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TATA STRATEGIC MANAGEMENT GROUP

FICCI

4th

NATIONAL CONFERENCE ON
CHEMICALS WITH FOCUS TO SPECIALTY CHEMICALS

INDIA CHEM Gujarat 2015

28 - 30 October, 2015
Mahatma Mandir, Gandhinagar, Gujarat

Theme: Chemicals - A Way of Life

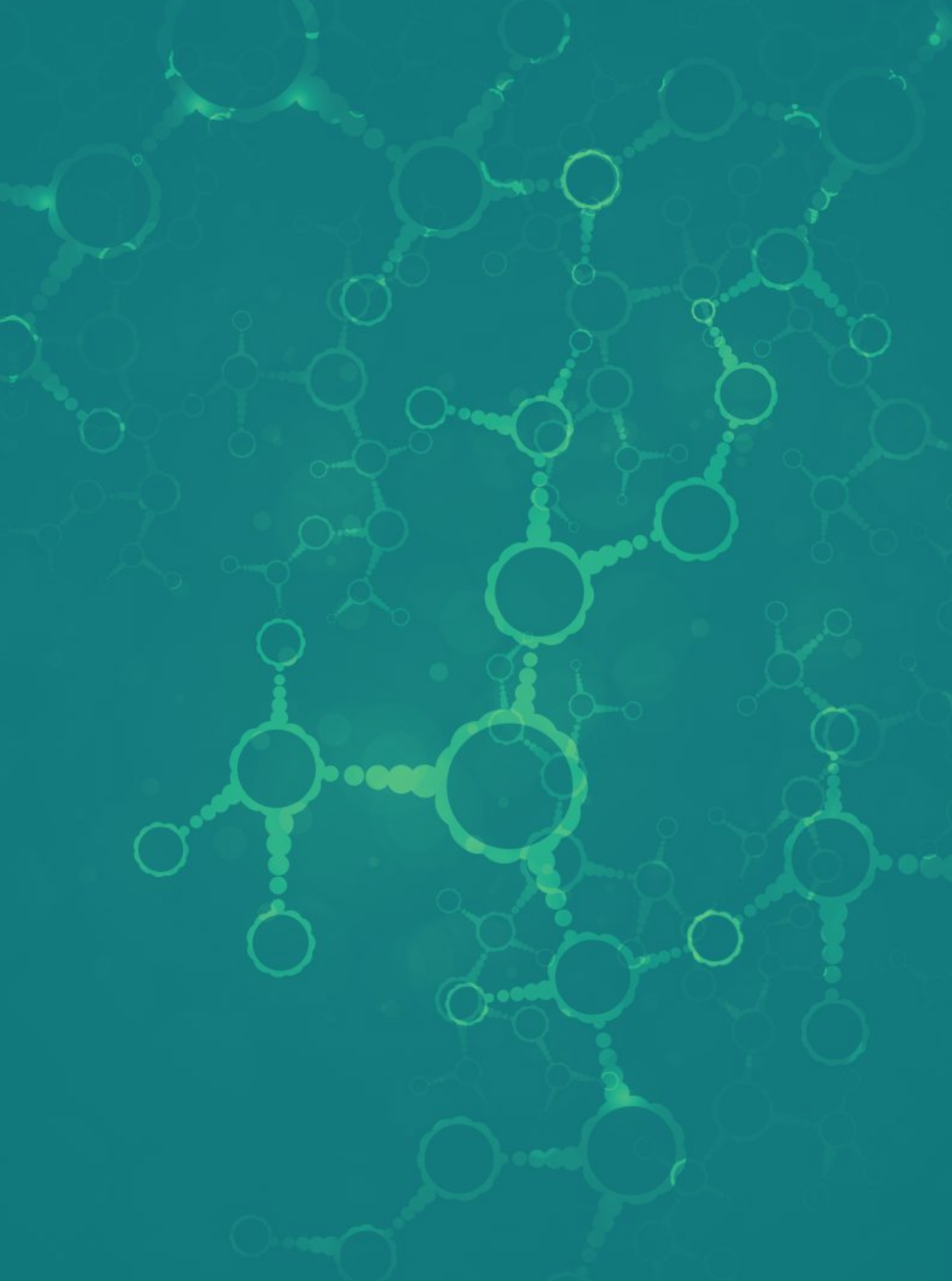
INDIA'S BIGGEST PLATFORM
FOR CHEMICALS



A report on

Chemical Industry

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Message

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As Chairman of the FICCI National Chemical Committee, I must congratulate the Department of Chemicals and Petrochemicals, Government of India, iNDEXTb Government of Gujarat and Federation of Indian Chambers of Commerce and Industry for the initiative in organising India Chem Gujarat 2015, with focus to Speciality Chemicals from October 28-30, 2015 at Gandhinagar, Gujarat. It indeed is a very good initiative, as the Speciality Chemicals sector has a very huge potential for growth.

The key growth drivers for specialty chemicals industry are exports base growth coupled with increasing domestic demand. The domestic demand is rapidly increasing due to growth in end use industries and application (per capita consumption) growth. Approx. 300 million Indian middle class consumers need more high-quality end products (e.g. high quality textiles, cosmetics, high-end paints, paper etc.) and in order to improve quality of end products, product manufacturers need to consume more high-end specialty chemicals

I wish the event all the success.



(Deepak C Mehta)

Message

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The Indian Chemical Industry is an integral part of Indian economy . The industry has key linkages with several other downstream industries such as agriculture, infrastructure, textiles, food processing etc.

