State	Implemented	Yet to be implemented	Not Applicable	Total	Implementation %
Andhra Pradesh	325	4	11	340	98.78
Gujarat	330	6	4	340	98.21
Maharashtra	312	24	4	340	92.86

Moreover, when comparing the relative performance, Andhra Pradesh has fared better than Maharashtra and Gujarat in almost all Key result areas except starting a business and inspections where Gujarat has fared better (Ref: Figure 10)

Figure 10: Performance Comparison: Key States

Key Result Areas	Andhra Pradesh	Gujarat	Maharashtra
Starting a Business	2.00	2.40	1.40
Land & Construction	2.50	1.50	1.50
Environmental Regulations	3.00	1.00	2.00
Labour & Other Regulations	3.00	1.78	1.22
Provision of Utilities	1.50	1.00	2.00
Inspections	1.33	1.67	1.33
Total	**2.36**	**1.64**	**1.48**

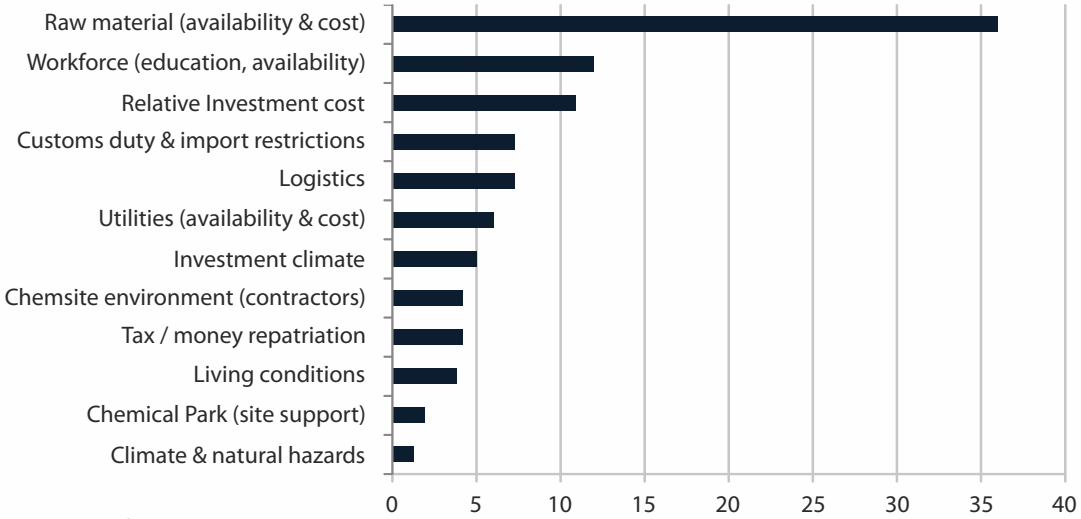


Disclaimer: The above analysis has been taken from reports available in public domain. Tata Strategic has not validated the data

EODB for Chemical Industry

While the above analysis highlighted states which are doing relatively better than others on realizing "Ease of Doing Business" TATA Strategic collated and analyzed experiences of leading chemical companies in India on the on-ground reality with respect to EODB in chemicals industry. Aspects most relevant to the chemical industry were considered as highlighted in Figure 11.

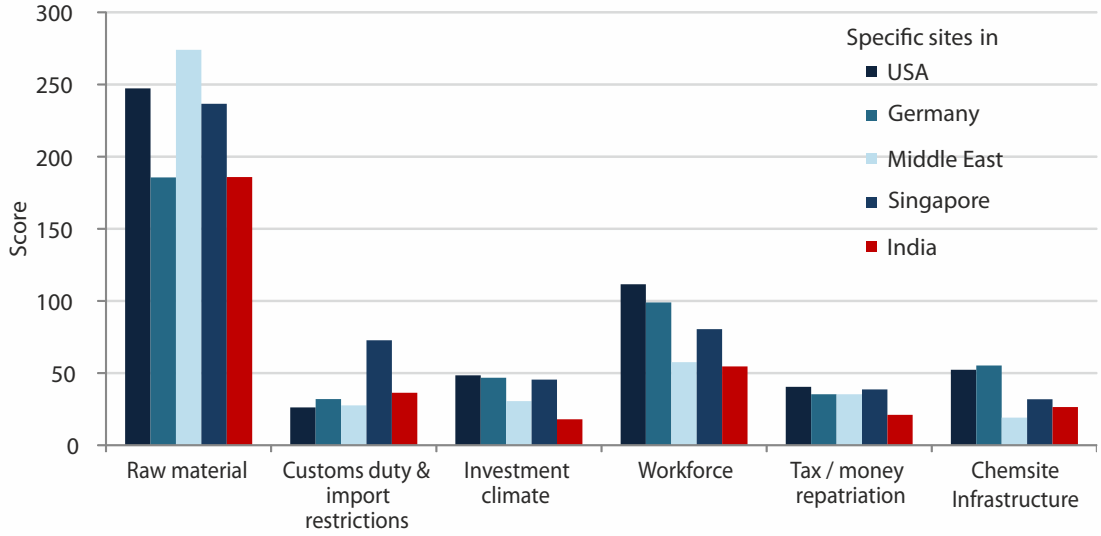
Figure 11: EODB Aspects relevant to chemical industry



Source: *Evonik*

When comparing these parameters in India vs. other large chemical manufacturing countries, the relative competitiveness of India is evident (Ref: Figure 12). The gaps are significant which needs to be bridged in order to improve competitiveness.

Figure 12: Performance comparison: India Vs Developed countries



Source: *Evonik*

India has the "Right to Win" & become No. 4 chemicals producer in the world - So why leave this opportunity?

It is evident from above that we have significant improvements to make when it comes to ease of doing business (EODB) and overcoming challenges specific to scaling up of chemical industry in India. And it is worth solving these challenges due to the following:

India is one of the most populated countries in the world with 17% of global population but the share of its chemical industry is only 3%. China, with comparable population level, has a 33% share, projected to grow to 40% in 2020

Healthy and consistent increase in GDP & purchasing power has made India the largest self-consuming economy. Therefore the most valuable national resource available to India is its domestic market. This should not be ceded to international trade (eg: Only in chemical intermediates India would fall short by 25-30 MMTPA by 2025, implying an additional import cost of INR 150,000 to 200,000 Cr (USD 24 to 32 billion) a year)

Low per capita consumption across product categories is well known and a small increase in per capita consumption would mean multi-fold increase in demand due to huge population factor. Moreover, Government initiatives: Adherence to COP 21, Make in India, AMRUT, Smart City Mission, Swachh Bharat will all require chemicals and manufacturing them in India will be a significant contributor to the exchequer and save on foreign exchange

Encouraging local production has the potential to spark off huge investments in India which the domestic economy sorely needs both to boost "Make in India" and to create jobs. Apart from economic advantage, it has strategic implications for India. It would be easy for other nations to choke down supplies in an import centric market for various reasons (Pricing/profit, war)

The challenge of making this aspiration into a reality is not unique to India especially being the world's knowledge capital and availability of talent & technical know-how. Major chemical-producing economies such as China, the European Union and Singapore have faced and resolved similar challenges

How can India become No. 4 in the world in Chemicals Manufacturing?

India is one of the fastest growing countries in chemical industry with respect to production as well as sales. Currently it ranks 3rd In Asia and 7th in the world in chemical production.[1] It is 6th largest market in the world with respect to sales after USA, China, Germany, Japan and Korea. India has potential to become 4th largest chemical producer in the world if it maintains ~12% growth for a decade. Four aspects listed below, if implemented properly, will assist India's journey towards fourth spot in the world.

[1] *IBEF Chemicals Report June 2017*

A. Improving Ease of Doing Business on issues endemic to chemical industry:

- ***Fulfilling basic chemsite infrastructure needs (plug and play)*** - India has to compete with developed countries which have well planned chemical parks with very efficient infrastructure. German Verbunds, USA, China, Korea, Singapore, Thailand are some examples. Absence of basic infrastructure leads to higher Capex of 10 to 30% (with already high interest rates) and also higher operating costs of 5 to 20%. These erode margins and go beyond tariff protection and industry is forced to operate in areas not of its core competence. To overcome, the following needs to be part and parcel of building a reliable infrastructure:

  - Power: Adequate supply with no stoppages, no denial of exchange power
  - Water: Plan for the future with adequate water availability
  - Steam : Central generation needs to be implemented and practiced
  - Waste water treatment : Proper functioning of CETPs should be ensured
  - Solid waste disposal facilities: Need to be planned as part of master plan
  - Pipeline corridors for transfer of raw materials: Need to be part of master plan
  - [redacted].
  - Chemical Ports - Jetty and terminals: Plan keeping 30 years demand in mind
  - Natural Gas network: Need to cover all major chemical parks
  - Social infrastructure : Should not be left to individual companies to develop
  - Skill development institutes: One in each chemical cluster on a PPP model
  - Fire-fighting, Laboratories, R & D facilities: Need to be part of master plan

- ***Land availability and allotment*** - For meeting chemical project needs (defined chemical parks) land availability & allotment process needs higher transparency & should be online. Process for providing comprehensive information in one place needs to be implemented and ensuring time bound approvals (clear SLA's) & should be harmonized pan India

- ***Pre project approvals*** - Statutory clearances mainly related to environment and DISH need to be made simpler and need to be done in a time bound manner.

- ***Post project approvals*** - Comprehensive online inspection list with clear processes and a time bound implementation plan is required. In case of compliance, the format for reports need to be simplified & made relevant

- ***Regulatory approvals*** - Streamlining and simplifying the entire regulatory process towards time bound single window and self-certification must be implemented with measurable SLAs. There needs to be complete transparency in it with usage of IT. For eg:

An auto renewal of consent to operate & renewal by third party is a welcome step. Similarly, a comprehensive online list for waste management will allow better compliance and will lead to efficiency improvements

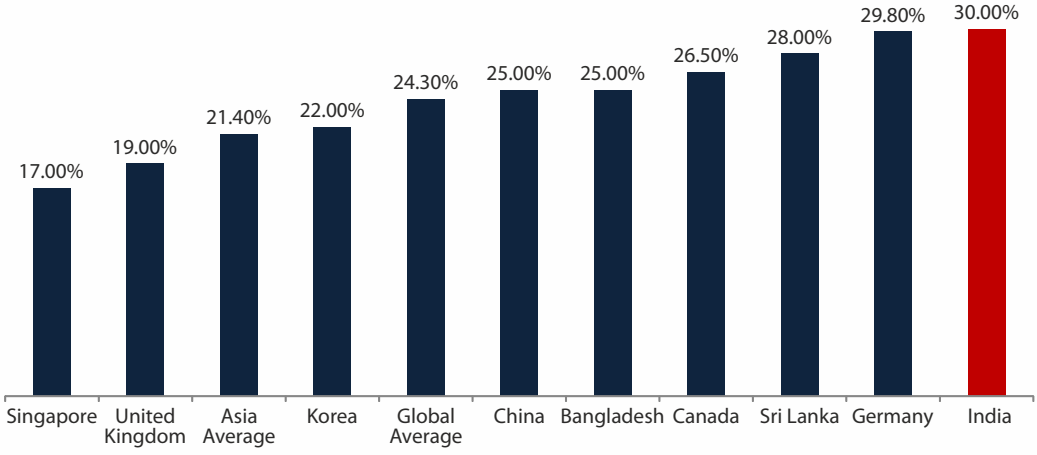
- ***Labour Reforms*** - A comprehensive list of compliances, time bound delivery & allowing 3rd party to verify certification for licensing will be pivotal. Hardcopy submissions & physical interphases should be minimized and downsizing is practically impossible which needs to be changed quickly

- ***Exiting Businesses / Dispute Resolution*** - Enablers needed for dealing with bankruptcy cases. Seamless systems & processes required for companies to exit businesses. Similarly, dispute resolution is a lengthy process and requires clear processes and timelines

- ***Export / Import clearances*** - Through usage of IT and digitization, the entire export and import clearances and documentation needs to be simplified and made easy to complete

- ***Reassessing corporate tax structure*** - One of the major factors through which other countries have been able to draw large investments is by providing tax holidays / competitive taxation structure. While the introduction of GST in India will support simplifying the taxation structure, relooking at the corporate taxation rate and incentivizing at least the advanced technologies / processes could provide major encouragement for investments

Figure 13: Corporate Tax Structure Comparison (2017)

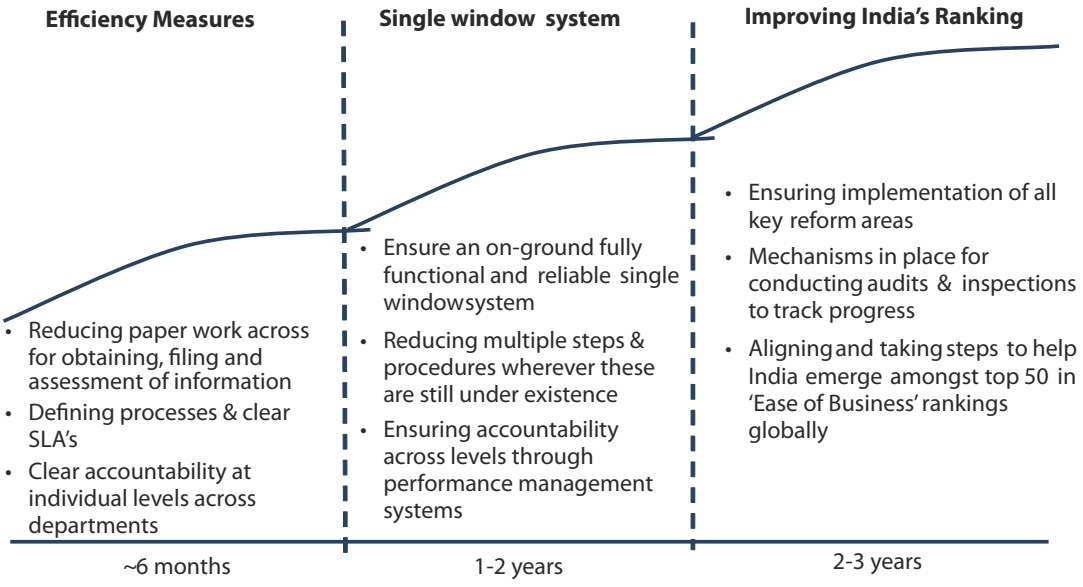


Source: *Secondary Research*

- ***Consider making EODB legislation*** – A major support to the EODB could come from making it legislation at a national level. This will help in raising the bar for all the states in India and also expedite the process of EODB implementation. Currently West Bengal government is in the process of enacting legislation for EODB and the same is under notification.