There is need to give focus to and provide support to Knowledge based segments of the chemical industry namely Speciality Chemicals. This is in view of the large talent pool in the country, coupled with huge emerging market resulting from massive urbanization, infra building and increasing aspirations of emerging middle class. Agrochemicals, Dyes, Food processing chemicals, Construction chemicals, personal care chemicals are some of such segments. The sector has huge unrealised potential.

I am happy to note that FICCI jointly with the Department of Chemicals and Petrochemicals, Government of India and Government of Gujarat is organising India Chem Gujarat 2015, an event with focus to Speciality Chemicals.

I am sure it will be found useful by all stakeholders.

A. Didar Singh

Foreword



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This report on Indian Chemical and Petrochemical Industry is a part of FICCI and TATA Strategic Management Group (TSMG) Chemical Practice's endeavor to highlight the utility of Chemicals in day-to-day life.

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. Petrochemicals, Agrochemicals, Fertilizers and Specialty Chemicals. 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.

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.



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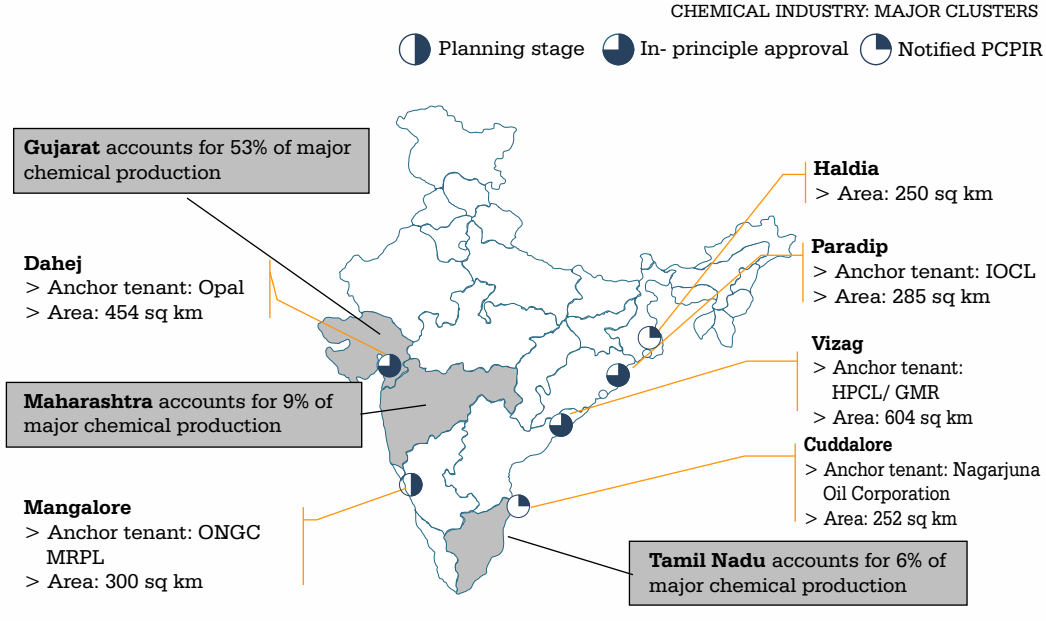
I. Executive summary



This report is developed by the TATA Strategic Management Group with support from FICCI as the knowledge partner for the Indiachem Gujarat Conclave 2015.

The Indian chemical market is estimated at USD 139 billion in 2014 and is expected to grow at ~9% per annum over the next five years. India stands at 12th worldwide in terms of volume contribution towards Global chemical industry.

Figure 1: Indian Chemical Industry Major Clusters



Source: Industry reports, Analysis by Tata Strategic

Gujarat, Maharashtra and Tamilnadu are leading the charge being the major chemical manufacturers in the country. The key driver being the significant coastlines the states are endowed with (Fig 1). The country's chemical industry has the potential to reach USD 214 billion by FY19 growing at a CAGR of ~9%. The growth is expected to be driven by rising demandin end-use segments and expanding exports fuelled by increasing export competitiveness. The success, however, will depend on how well it's key challenges are addressed such as high dependence on imports, small installed capacities, low focus on technology up-gradation and the availability of vocationally trained manpower.

1.1 Chemicals - A way of Life!

Chemical industry is the responsible for converting raw materials like water, crude oil, natural gas, air, metals, and minerals, etc. into other valuable products. It is involved in almost every industrial process and therefore plays a significant role in global economic and social development. R&D in the field of chemistry is now focusing on rendering a green and sustainable solution for the long run. Thus, chemistry might come across as a complicated theory but in true essence it has offered products and solutions for virtually all sectors of economy. Hence, Chemicals are truly a way of life, it has simplified our way of living as compared to the past; and have also fostered comfort and growth in human lifestyle.

1.2 Chemical Industry

I. Overview

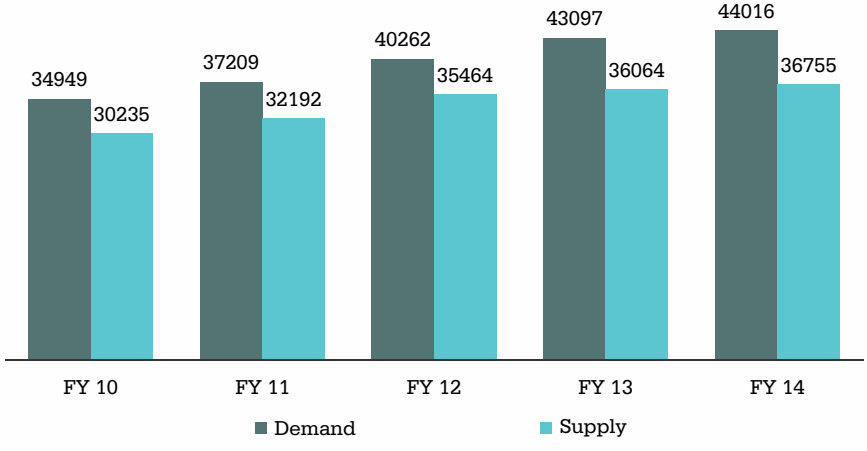
With immense thrust on knowledge building and an inherently capital intensive nature, the Chemical industry has a significant role to play in the global economic and social development. It is also a highly human resource intensive industry employing a large number of people. Globally, nearly 20 million people are employed in this industry. The diversification within the chemical industry is large and covers more than 80000 commercial products with myriad applications that one needs to only look around oneself to gauge how deeply connected one is to the world of chemicals

Over the last few decades, the chemical industry has seen an increasing shift towards Asia. This is in line with shift of key consumer industries (e.g. Automotive, Electrical and Electronics) towards Asia. Looking particularly towards the Indian chemical industry, it stands out to be the 3rd largest producer in Asia. The chemical industry in India has started to evolve rapidly since the last five years. Despite its large size and significant GDP contribution, the industry accounted for ~3.4% of the global chemicals industry (~USD 4 Trillion).

When the past trends of demand and supply of the total major chemicals and petrochemicals are considered, it can be understood that the demand (Fig 2) has been on high rise and has grown nearly at 6% from ~35 MnTPA in FY10 to ~44 MnTPA in FY 14, whereas the supply has grown at slightly slower rate i.e. 5% and reached up to nearly 37 MnTPA in FY 14. On the other hand, this has given simultaneously rise to the imports of the major chemicals and petrochemical products which have grown at ~11% from ~8 MnTPA in FY 10 to reach ~13 MnTPA in FY 14, whereas the exports are growing at ~9% which is lower as compared to the imports. (Ref Fig 2 &3)

Figure 2: Demand & Supply for Major Chemicals & Petrochemicals

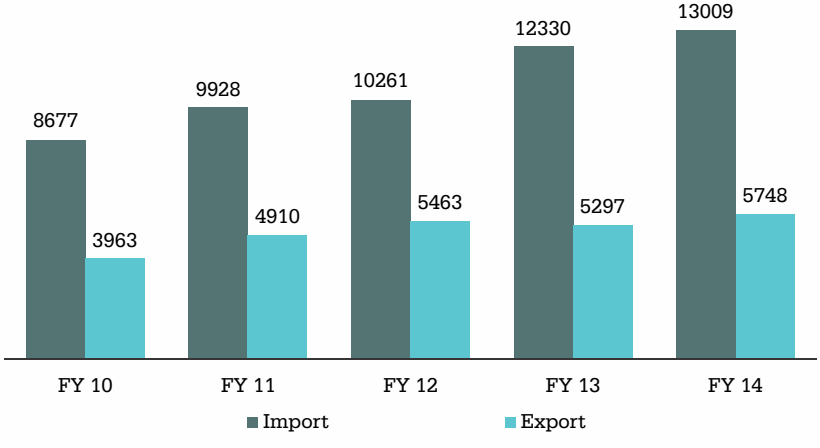
Demand & Supply for Total Major Chemicals & Petrochemicals in India (000' Tonnes)



Source: Ministry of Chemicals and, Petrochemicals Analysis by Tata Strategic

Figure 3: Import & Export for Major Chemicals and Petrochemicals

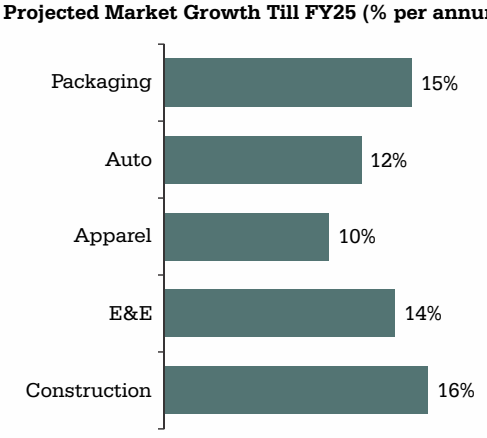
Import & Export for Total Major Chemicals & Petrochemicals in India (000' Tonnes)



Source: Ministry of Chemicals and Petrochemicals, Analysis by Tata Strategic

However, with the upcoming government proposals, diversified manufacturing base, technology up-gradation, exploring alternate feedstock etc. will give momentum to the manufacturing sector of the industry and help to meet the growth in demand that is expected in the coming five years. The demand growth will be primarily driven by domestic consumption because per capita consumption of most of the chemicals is much lower than global averages. Moreover, with a very strong outlook for the key end user industries the demand of chemical products is expected to surge in the coming years.

Figure 4: Projected Market Growth Till FY25



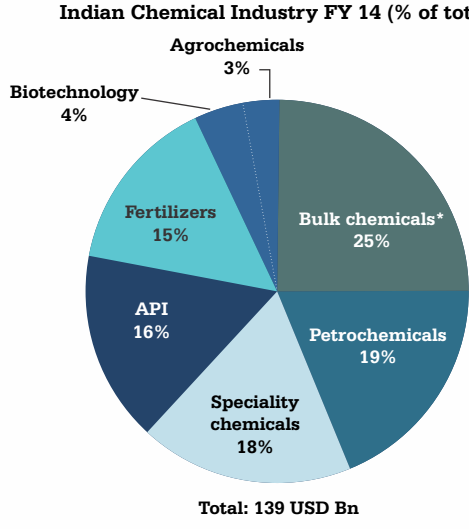
Source: Industry reports, Tata Strategic estimates

II. Industry Sub-Segments

Chemical industry is broadly classified as the following sub groups:

Bulk Chemicals: It includes basic organic chemicals (methanol, acetic acid etc.), basic inorganic chemicals (caustic soda, chlor alkali etc.) and other chemical intermediaries.