We suggest adopting a phase wise approach outlined in figure 14 to improve EODB in the short term especially with respect to chemical industry

Figure 14: Phase wise Approach



B. Integrated Chemical - Petrochemical Sector

It is fully recognized that PCPIRs, when implemented successfully, could bring about a transformation in the Indian chemical industry, leading to growth, FDI, competitiveness, exports, higher stature, global recognition and employment creation.

It is obvious that the present concept, structure and execution of PCPIRs in India have been ineffective and need a radical transformation. Some suggestions in this respect are given below.

Concept

Any concept of the integrated sites must address the following cornerstones:

- Sharing of basic feedstock by anchor tenants (while meeting their own needs) to generate downstream value addition. Basically ensuring merchant supply of raw material
- Shared physical infrastructure (Port, Terminal, road and rail connectivity, power, steam, industrial gases, waste water treatment) at affordable costs based on a suitable viability model
- Shared infrastructure for other allied purposes (residential colonies, social facilities, laboratories, training institutes, firefighting, safety, educational institutions)

- Pipeline infrastructure of international standards
- Timely execution under a corporate type structure, with an empowered Board and an answerable CEO
- Single window time bound approval process for all statutory clearances
- Incentives on initial investment to make it a level playing field with other integrated sites in the world
- Tax holidays, especially for pioneer technologies

structure

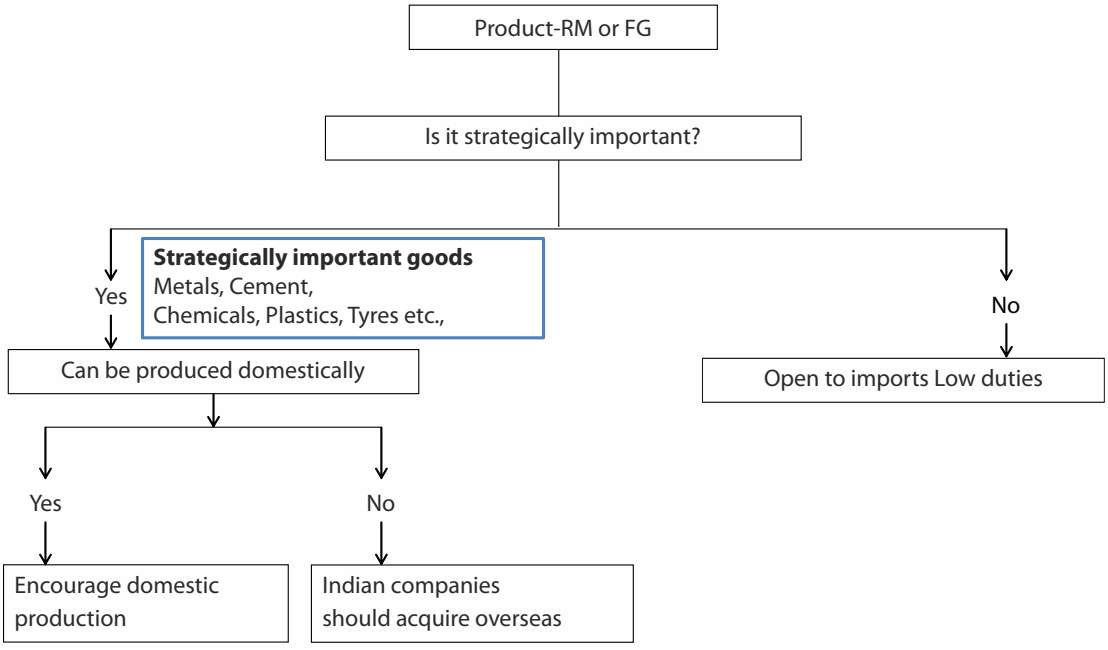
- The present loose structure of DCPC coordinating with various ministries at the Centre and States, without any significant authority, has been ineffective. There needs to be an overall centre for decision making and enforcement, which could be the Cabinet Secretariat or the PMO, considering the multiplicity of ministries involved and, at times, conflicting interests
- We need to benchmark how this crucial aspect of success is managed in other countries, such as South Korea, Thailand and even China and Singapore
- Based on the criteria listed under "Concept" above (and to avoid the failure of the PCPIR concept in the past), a suitable international agency could be asked to suggest an appropriate structure and processes for all the stages of a PCPIR, from concept to completion
- The agency could also first audit the current PCPIR policy and implementation to identify what went wrong, in order to avoid these mistakes in future models
- Suitable successful models in India, such as world-class international airports and expressways could be studied to transfer the best practices to create an international quality PCPIR model. The models could include JVs with successful chemical parks abroad, PPP, Revenue sharing, tax incentives, etc
- It is very important to involve the industry at every stage, as it represents the voice of the ultimate users. Consultations could be held on key issues, such as reservation of feedstocks from anchor tenants in a manner that the interests of both the supplier and the customer are adequately protected. FICCI Chemical Committee would be available for playing an active role in the process.

As the first step, a high level committee under the Cabinet Secretariat or the PMO be constituted, comprising Secretaries from concerned Ministries, Chief/Industry Secretaries of coastal states (with substantial chemical industry presence) and industry experts. They should be mandated to discuss the suggestions made above and to propose a final roadmap/structure/revenue model within a specified timeframe for Cabinet endorsement.

C. Defining "Where to Play"

The most valuable national resource available to India is its domestic market and it should not be ceded to international trade. Encouraging local production has the potential to spark off huge investments in India which the domestic economy needs. The following approach (Ref: Figure 15) could help define the blueprint of "where to play" in India, i.e. which chemicals to manufacture and which ones to import.

Figure 15: Approach to define "Where to Play"



Source: *Sanmar Group*

D. Establishing Standards & Building Non-Tariff Barriers

Establishing product standards is of paramount importance mainly due to the reasons mentioned below:

- Availability of low quality and low performance products will eventually lead to health risks, customer dissatisfaction, negative industry image and will finally impact growth of the value chain
- A number of products which are either banned or regulated in western markets are still used in India

- Standards which do not meet global norms will lead to lower quality products at higher prices for high tech goods in India

Implementation of consumer standard will have positive impact on growth as shown in the figure 16 below

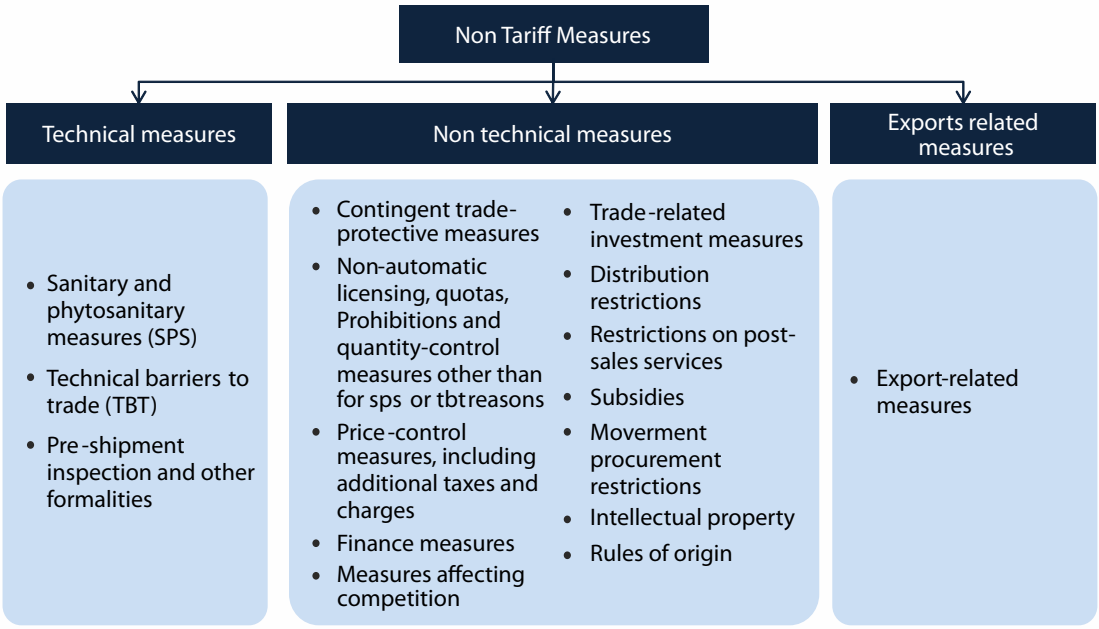
Figure 16: Impact of consumer standard on growth

Segment	Key end application	Impact of consumer standard on growth
Polymer Additives	Pipes, automotive	
Personal Care	Cosmetics, Bath shower, Hair care etc.	
Water Treatment	Industrial and municipal water	
Construction Chemicals	Infrastructure,real estate	
Paints and Coatings	Automotive Construction etc.	
Colorant	Textile	
Flavours & Fragrances	Personal care, food processing	
Surfactants	Laundry	
Textile Chemicals	Apparel, textile	
Others (Specialty polymers, paper chemicals, printing inks, Industrialand Institutionalcleaners, rubberchemicals)	Printing, packaging, tyres etc.	

Govt. should set standards and regulation across the segments to promote quality consciousness, sustainable development and efficiency improvements. Introducing new product standards is a long drawn process in India currently, often taking few years. We need to define timelines whenever new standards are drawn. Often, the domestic industry at a severe disadvantage due to unregulated imports of sub-standard products which find a safe evacuation to India

There is also lack of an appropriate mechanism for non-tariff barriers. In an era where tariffs are progressively reducing, a dire need to have a credible mechanism for non-tariff measures that will ensure that imports are regulated to conform to minimum acceptable national standards

Figure 17: Non-Tariff Measures Classification

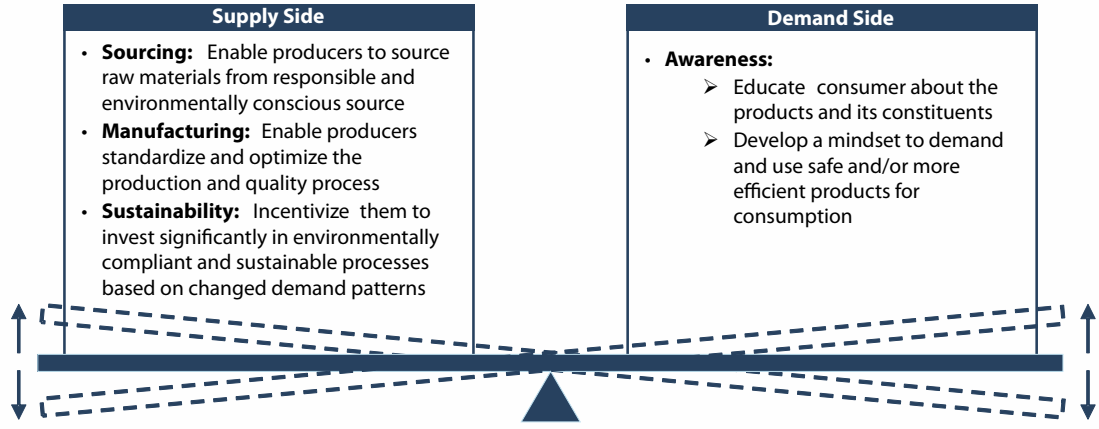


Source: *Industry reports & TATA Strategic Analysis*

As shown in the figures 17 above, Sanitary and phytosanitary measures (SPS) gathers measures such as restriction for substances and ensuring food safety, and those for preventing dissemination of disease or pests. It also includes all conformity-assessment measures related to food safety, such as certification, testing and inspection, and quarantine. Technical barriers to trade (TBT) refer to measures such as labeling, standards on technical specifications and quality requirements, and other measures protecting the environment.