Figure 5: Market Share of sub-segments



* Includes basic organic, inorganic and other chemical intermediaries

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

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

Speciality Chemicals: Speciality Chemicalsare low-volume but high-value compounds. These chemicals are derived from basic chemicals and are sold on the basis of their function. Paint, adhesives, electronic chemicals, etc. are some examples of specialty chemicals

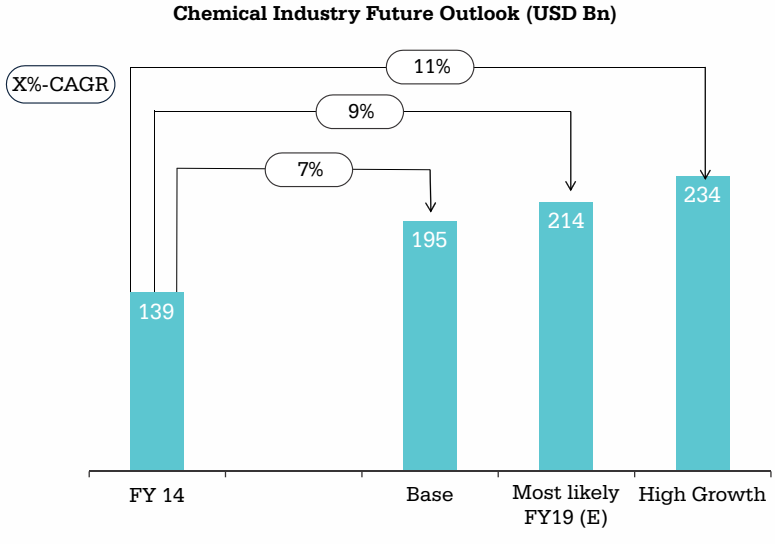
Agro Chemicals: Chemicals essentially meant for protecting agriculture crops against insecticides and pesticides are covered under this sub-group

Of the five segments, Bulk chemical (25% share) is the largest followed by petrochemicals (19%)and speciality chemicals (18%). In terms of potential growth, speciality chemicals and agrochemicals are the fastest growing segment followed by petro and bulk chemicals.

III. Future Outlook

To address the macro level uncertainties associated with an industry level growth estimate, Tata Strategic has developed three scenarios to look at the possible growth outlook of Indian chemical industry based on the growth rates of its sub-segments. In the base case, the market size is estimated at ~195 USD billion by FY19. Most likely the market will rise to ~USD 214 billion with 9% growth. And the optimistic case is likely to achieve a growth of ~11% p.a. over the next five years resulting in an industry size of ~USD 234 billion.

Figure 6: Chemical Industry Future Outlook



Source: Industry reports, Tata Strategic Analysis

IV. Key Challenges

With immense potential lined up in the way ahead, it is of prime importance, to first overcome the existing challenges in the industry. The industry has several critical issues like infrastructure, scale of operation, access to technology, ease of doing business, energy and feedstock security etc. which have hampered it to achieve its true potential and if those issues are addressed with the help of Government intervention, it would help industry to achieve its true potential. The new Government is now focusing on to revive manufacturing, build robust infrastructure and regain investor's confidence. It has been taking initiatives to address challenges in feedstock availability, complex tax and duty structure and overcome other system intricacies.

V. Key Drivers

- **Strong growth outlook:** There is an abundance of skilled human resource in India which can be employed in this industry. Going forward, speciality chemicals and pharmaceuticals segments are expected to outgrow the overall industry growth rate
- **Low per capita consumption:** Due to low awareness among farmers, usage of agrochemicals and fertilizers have been on the lower end, which can be improved by taking knowledge building initiatives by either government or large corporation. There is a need to address issues like availability, allocation and pricing of key feed stocks and providing for necessary infrastructure.
- **Growing demand:** With growing disposable incomes and increasing urbanization, end consumption demand is increasing for paints, textiles, adhesives and construction, which in turn, is leading to substantial industrial growth rate.
- **Diversified manufacturing:** The Indian chemicals industry has seen quantum jump in diversified manufacturing base that produces world-class products. This increasing scope will favourably influence the industry growth.

One of the initiatives is 'Make in India' campaign, which aims to facilitate investment, foster innovation, enhance skill development and build best-in-class manufacturing infrastructure. Under this initiative GOI is focusing onto raising the share of manufacturing in GDP from 16% to 25% by 2022.Theyhave de-licensed manufacturing for most of the chemicalsand100% FDI is made permissible in Indian Chemicals. Policies have been initiated to set up integrated Petroleum, Chemicals and Petrochemicals Investment Regions (PCPIR).Ithas also been encouraging the R&D sector and has reduced the list of reserved chemical items for production in small scale sector thus facilitating investment in technology up gradation and modernisation. Thus, through Make

in India initiative, the government can ensure its domestic demand is efficacious and certain critical factors of the industry are well-addressed, and competitiveness is enhanced for both domestic and multinational players as far as domestic manufacturing is concerned.