To ensure minimum accepted standards, we need to set up appropriate mechanism for SPS and TBT. Also we should take initiatives to address the same from demand side and supply side as shown in the figure 18 below

Figure 18: Ways to consumer standards



In addition, we need to look at some of the infrastructural, policy aspects mentioned below:

- We have a robust network of CSIR laboratories but not enough world class technology. We need to make these more accountable and set a target of new world scale technologies in line with India's needs and raw material resources
- As suggested in the Draft Chemical Policy, we need to set up a National Chemical Centre with the aim of improving competitiveness, to achieve growth and use sustainable chemistry safely. The pillars would be Commerce and Trade, Safety, Technology and Sustainability
- There should be continued third party evaluations of States and their competitiveness for the chemical industry to enable entrepreneurs to select the state with high ranks
- As is done by China (and even by India for Petrochemicals), a National Chemical Policy needs to be drafted for the period up-to 2025 and adopted by the Cabinet for implementation
- Tariff anomalies arising out of FTAs need to be addressed expeditiously
- A complete review of Antidumping and Safeguard duty procedures to ensure speed of decision making
- A national feedstock policy including development of "Reverse SEZ" projects, under which basic feedstocks and building blocks are produced abroad by Indian JVs in resource rich countries in the neighborhood and then brought to India for downstream value addition.

In a nutshell, improving on EODB, integration of chemical & petrochemical sector, identifying strategic products of our interest, defining consumer standards and building the right non-tariff barriers will be crucial for India to realize its aspiration of being the 4th largest chemical manufacturer in the world.

Tata Strategic is grateful to the industry leaders for their efforts, insights and participation to develop this special section for the India Chem 2017 report. Their knowledge and guidance has helped us shape this paper. We provide our sincere thanks to -

1. Mr. Deepak Mehta - Chairman & Managing Director, Deepak Nitrite Limited
2. Mr. Frank Lelek - Head of Integration Office, Evonik Industries AG
3. Mr. Mukesh Malhotra - Country Manager & Managing Director, Solvay India
4. Mr. Rajeev Pandia - Chemicals and Petrochemicals Advisor & Ex Vice Chairman and MD, SI Group India Ltd.
5. Mr. Vijay Sankar - Deputy Chairman, Sanmar Group

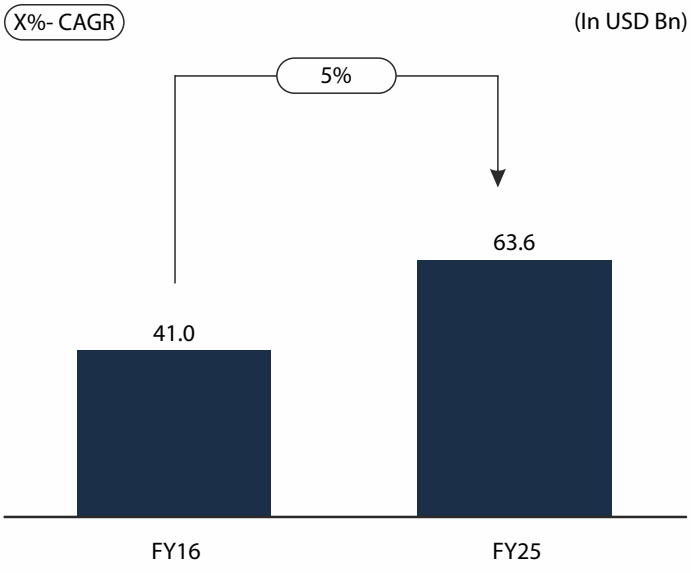
I. Bulk Chemicals

1. Introduction

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 industry (including intermediates) is estimated at $41Bn as on FY16. 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.

2. Industry Outlook

Figure 19: Industry Outlook: Bulk Chemicals



3. Key-Sub-segments/ Major Chemicals

Basic Organic Chemicals

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.

Indian Organic Chemicals Industry

The consumption of organic chemicals in India has increased at a CAGR of 6.4% from 3.5 Mn metric tons per annum (mmtpa) in FY12 to 4.5 mmtpa in FY16. The domestic supply however, has grown at a CAGR of -0.8% from 1.64 mmtpa in FY12 to 1.59 mmtpa in FY16. 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 11.7% from 1.9 mmtpa in FY12 to 2.9 mmtpa in FY16. 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 65% to 73% during the FY12- FY16 period.

Figure 20: Production & Consumption Scenario of Organic Chemicals in India

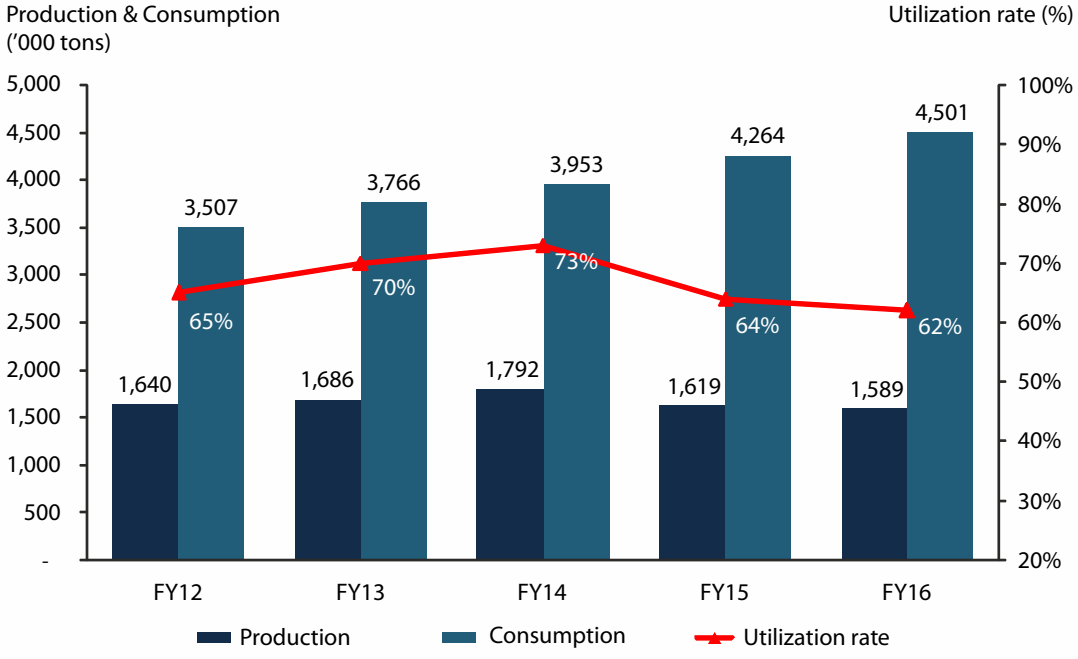
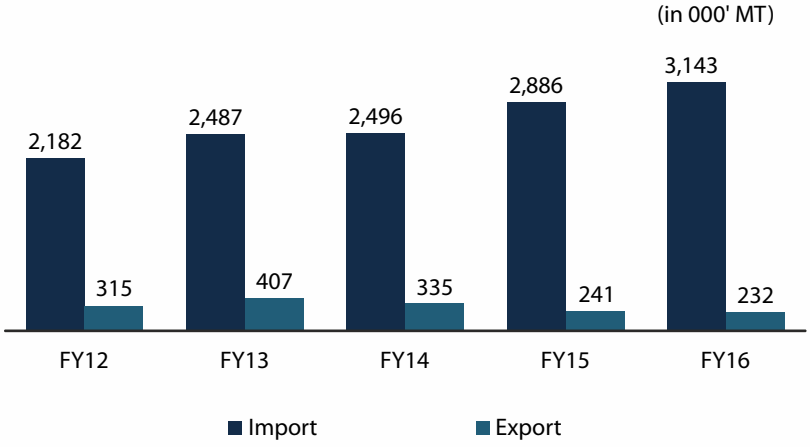


Figure 21: Import - Export Scenario of Organic Chemicals in India



Basic Inorganic Chemicals

Inorganic chemicals are typically of mineral origin. The chemicals evolved out of this industry are used as intermediaries for other industrial and manufacturing process. Some examples of inorganic chemistry in our daily life include; Ammonia is one of the major inorganic chemicals used in the production of nylons, fibres, plastics, polyurethanes etc. Chlorine used in manufacture of PVC, agrochemicals etc. Thus inorganic chemicals are used in the fields ranging from mining to microchips. They are used in fertilizers and 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 etc.

The inorganic chemicals industry consists of two segments-basic inorganic chemicals and alkaline chemicals. Alkaline chemicals form a larger share of production and also constitute the oldest segment of the chemical industry.

Indian Inorganic Chemicals Industry

The consumption of inorganic chemicals in India has increased at a CAGR of 5.4% from 7.8 Mn metric tons per annum (mmtpa) in FY12 to 9.7 mmtpa in FY16. The domestic supply however, has grown at a CAGR of 1.4% from 7.4 mmtpa in FY12 to 7.8 mmtpa in FY16. 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 41% from 0.5 mmtpa in FY12 to 1.9 mmtpa in FY16. The major reason of lower domestic production of organic chemicals has been oversupply in global markets leading to cheaper imports of inorganic chemicals into India. As a result, the capacity utilization levels of domestic producers have been in range of 78% to 80% during the FY12- FY16 period.

Figure 22: Production & Consumption Scenario of Inorganic Chemicals in India

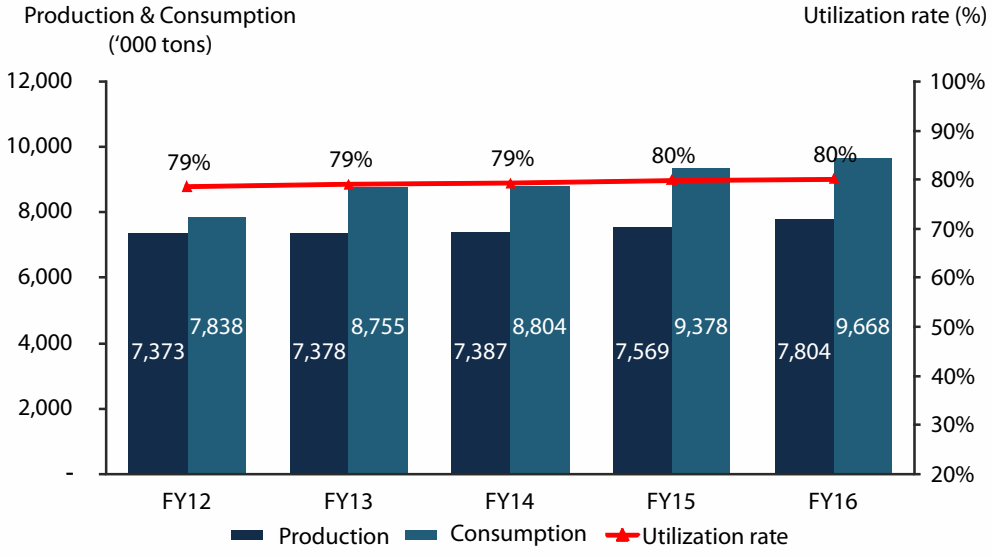
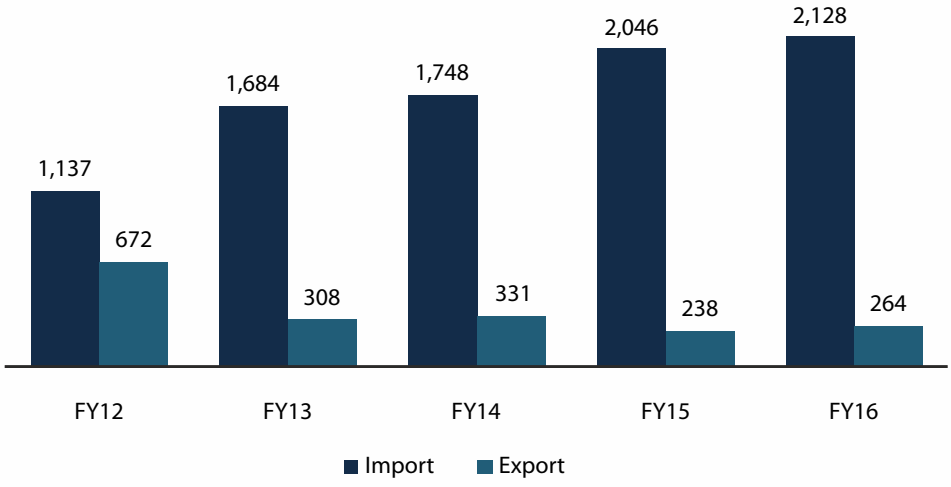


Figure 23: Import - Export Scenario of Inorganic Chemicals in India



4. 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.