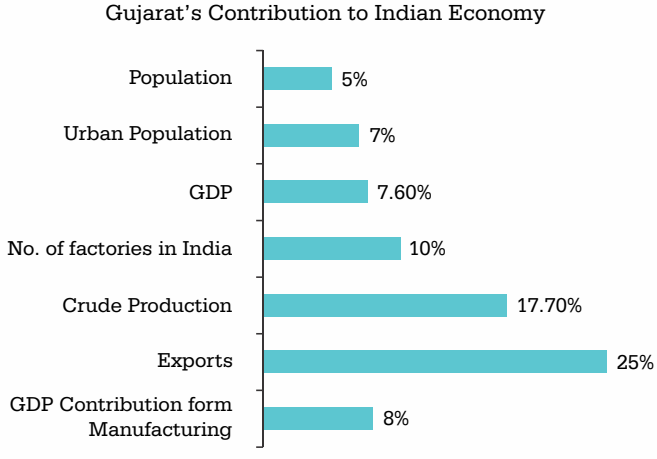
Besides the government support the key imperatives for the growth of chemical industry is to secure feedstock, right product mix and identify opportunities for Mergers and Acquisitions. Companies can secure feedstock by setting plants in the resource rich nation or explore alternative feedstock. Investments are needed to be made in the right product mix and optimize the use of available feedstock such as Naphtha and its derivatives. Exploring Merger, JV opportunities can help companies to gain capital and technology support and also might open new opportunities in the international market. To remain competitive in the market companies can invest in strategic energy management and strategic water management to cut down their energy costs and invest in upcoming PCPIRs in India and overcome challenges related to infrastructure, power and water availability.

II : Gujarat: An Investment Destination



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 15% of the country's chemical exports. Bulk of this goes to US, Europe and other developed nations - a clear sign of global competitiveness.

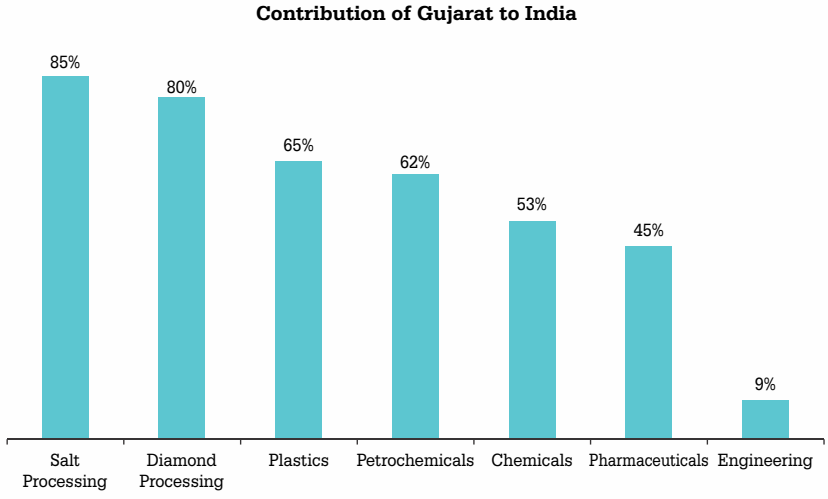
Figure 7: Gujarat's Contribution to Indian Economy



Source: Industry Research

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Figure 8: Contribution of Gujarat to India



One of the leading industrialised states in India, Gujarat has become one of the most preferred locations for investments. The state has attracted cumulative FDI worth USD 11 billion from Apr 2000-Mar 2015 and is the second highest recipient of FDI in India after Maharashtra. Currently, it has over 100 Industrial clusters, involved in different industrial activities, to bring in cost competiveness and extend common support for market development. The Cluster Development Scheme has been launched for furthering the growth of product clusters. It has truly emerged as the leader of chemical manufacturing in India distantly followed by Maharashtra and Tamil Nadu.

Infrastructure and strategic location

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 thisthe 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.

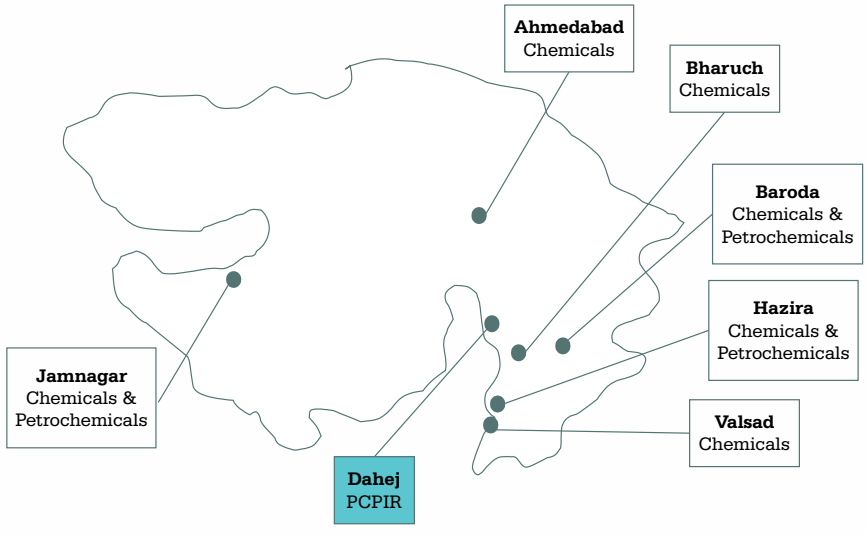
9. Leading Chemical Players in Gujarat

The state a destination for several leading Petroleum, Chemical & Petrochemical majors



Figure 10: Overview of Chemical Industry in Gujarat

Overview of Chemical Industry in Gujarat



Source: Secondary research, Analysis by Tata Strategic

The PCPIR at Dahej is spread over 453 km^2 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. 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.

Upcoming Ports

Building ports would enable the state government to make maximum use of the state's 1600 km long coastline, which is ideal to facilitate movement of goods. State government is planning to add multiple capacities to leverage the potential of coasts. ABG Cement is planning captive cargo handling jetty in Surat with capacity of 4.95 MTPA. Essar Ports is constructing a dry bulk terminal in Jamnagar with capacity of 20 MTPA and Cochin Shipyard is planning a shipyard in Kutch.

Gujarat is the leader in India when it comes to "Ease of doing business". It is the only state which comply 100% with Environmental procedures.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. Low per capita consumption and strong growth drivers will propel the industry in this state to newer heights.

Issues & Challenges in upcoming chemical clusters

- **Policy and Government Support:** Gujarat has setup a single window clearance mechanism for entrepreneurs who want to establish industrial ventures. Industrial Extension Bureau which serves as the single point of contact has helped in reducing the time for clearance of projects. However, ground reality is that there are time delays due to involvement of multiple central and state agencies.

- **Port Connectivity:** Port connectivity is a critical aspect for setting up any industry. Talking about the Dahej port, it has access to only one liquid chemical terminal. The current port infrastructure is inadequate and has limitations in size of vessels that the port can handle. There is currently no export facility for chemicals through the Dahej port. There is a need for identifying and partnering with players having experience in providing such services.

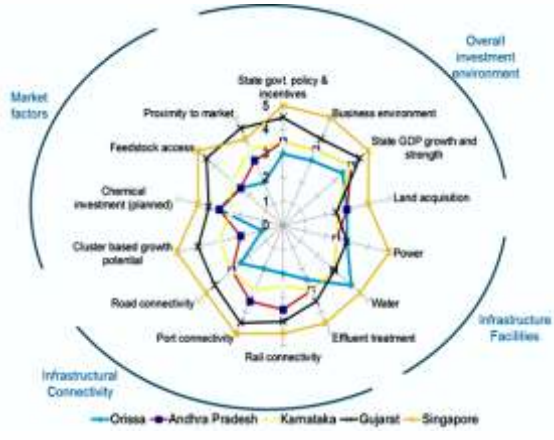
- **Basic Infrastructure:** Basic infrastructure like road, rail, power, water, gas & CETP needs to be further augmented. Proper layout planning and disaster management is extremely critical in the case of an industry of such hazardous nature. The current layout has a single gate serving both as an entry and exit point. Water is another critical input for the chemical industry. As of now there are already concerns with the quality and quantity of water being made available at the PCPIR, even thou only part of the first Phase is operational. There is an immediate need for the nodal agencies to look in to developing Desalination facilities for water. CETPs for waste treatment, is another critical requirement to ensure sustainable models for the future.

- **Social Infrastructure**: Social infrastructure acts as the backbone for the sustenance of industry growth and attracting skilled talent. Gujarat needs to ensure that proper social infrastructure like education, recreation facilities etc. are in place near the chemical industry cluster and regions like Dahej PCPIR. Advance planning and development of master plan is essential.

Relative Comparison of Infrastructure

TSMG has conducted a detailed analysis, where we have mapped four Indian states based on their current and future investment outlook for the chemical sector and Singapore - a case study of success stories for an integrated chemical park, on chemical industry and related infrastructure support parameters. On the basis of our research Gujarat does emerge as the location of choice for chemical industry in India. But on a global scale, when compared with countries like Singapore, Gujarat has further potential to build infrastructure for the chemical industry. Gujarat needs to check if there are enough initiatives to sustain the infrastructure growth and compete with world class chemical hubs on a global stage.

Figure 11 : Comparison of Infrastructure



Way Forward: Integrated Development – key to growth of Gujarat as a chemical hub

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

Figure 12 : Integrated Approach



and projects of similar scale are not plagued with the issues and challenges of the present.

Speciality chemicals in Gujarat

Amongst all states of India, Gujarat is one of the fastest growing states in terms or urbanization. Its urbanization has increased from 37% to 43% in last decade. The demands of these urban users are more towards performance & high value added products. This makes Gujarat market a ripe market for consuming specialty chemical products. One of the key segments of specialty chemical is agrochemicals. Gujarat as a state faces food security challenge. And hence the need to increase the yield is quite high. This makes it a good focus market for agrochemicals. Another example for the site specific need of Gujarat is for water treatment chemicals. Gujarat is an industrial state with the water availability already in scarce zone. This has increased the significance of water conservation & hence increased the scope of water treatment chemicals. The presence of downstream industries is huge, based on favourable investment policies of govt. in the past. The entrepreneurial spirit of Gujarat is well acclaimed & hence a lot of small & medium enterprises could also be found here.

For feedstock availability, Gujarat alone accounts for more than 40% of the refining capacity in India. And with RIL& OPaL crackers the availability of raw materials should not be a major concern. However the challenge for the availability still remains, as the fragmented structure of specialty chemical producers does not guarantee a regular off take for crackers. This makes feedstock for specialty chemical a low priority in their product portfolio.

Apart from these another major hindrance for growth of specialty chemical is technology. The level of R&D in Gujarat is limited (in comparison to India it is still better). However going ahead with many foreign MNCs increasing their presence & govt. promoting industry academia linkages, Gujarat is likely to overcome this hurdle also.