5. Key Challenges

- **Lack of world class infrastructure:** Domestic manufacturers will continue to face difficulty to procure raw materials at cost competitive price with global peers due to poor infrastructure, lack of adequate facilities at ports and railway terminals and poor pipeline connectivity
- **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.
- **No domestic price discovery:** Given the small scale of domestic operations, local manufacturers are highly influenced by global demand and supply forces. Domestic prices of organic chemicals are highly correlated with international prices.
- **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.

6. 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.

- **Wider product portfolio:** Commodity chemicals companies can improve their product portfolio by adding specialty chemicals such as polymers additives, water treatment chemicals, lubricating additives, etc. This will help in improving their margins but requires significant R&D efforts.

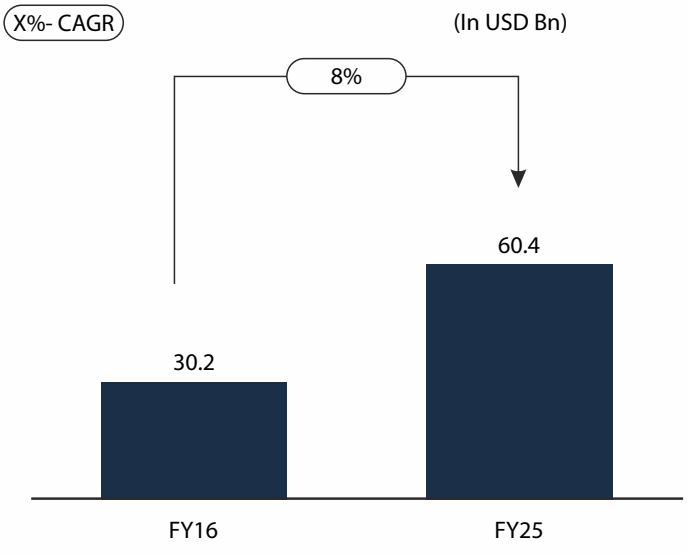
II. Petrochemicals

1. Introduction

Petrochemicals play a vital role in economic development & growth of a country. They are considered as enablers for growth of other sectors of the economy. Petrochemicals are derived from various chemical compounds, mainly hydrocarbons which are derived from crude oil and natural gas. Based on chemical structure petrochemicals can be divided into 3 groups' olefins, aromatics and synthesis gas. Examples of olefins include ethylene/propylene which is used in industrial production of chemicals, plastics & plastics products. Aromatics include benzene which is used in making dyes as well as in making synthetic detergents. Synthesis gas is used to make ammonia and methanol which are further utilised in making urea (fertilizer). Thus, 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 etc.

2. Industry Outlook

Figure 24: Industry Outlook: Petrochemicals



3. Key-Sub-segments/ Major Chemicals

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.

Figure 25: Production & Consumption of Basic Major Petrochemicals India

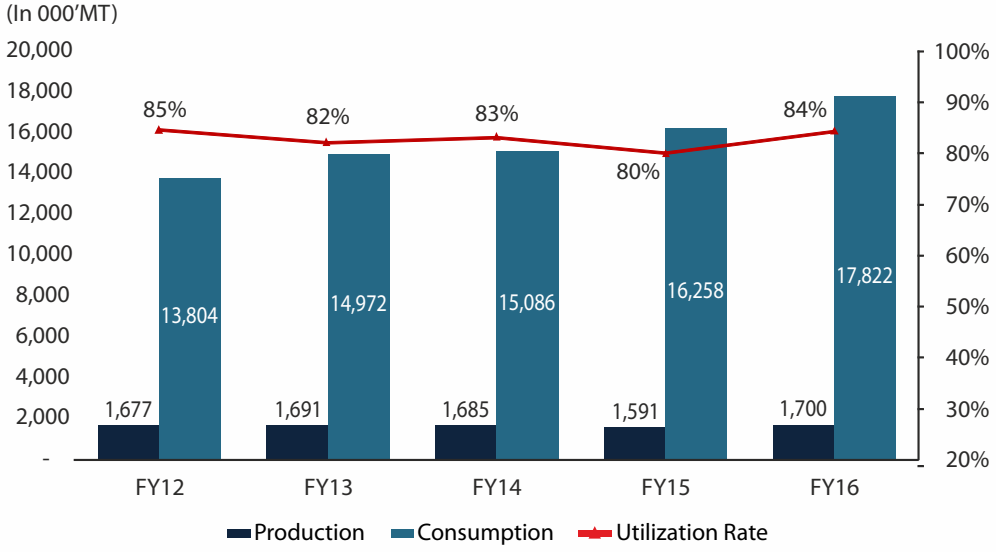
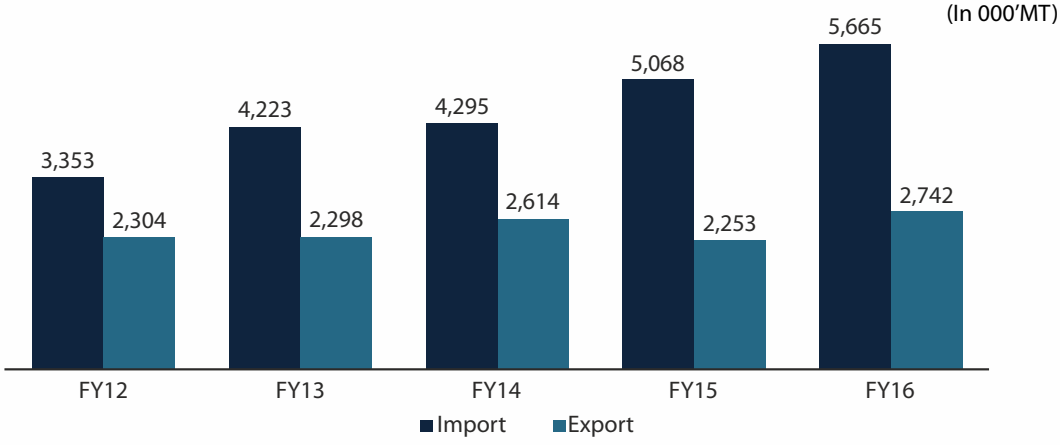


Figure 26: Import & Export of Basic Major Petrochemicals



4. Key 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.

5. Key Challenges

- **Volatility in raw material prices:** More than 50% of global petrochemical capacities are based on naphtha, a crude oil derived product. The prices of crude oil products have witnessed significant volatility, thereby making petrochemicals prices highly volatile.
- **Increased competition:** Large capacity additions taking place in ethane rich Middle East and demand rich China. Out of the 30 million tons of ethylene capacity additions expected during period 2014 and 2019, 9 million 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.
- **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 95% levels before global economic crisis to ~84% in 2014.

6. Key Opportunities

- Backward & forward integration: Given the volatility of crude oil prices and India's heavy dependency on oil imports, there is an opportunity for oil and oil related companies to reap benefits of increase in presence across the value chain.
- 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.
- 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.

III. Specialty Chemicals

1. Introduction

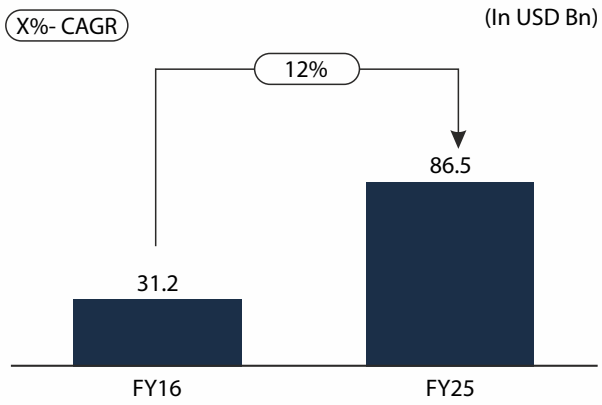
Specialty Chemicals are targeted towards specific end-use applications. In contrast to base or commodity chemicals, specialty chemicals are recognized for 'what they do' and not 'what they are'. They provide the required 'solution' to meet the customer application needs. It is a knowledge and IP driven 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 favorable price-performance ratio.

Figure 27: Comparison: Base Chemicals Vs. Specialty Chemicals

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

2. Industry Outlook

Figure 28: Industry Outlook: Specialty Chemicals



3. Key-Sub-segments/ Major Chemicals

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 personal care, polymer additives, water chemicals, textile chemicals and construction chemicals. Application driven segments include surfactants, flavours and fragrances, paints and coatings and colorants. These industries cumulatively constitute over 80% of the specialty chemicals sector.

Figure 29: Breakdown of Specialty Chemical Segment by value (% share)

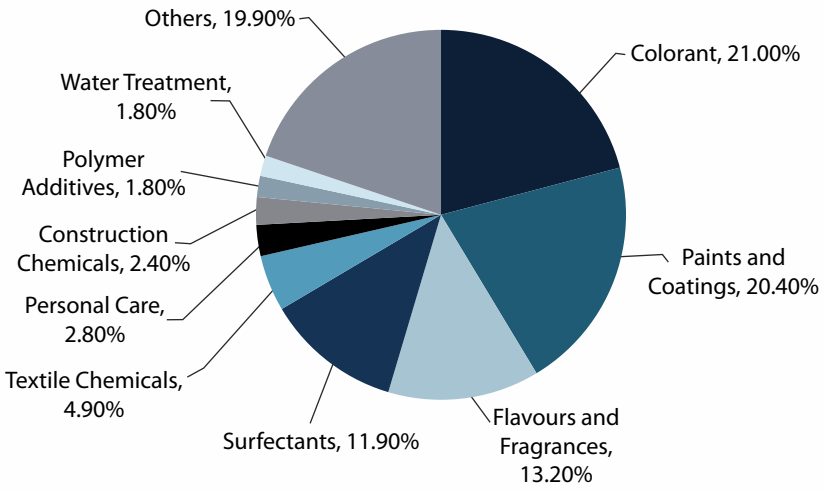


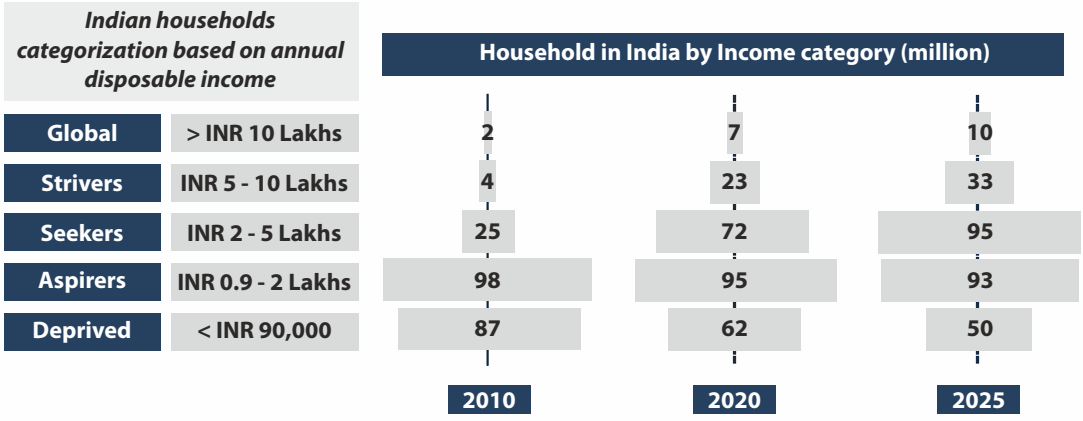
Figure 30: Segment Snapshot

Segments	FY16 Market Size ($ Million)	Projected Growth (Till 2025)	Product Differentiation
Polymer Additives	573	11%	
Personal Care	871	13%	
Water Treatment	570	14%	
Construction Chemicals	746	12%	
Paints and Coatings	6,364	10%	
Colorant	6,543	11%	
Flavours & Fragrances	4,106	14%	
Surfactants	3,700	13%	
Textile Chemicals	1,528	13%	
Others (Specialty polymers, paper chemicals, printing inks, Industrial and Institutional cleaners, rubber chemicals)	6,200	12%	

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.

Figure 31: Household in India by income category (In Mn)



Source: *NCAER, Tata Strategic Analysis*
Note: Figures in 2020 and 2025 are estimated

Growth Potential and Success Factors

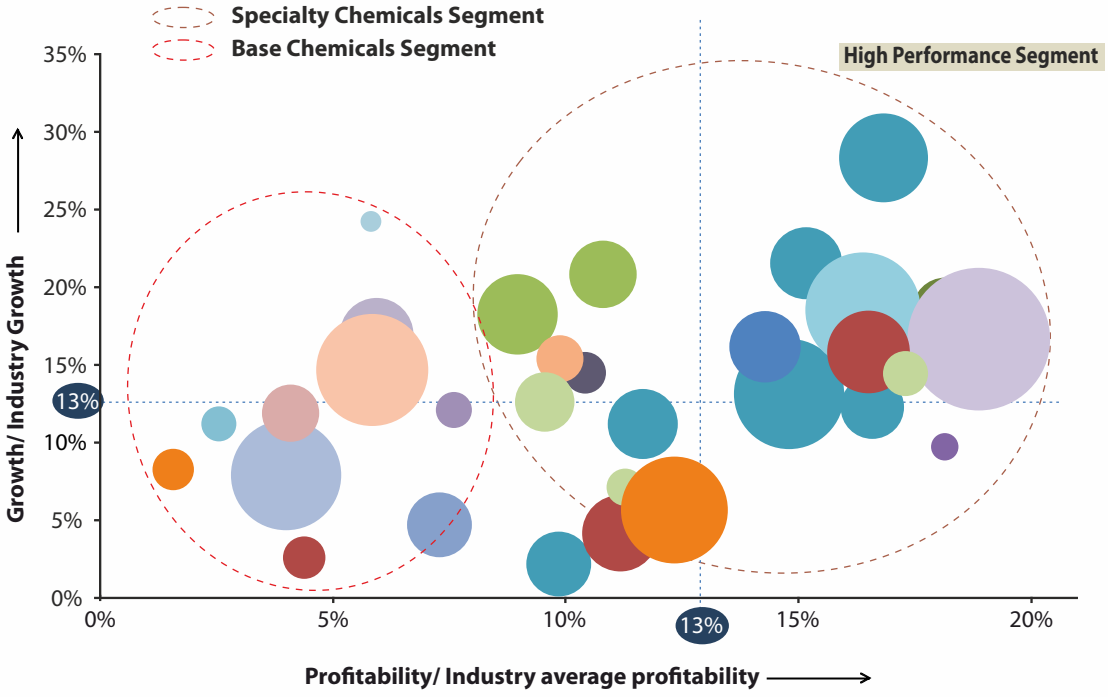
Driving factors for the growth in specialty chemicals segment are multi-fold. Firstly, the growing demand from the end use industry has been key to the high growth in specialty chemicals segment. Secondly, the Chinese chemical industry is stagnating due to tightening pollution control, labour costs and strengthening of Chinese Yuan against the American $. This encourages 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 speciality 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, on stringent regulation of products and strengthening of consumption standards, usage of speciality 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

Figure 32: Segment analysis chart: Base Chem vs. Specialty Chem



Source: *Annual Reports of companies, Tata Strategic Analysis*
Note: Bubble Size indicates relative FY'15 net sales

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 FY16 is estimated at $ 573 Mn and has been growing at a CAGR of 11%.

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.

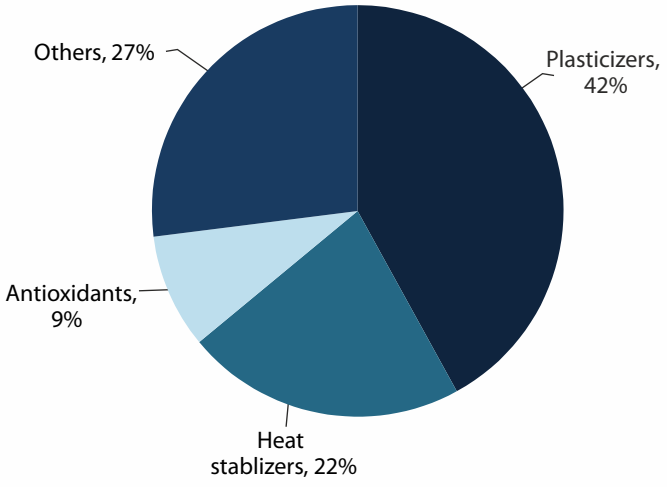
2. ***Heat stabilisers:*** Heat stabilizers protect plastics from the degrading effects of heat. Their major applications include usage in PVC products for construction, such as window profiles, pipes and cable ducts.

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 33: Polymer Additives Product Share



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 $ 573 Mn as of FY16.

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.

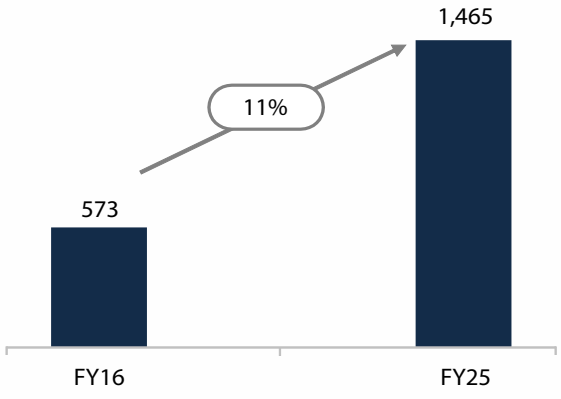
BASF, after its acquisition of Ciba, has become the market leader in higher margin segments such as flame retardants, light stabilizers and antioxidants. Within plasticizers, there are a large number of unorganized players, leading to price competition and resultant margin pressure. Most Indian companies 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 11% to reach $ 1,465 Mn in FY25. 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.

Figure 34: Polymer additives market growth (in $ Mn)



Source: *Industry reports, Tata Strategic estimates*

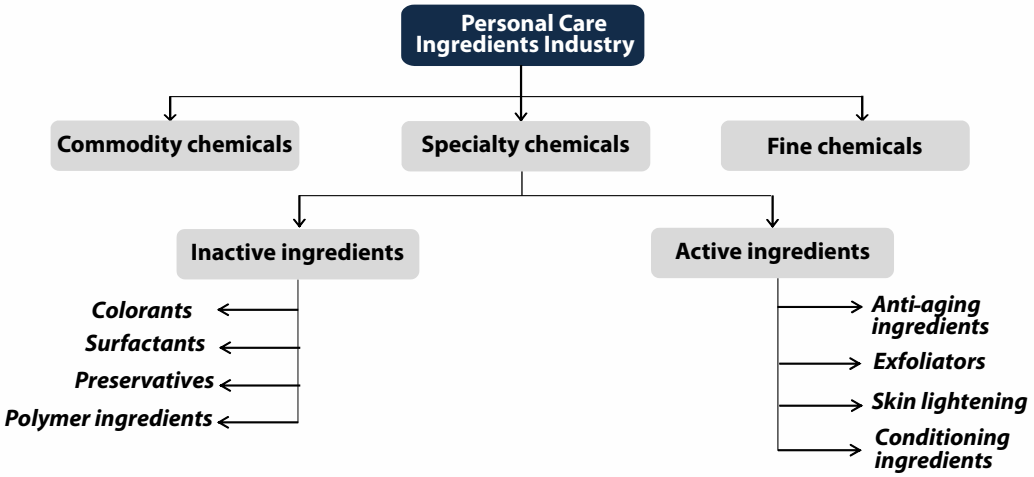
Key Trends and Future Outlook

- ***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 35: Personal Care Ingredients industry snapshot



Source: *Industry reports, Analysis by Tata Strategic*

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.

1. 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.

2. 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 $ 871 Mn in FY16 with active ingredients accounting for 40% of the total market.

Demand & Supply Scenario

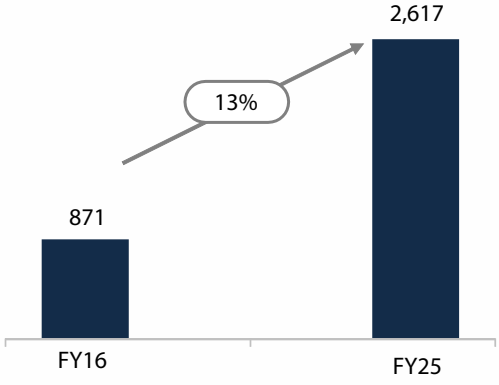
Personal care ingredients market has grown at a CAGR of 11.8% in the past. Rising income, increased availability and wider product portfolio of companies has led to growth in personal care products and thereby personal care ingredients.

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% to reach $ 2,617 Mn by FY25. Key growth drivers include:

Figure 36: Personal Care Ingredients- Future forecast (in $ Mn)



Source: *Industry reports, Analysis by Tata Strategic*

- ***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

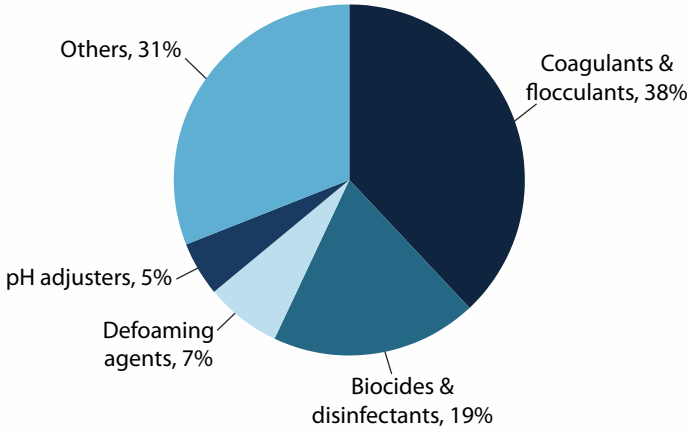
countries, chemical water purification is conducted at household level to provide safe drinking water. In developed countries and urban centres of developing countries, this is generally done at the municipal level by civic authorities or by water management organizations.

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 FY16, the Indian water treatment chemicals market is estimated at $ 570 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.

Figure 37: Water Chemicals product share



Source: *Industry reports, Analysis by Tata Strategic*

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

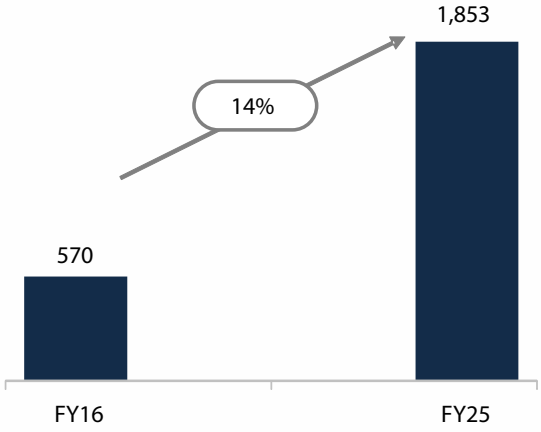
The largest consumer of water (76% of the total water consumption in India) has been irrigation. Industrial, household and other segments constitute 24% of the total consumption. In the water treatment chemicals market, most players are integrated end to

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 14% to reach $ 1,853 Mn in FY25. Key market drivers include:

Figure 38: Water Chemicals- Future forecast (in $ Mn)



Source: *Industry reports, Analysis by Tata Strategic*

- 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.