III. Bulk Chemicals



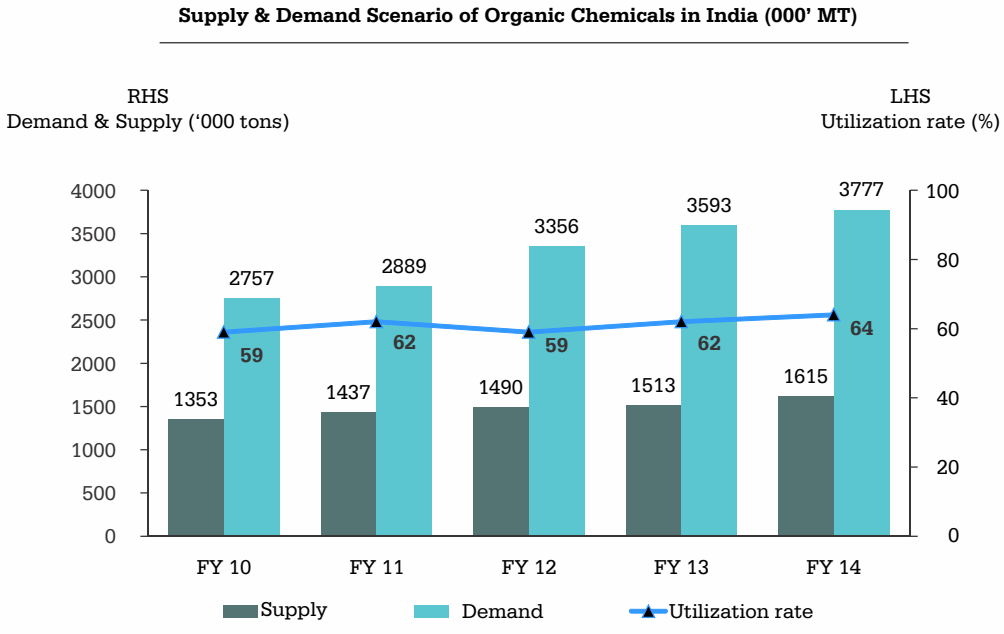
3.1 Basic Organic Chemicals

Organic Chemicals form a crucial segment of chemical industry. They play a significant role by producing chemicals that are useful for our day to day life and constitute an important part of human endeavours. Organic compounds are structurally diverse and show enormous applications. They are important constituents of useful products such as Synthetic fibres, Drugs & Pharmaceuticals, Dyes & Pigments, Rubber, Agrochemicals, Polymers, and Perfumes etc.

Five major organic chemicals produced in India are Methanol, Aniline and its derivatives like Formaldehyde, Acetic Acid and Phenol. Together, they contribute to ~2/3rd of Indian basic organic chemical industry.

The demand for organic chemicals in India has increased at nearly 8.2 % between FY 10- FY 14 to reach 3.7 million tons in 2014 (Fig 13). The domestic supply has however grown at a much slower pace and has essentially been stagnant in the last 3 years. This has resulted in widening of demand supply gap which was primarily bridged through imports. Domestic production has increased at ~ 4.5% per annum (Fig 13) and imports grew at a rate of 12.7% between FY10 and FY14 (Fig 14). The stagnation in the domestic production is largely attributed to the large volume imports taking place from countries like China, resulting in low utilization rates of ~ 64%.

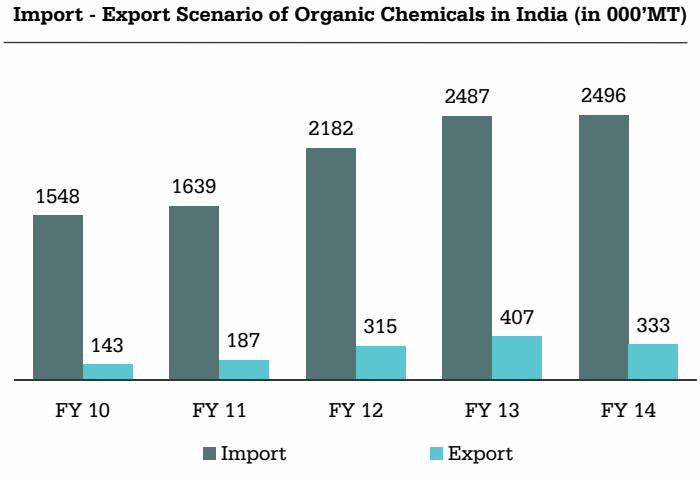
Figure 13: Demand & Supply Scenario of Organic Chemicals



3.2 Market Outlook

Domestic demand of basic organic chemicals is expected to grow at 10% and reach 5 million tonnes by end of twelfth plan period. This will be mainly led by the growth in the end-user market. In order to meet the burgeoning demand, organic chemical industry must also target to grow at 10-12% during the same period. This can be achieved through policy initiatives, ensuring strong fiscal and regulatory support, support for world scale plants in PCPIRs, integration with downstream facilities etc. Imports as a percentage of domestic consumption is expected to widen from the existing ~11% to ~20% by the end of 2019.