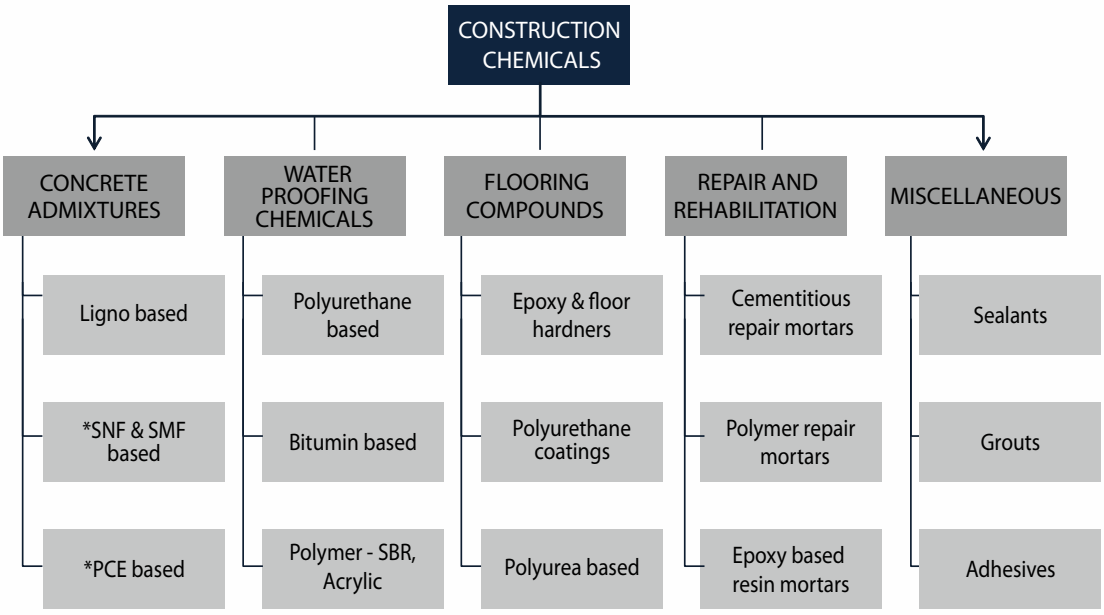
- ***Growing urbanization:*** With growing urbanization, the demand for both water treatment of municipal water supply and industrial wastewater treatment is expected to rise. Many global players in the water chemicals space are already present in India. Indian companies in this space have also grown 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 39: Classification of Construction Chemicals

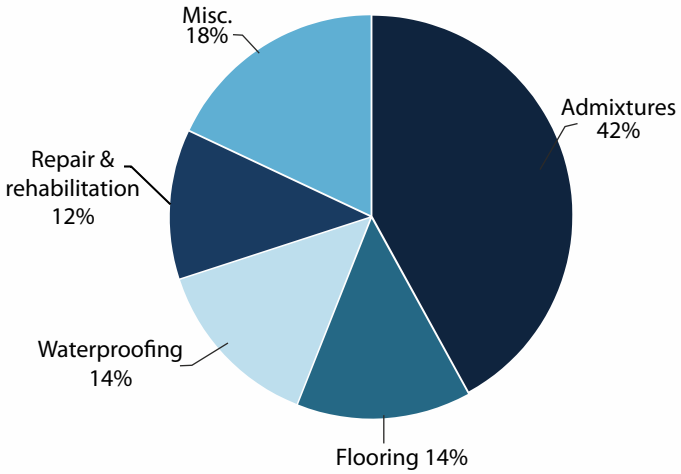


Source: *Industry reports, Analysis by Tata Strategic*

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. 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 40: Construction Chemicals product share



Source: *Industry reports, Analysis by Tata Strategic*

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.

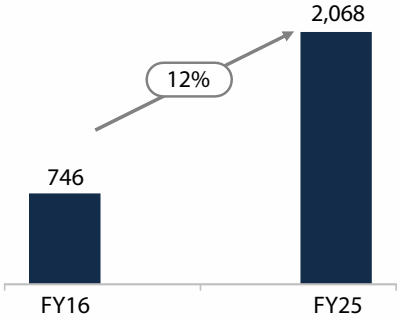
Demand and Supply scenario

The market, boosted by the investment in construction sector, has grown at a CAGR of 13.8% in the past. 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% to reach $ 2,068 Mn in FY25.

Figure 41: Construction Chemicals- Future forecast (in $ Mn)



Source: *Industry reports, Analysis by Tata Strategic*

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.
- ***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 9% between FY16 and FY25. 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.

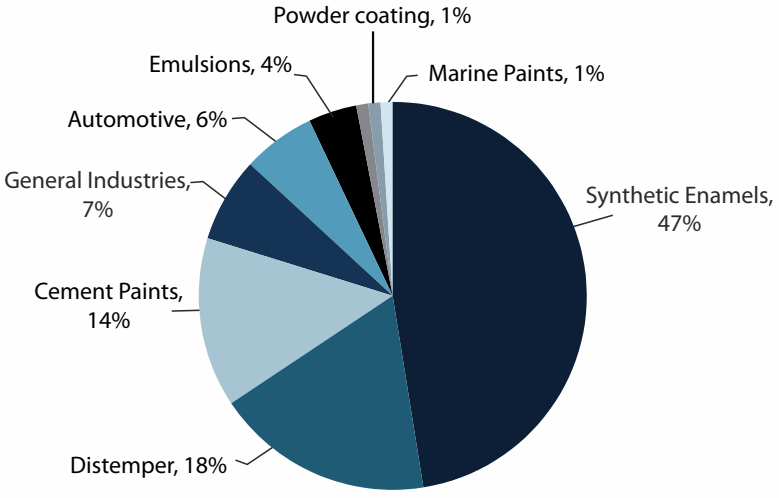
e. Paints and coatings

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 42: Decorative paints segment wise breakup



Source: *Industry reports, Analysis by Tata Strategic*

Demand and Supply Scenario

The Indian paint industry, valued at $ 6.4 bn. The paint industry is highly consolidated with 65% market captured by the organized sector.

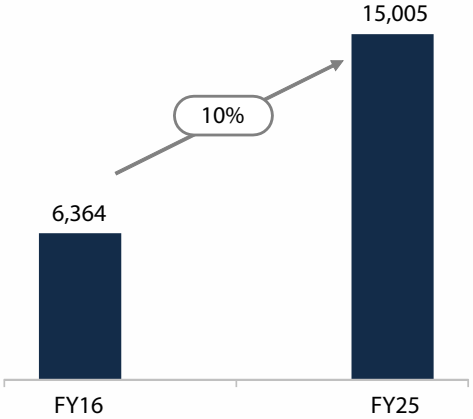
The major players in the paint industry are Asian Paints, Kansai Nerolac, Berger Paints and ICI. In the decorative segment, Asian Paints is the market leader followed by Berger and Kansai Nerolac. Kansai Nerolac is the market leader in industrial paints followed by Berger and Asian PPG.

Projected Growth and Drivers

The paint industry is expected to grow at a CAGR of 10% 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
- Untapped rural market: There is a shift in rural demand from cement paints to better quality paints.

Figure 43: 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.
- 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.

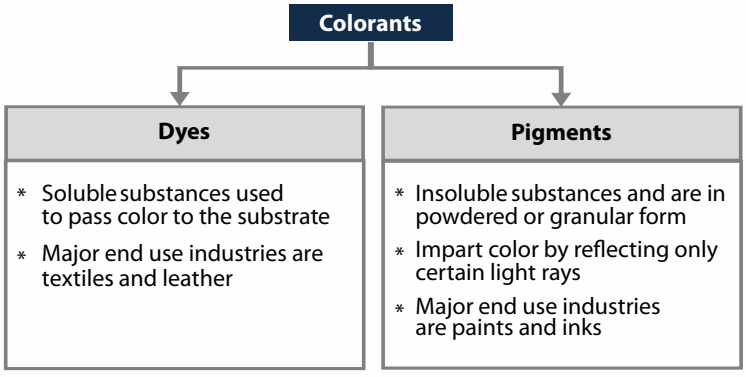
f. Colorants

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.

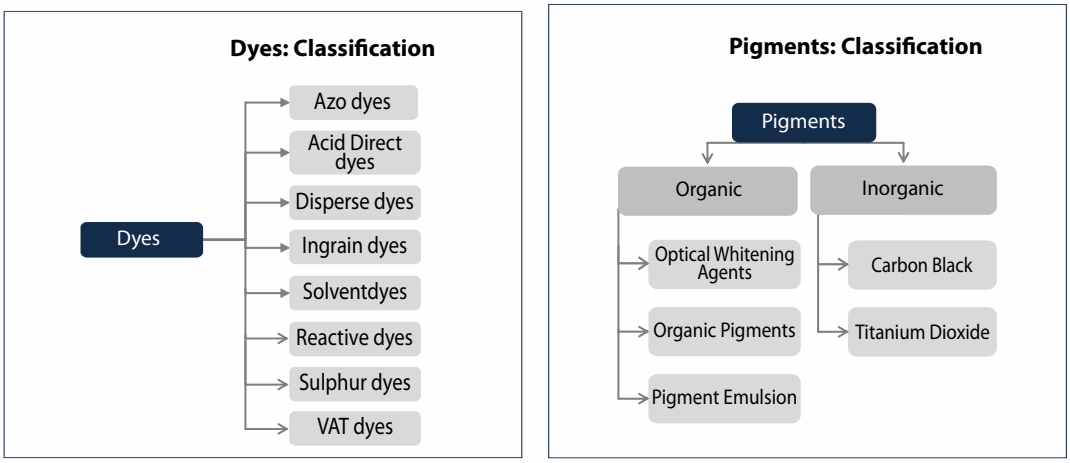
Figure 44: Classification of colorants



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 45: Classification of dyes and pigments



Source: *Industry reports, Analysis by Tata Strategic*

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 $ 6.5 Bn in FY16. In FY16, the exports contributed more than 80% of the total consumption which again highlights the tremendous growth potential of the overall industry.

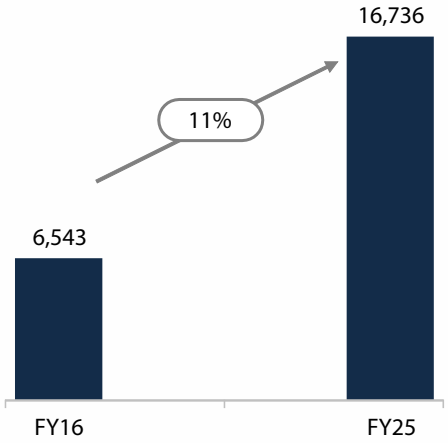
Within India, the major players in the pigments industry are Sudarshan Chemicals, Golchha Pigments, Tata Pigments and Clariant India while in the dyestuff industry, companies such as are Atul, Clariant India, Kiri dyes, and IDI are large players present in the organized sector.

Projected Growth & Drivers

The market size of the overall colorant industry is estimated to grow at a CAGR of 11%. 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 46: Colorant industry- Future forecast (in $ Bn)



Source: *Industry reports, Analysis by Tata Strategic*

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

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.

- **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.

IV. Fertilizers

1. Introduction

Fertilizers are materials - Organic or inorganic, natural or synthetic - that provides for one or more nutrients required for plant growth. There are 16 nutrient which is required, while some is derived from atmosphere, others have to be obtained from ground. Hence, Fertilisers are crucial for sustaining and increasing food production in order to meet the increasing food requirement. Fertilisers can broadly be categorized into nitrogenous, phosphate, potassium and complex fertilisers. Application of fertilisers varies from region to region based on regional nutrient requirement, cost of fertilisers and farmer preferences.

2. Industry Outlook

Overall fertilizer demand has been restrained over the last 4 years due to unsupportive monsoon spells along with demonetisation phase in November 2016. However, the industry is expected to revive and post a significant growth over the next few years as compared to last five years' trend. Overall fertilizer demand is expected to grow at a modest 3% CAGR. The growth will be majorly supported by demand of Urea and Complex fertilizers.

Figure 47: Industry Outlook: Fertilizers

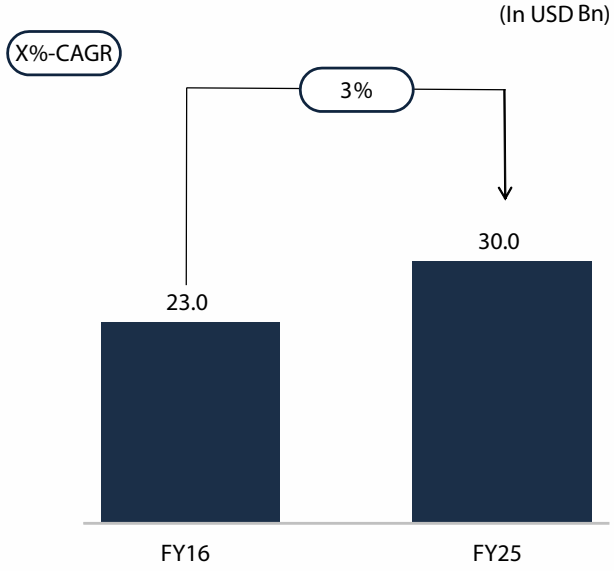
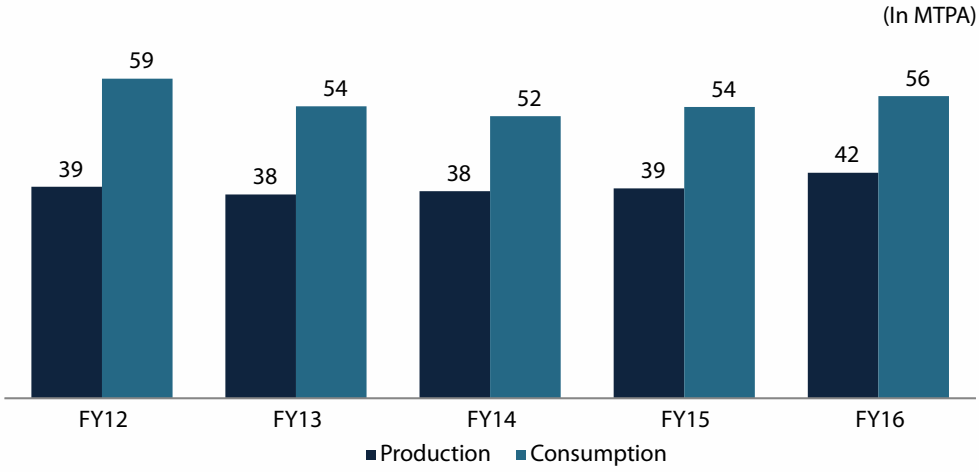


Figure 48: Fertilizer Production & Consumption in India



3. Key-Sub-segments/ Major Chemicals

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.

Figure 49: Fertilizer Production in India (FY16)

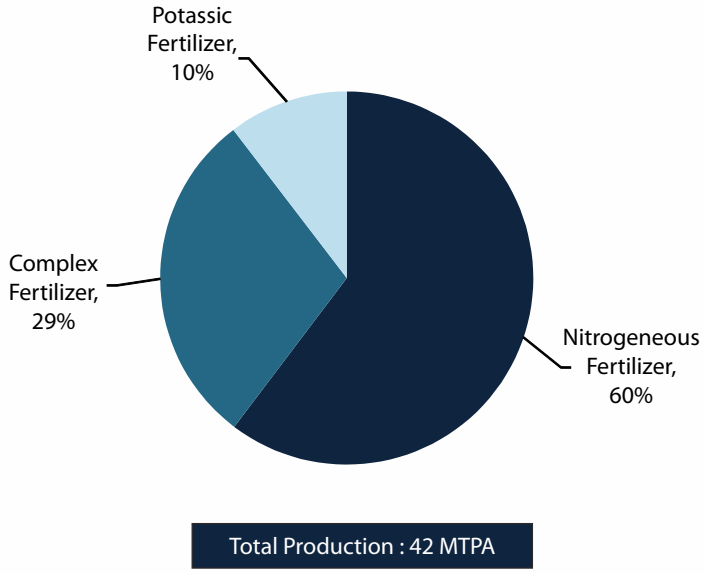
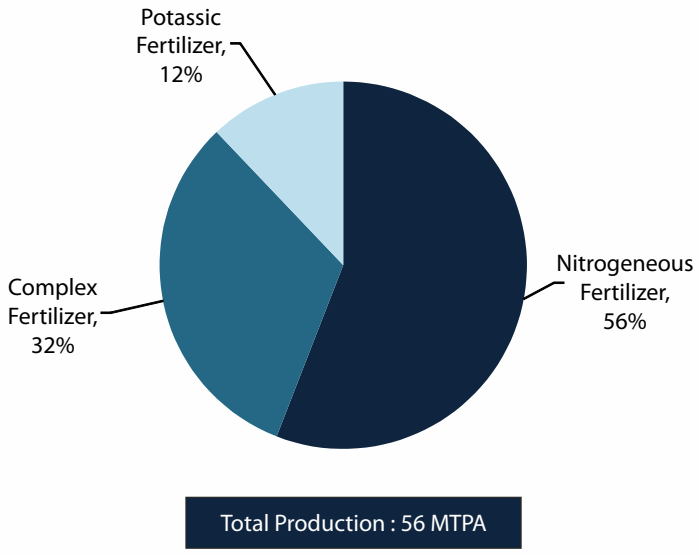


Figure 50: Fertilizer Consumption in India (FY16)



4. Key Trends

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.

5. Key Challenges

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.

6. Key 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 subsidy would be given on the nutrient basis, players developing newer formulations will be able to rate the products based on demand.

V. Pharmaceuticals (APIs)

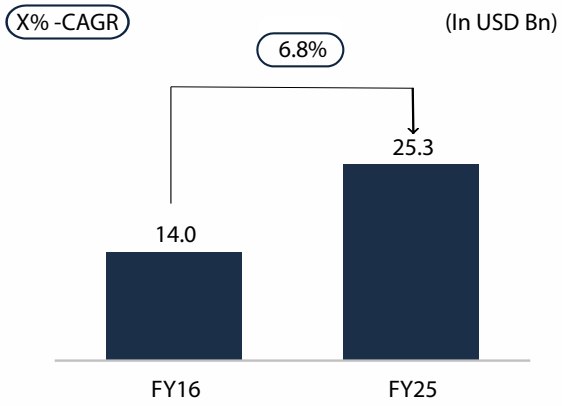
1. Introduction

The Indian pharmaceutical industry, sized at USD 39.5 billion in FY16, has remained on a strong growth trajectory, over the past few years. The industry is marked with high fragmentation and relatively low drug prices, as compared with the regulated markets. 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.

Pharmaceutical industry consists of two main segments: Active pharmaceutical Ingredients (APIs/ Bulk drugs) and Formulations. For our analysis, only APIs are considered to be a part of chemical industry. The pharmaceutical API industry in India is estimated at $ 14 Bn in FY16.

2. Industry Outlook

Figure 51: Industry Outlook: Pharmaceuticals (APIs)



Source : *TATA Strategic Analysis*

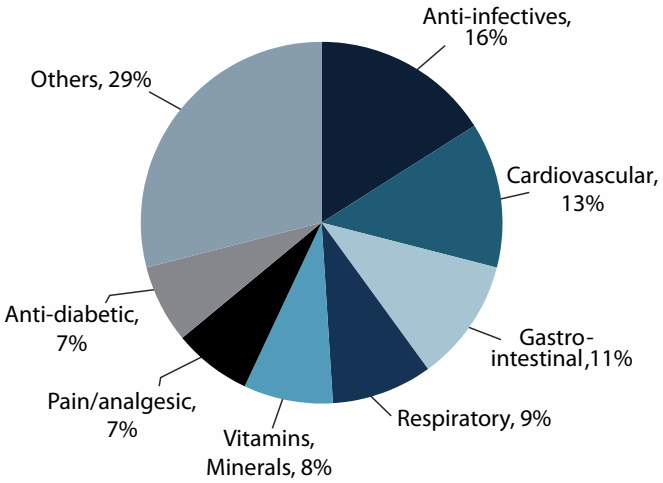
3. Key-Sub-segments/ Major Chemicals

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 Cardio vascular & Gastro-intestinal, Respiratory and Vitamins & Minerals. The top 5 segments contribute to nearly 57% of the entire market in 2016.

Figure 52: Major Therapeutic areas in India (% share)



Source : *Indian Pharmaceutical Sector presentation 2015, IBEF*

4. Key Trends

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.

5. 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

6. Key Opportunities

- 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

VI. Biotech

1. 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.

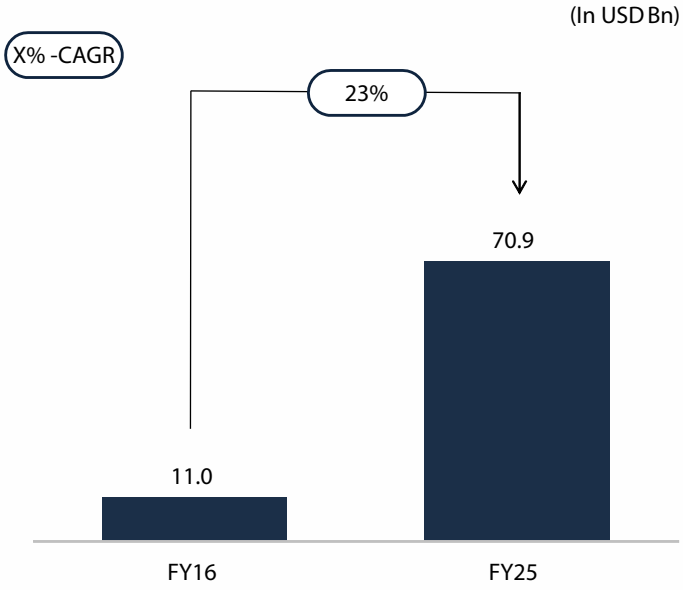
4. **Bio-informatics:** Bio-informatics is usage of computer software tools for database creation, data management, data warehousing and data mining for molecular biology applications.

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

2. Industry Outlook

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 53: Industry Outlook: Biotechnology

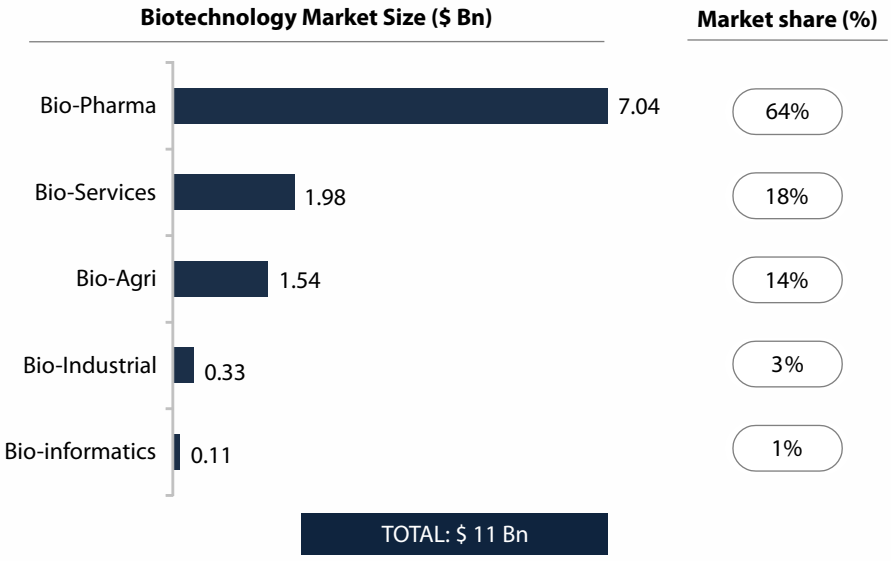


Source : *TATA Strategic Analysis*

3. Key-Sub-segments/ Major Chemicals

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

Figure 54: Indian Biotechnology Industry Segments



Source : *IBEF Biotechnology Report, 2016*

4. Key Trends

- India has strong global positioning in biotech market and ranks in the world's top 12 biotech destinations
- Major pharma companies are focusing on Biotech. For e.g. Ranbaxy, Cadila Healthcare, Lupin, Wockhardt & Dr Reddy's operate in the bio-pharma segment
- India has strong position in biosimilars, molecular diagnostics and personalized medicine
- According to International Service for the Acquisition of Agri-Biotech Applications, India has the 4th largest area covered under genetically modified crops and it remains the major growth driver for the industry

5. Key Opportunities

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, bio-similars, 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.

VII. Agrochemicals

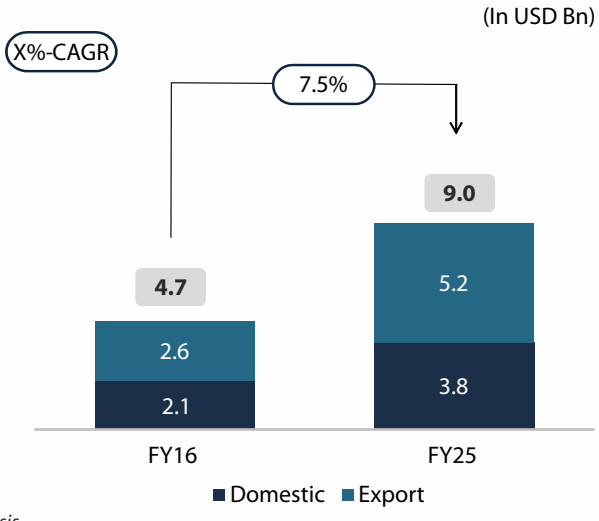
1. Introduction

With growing population, food security has come up as a concern for India recently. Agrochemicals have a major role to play, viz. enhancing productivity and protecting the produce during and after harvest. Agrochemicals broadly cover Insecticides, Fungicides, Herbicides, Bio-pesticides, etc. 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.

2. Industry Outlook

Indian Agrochemical industry is valued at USD 4.7 billion in FY16 and is estimated to grow at a CAGR of 7.5% to reach USD 9 billion by FY25. Export market is expected to grow at 8.0% to reach USD 5.2 billion by 2025. India is fourth largest producer of agrochemicals worldwide, after United States, Japan and China.

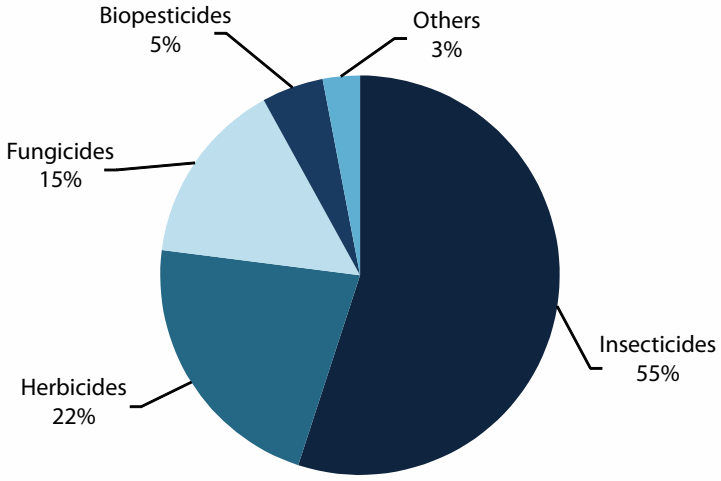
Figure 55: Industry Outlook: Agrochemicals



Source : *TATA Strategic Analysis*

3. Key-Sub-segments/ Major Chemicals

Figure 56: Indian Crop Protection Market split (FY16)



4. Key Trends

- Focus on improvement and use of indigenous technologies such as pesticide formulation, seed coating and use of hydrogels and soil conditioners can further help in enhancing the productivity of a wide-ranging variety of crops and broaden its reach in the overall region.
- Focus on R&D in bio-pesticides segment with increasing preference for environmentally safe products in the market.
- Focus on development of new active ingredients, involving long-term toxicity tests, meeting regulatory requirement, increase adoption of GM (genetically modified) & biotech crops etc.
- Trend of contract farming is catching up in the Indian agriculture sector, which may lead to faster technology transfer & adoption. Hence, the development and effective usage of agrochemicals can empower every crop across the nation; thereby contributing to raising rural economy.

5. Key Challenges

- **Low awareness:** Indian agrochemical industry faces challenges in terms of low awareness among farmers, in spite of the strong growth drivers. Though, government

bodies are taking initiatives towards a nationwide programme to enhance the usage of agrochemical products among farmers. Larger companies are conducting awareness camps for farmers and providing complete solutions as part of their CSR activities and brand building.

- **Spurious products:** Inefficient products, from the unorganised sector, devoid of any credibility, are reaching the end user negatively impacting the revenues of the organised sector. The fake pesticides market size India was ~ USD 233 Mn in 2009.

- **Expensive R&D:** The gestation period of a new agrochemical molecule is an estimated 9 years and ~USD 180 Mn. Typically, due to low returns and high investments, Indian companies have not focussed on developing new molecules. There is a need for the key players to develop these capabilities.

- **Inefficient distribution system:** The major end users being farmers located in country side areas, effective distribution through retailers is crucial to ensure that the products are available to them. Large corporations, lately, have been assigning retailers to manage the distribution network to cut costs and other resources.

6. Key Opportunities

- **Immense growth potential:** Currently, consumption levels of agrochemicals is low; an estimated figure of 0.6 kg/ha as compared to world average of 3 kg/ha. So, there is huge potential for growth in future.

- **Make in India:** Due to abundance of cheap labour and low processing costs, MNCs have an opportunity to setup their manufacturing hubs in India for their export markets. The large pool of technically skilled labour in India is a key driver for Indian players to initiate contract manufacturing and setup research centres.

- **Leveraging Export potential:** India can use its low cost producer status to increase exports and effectively manage the excess production capacity. There is a need to establish an efficient supply chain both inside and outside the territory.

4

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Article by : Mr. Deepak C Mehta, Chairman - FICCI National Chemical Committee & CMD, Deepak Nitrite Ltd

Road map to future for Indian chemical industry

The Indian Chemical and Petrochemical sector is a focus destination for investment. Virtually all sectors of the economy are dependent on this sector. Its growth is a prerequisite for the overall development of the country. The chemical industry, with its variety of raw materials and key inputs, is one of the most diversified sectors and the mainstay of Indian industry. The Indian chemical industry, comprised of 3.4 % of the global industry and presents a huge opportunity for young and dynamic entrepreneurs. . India's national manufacturing policy aims to enhance the share of manufacturing in the country's GDP to 25%, and create 100 million jobs by 2022, and the chemical industry would have a very important role in this. "The Indian chemical industry is currently estimated to be about US $ 155 billion in 2016, that is 3.4 % share of the global market. China incidentally is the largest contributor with 34% of the global share. This is a very good reason for policy makers and industry to take the lead and prepare a roadmap, with over 16500 (incl. above 500 large and medium scale . Chemical units in the state of Gujarat and over 80000 in India. The industry should increase its R&D to a proportion that should commensurate with international standards.

India's PCPIR policy would bring in world class infrastructure and global scale investments. However, with all these developments, the industry should not lose sight of sustainable development. A number of multi-national 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.



Article by : Mr. Sudhir Shenoy, CEO, Dow India

Building the Chemical Advantage: Smart Cities

"Cities in the past were built on riverbanks. They are now built along highways. But in the future, they will be built based on availability of optical fiber networks and next-generation infrastructure" - this quote by Prime Minister Modi, outlines the intent and objective of government's two key initiatives - Smart Cities as well as Digital India. Needless to say, both these projects bank on successful implementation of the other - An efficient city governance project relies on creation quality infrastructure and availability of modern technological infrastructure is critical to pull urban population to these new municipal hubs.

India's Smart City plan is part of a larger agenda of creating Industrial Corridors between India's big metropolitan cities. These new industrial and commercial hubs will be characterised by modern technological infrastructure and a unified approach to city management.

How is my city becoming smarter?

A smart city is an efficient urban centre that provides a high quality of life to its inhabitants through optimal management of its resources. Traditionally cities are created over thousands of years. However, development of a Smart City implies compressing the process and retrofitting the existing cities with new technologies and habitation benchmarks in a short span of 3-4 years.

Critical aspects of a city such as managing resources, stabilising pollution levels, allocating energy are traditionally calculated independent of each other. There is an opportunity in putting together a holistic blue-print and making these cities a tangible reality. It is important to note however that the concept of Smart City isn't static - every Smart City is unique and an evolution over the previous ones, becoming more habitable and responsive to the new challenges.

Role of Chemistry: Reduce, Reuse, Recycle

At the heart of all modern industries such as electronics, information technology, biotechnology, and nano-technology chemistry can make the smart cities project more sustainable, more energy efficient, and more cost effective. On a macro-level, there are five broad critical elements of any Smart City - water management systems, infrastructure, transportation, energy, and waste management. In all these elements, chemistry and chemical engineering are deeply involved. Let us examine how the chemicals industry can contribute to each one of these and make them not just economically viable but also environmentally sustainable.

1. Water management system: Through various policy and schemes, the government of India (GOI) has put its weight behind reducing private water consumption, increasing efficiency in irrigation, decreasing water footprint in all industries, minimize water loss in distribution systems and harnessing available water through an inter-linked water-grid to manage dearth and excess of water. In the context of Smart Cities, initiatives to increase reuse of water, desalination of sea water, sustainable water treatment solutions, recycling, water discharge facilities and providing a 24x7 water supply are few areas where the expertise of the chemicals industry provide thrust to economically viable solutions.

2. Infrastructure: In development of infrastructure, the construction and coatings industry has taken several gigantic leaps in the past few years. Energy use in buildings accounts globally for nearly 40% of energy consumption & 36% of total energy-related carbon dioxide emissions, according to Intergovernmental Panel on Climate Change.

For tropical regions in India, Phase Change Materials (PCM) enable walls and ceilings to absorb and store excess heat during the day and dissipate it at night. This enables further savings of energy on heating and cooling processes. For the hotter areas, high reflectance and durable outdoor coatings when applied to roofs and walls reflect radiation from sunlight and reduce roof and wall temperatures, leading to energy savings on cooling. This is particularly useful not only for residential areas but also public buildings such as - malls, hospitals and more.

Over the years, we have reached an all new level when it comes to enhancing interior air quality through reducing volatile organic compound (VOC) by using formaldehyde abatement and ammonia-free paints.

With India's increasing demand for energy facing limited capacity, the call for energy-efficient construction materials is getting louder. Because of its excellent insulating properties polyurethanes are used in the production of insulation for prefabricated panels by the construction industry, and in cold chain and wood imitation applications. They additionally offer excellent structural strength, durability and adhesion to laminates and liner materials, which are inherent structural elements for the end products.

A wide family of heat transfer fluids deliver the specialised technologies to achieve the optimum combination of stability, efficiency and economy. Utilised widely by retail cold-storage unit world over, these fluids offer a stable replacement to the refrigerant gases hence avoid pollution.

3. Transportation: Traffic congestion is an increasing problem in all major metros in India. With limited mass transportation options stretching across still, expanding urban footprints, there is little optimism regarding the availability of government funds to finance mass transit expansion and meaningfully reduce urban gridlock. Along with these requisites, we seek greater energy efficiency, higher safety norms and lower exhaust emissions.

Presently a vast range of composite polymers are available for light-weighting of vehicles. Light weighting techniques use lower density foams that stand up to rigorous Indian conditions - different kinds of weather, fluctuations in temperature, variation in humidity levels, and change in altitude. Furthermore, with deployment of specific elastomers - vibrations can be reduced and we can enable noise-free transportation.

4. Energy: India is a resource rich country. However, consumption of alternative energy while creating these new spaces, appears to be a logical step. Solar panels traditionally use ethylene vinyl acetate (EVA) components, which are expensive, and not easily available. This creates a barrier to the widespread use of solar energy. However, with close study of the Indian environment, scientists have been able to create effective alternatives which offer superior performance, while significantly improving cost efficiencies.

5. Waste management : Chemical industry can offer credible solution for sewage treatment problem of the smart cities. The sewage treatment plant (STP), which can use advanced tertiary treatment via ultrafiltration (UF) and reverse osmosis (RO) technologies, can operate round-the-clock to reuse wastewater and save huge amount of water every day. Treated water can then be utilised for other activities such as air-conditioning cooling, toilet flushing, horticulture, construction, etc.

Besides the above-mentioned examples, the industry can contribute to maintaining hygiene and health standards of these cities by controlled release of biocides. The industry can partner with the technology giants and turn this sci-fi dream into a reality.

To be environmentally sustainable, economically competitive and remain attractive to live in, cities need to reduce their total energy consumption, increase their use of renewable energy, adapt their physical and communication infrastructures, find solutions to inner-city mobility issues, in particular, personal mobility. For all these purposes chemistry and chemical engineering are irreplaceable tools.

The chemicals industry is still in a nascent stage in India. Our challenge today, is to develop this industry into a vast portfolio of value-added solutions that could contribute to these engines of economic growth. With a unified attempt from the industry - sky is the limit for us.



Article by : Mr. P S Singh, Head Chemicals and Petrochemicals, FICCI

Crop Protection Chemicals industry-Imperatives of growth

The Indian Agro-chemicals industry (crop protection chemicals), which ranks 4th globally, after US, Japan and China was valued at US $ 3.8 in FY 2016 with exports contributing 53% to it. There has been some slowdown in the sector in the past few years owing to adverse/varying weather patterns and weak rainfall in several geographics globally. The future of Crop Protection Chemicals industry is bright. It is expected to grow at a CAGR of 7.5% between FY 16 and FY 25 to reach USD 9.00 Bn (with domestic usage being US $ 3.8 Bn and balance 5.2 Bn being exports). In coming years, Crop Protection chemicals industry needs to 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.

In coming years, 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.

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 bio pesticides, 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.

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.

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 24

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.

At the same time, we do feel that focus to export potential can also be a good trigger for future growth of the sector. As detailed in para 1 of this article, exports already account for above 50% of the size of this sector. At the same time CAGR for exports is also higher (6% for exports, compared to 4% for domestic consumption). It is noticed that activities in China are coming down because of internal re-configuration and this offers India a short to mid-term opportunity to enter the export market aggressively and consolidate its positon. For that to happen regulatory regime will need to be simplified. The same could include fast track approvals and clearances. Streamlining of procedures for import registration of technical grade pesticides which will provide support to export of formulations. In fact, it is worth noting that pesticides are medicines for plants (in the same manner as pharmaceuticals are for human beings). There is no requirement for export registrations/approvals for same and only requirement is to adhere to the regulations of the importing country. If that be so, why the same regime (as applicable to pharmaceutical's), be applicable to pesticides. USA for one follows the same procedure. The very fact that despite such avoidable regulations, Indian pesticide industry, is able to export above 50% of its production, is nothing less than a miracle. It points to the potential possibilities waiting to be realised.

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

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.



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- Cost
- Throughout
- Key Milestones
- Profit
- Lead Time

* Illustrative

Tata Strategic Contacts

Manish Panchal

Sr. Practice Head – Chemicals, Energy & Logistics
E-mail: manish.panchal@tsmg.com
Phone: +91 22 6637 6713



Charu Kapoor

Principal – Chemicals
E-mail: charu.kapoor@tsmg.com
Phone: +91 22 6637 6756



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.

FICCI Contacts

Mr. P. S. Singh
Head-Chemicals & Petrochemicals Division
FICCI
Federation House, 1 Tansen Marg
New Delhi-110001
Tel: +91-11-23316540 (Dir)
Email: prabhsharan.singh@ficci.com



Ms. Rinky Sharma
Assistant Director
Chemicals & Petrochemicals FICCI
Federation House, 1 Tansen Marg, New Delhi -110001
Tel: +91-11-23487473 (Ext: 473)
Email:rinky.sharma@ficci.com