Figure 14: Import-Export Scenario of Organic Chemicals



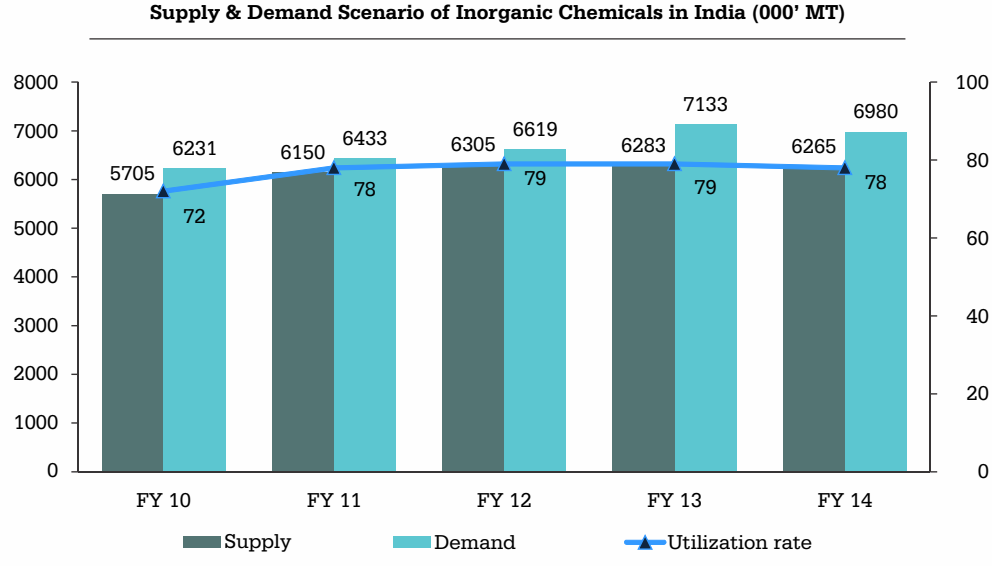
3.3 Inorganic Chemicals

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.

The demand for inorganic chemicals in India has been increasing at nearly 2.30 % from FY 10- FY 14 and has reached the level of 6.9 million tons. The domestic supply has however grown at a slower pace resulting in gradual widening of demand supply gap which was primarily bridged through imports. Domestic production grew at 1.89% per annum and imports grew at a rate of 0.14 % between FY10 and FY 14. The capacity utilization levels are at 78% which is close to that of the past few years.

Figure 15: Demand and Supply of Inorganic Chemicals in India

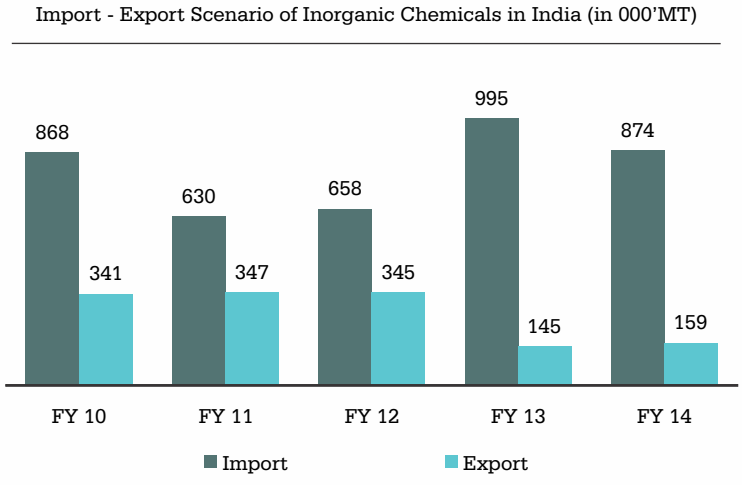


3.4 Market Outlook

Domestic demand of basic inorganic chemicals is expected to grow at a stable 6-7% CAGR over FY14 to FY19, mainly led by the growth in the end-user market like alumina, textiles, paper and detergents. Domestic utilization rates of the

Indian plants improved to 78% in FY14 from 72% in FY10. It's expected to grow by the end of FY19. Imports as a percentage of domestic consumption would increase from 12% in FY14 to 15% in FY19 despite the anti-dumping duties levied on major exporting countries.

Figure 16: Import-Export Scenario of Inorganic Chemicals



3.5 Key Trends

- Increased acceptance of methanol over olefins and propylene technologies.
- There is a growing acceptance for the co-production of ammonia and methanol. Due to the cyclical nature of the fertilizer sector, ammonia capacity lies unused due to lower operating rates.

3.6 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.

3.7 Key opportunities

- **Consolidation**: Sincemost 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 speciality chemicals such as polymers additives, water treatment chemicals, lubricating additives, etc. This will help in improving their margins but requires significant R&D efforts.

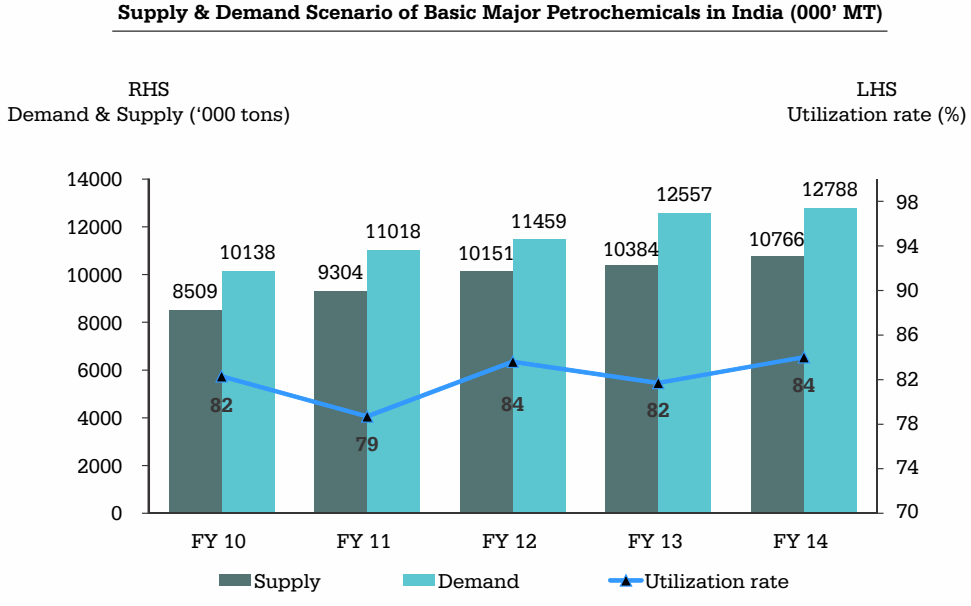
IV. Petrochemicals



4.1 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.

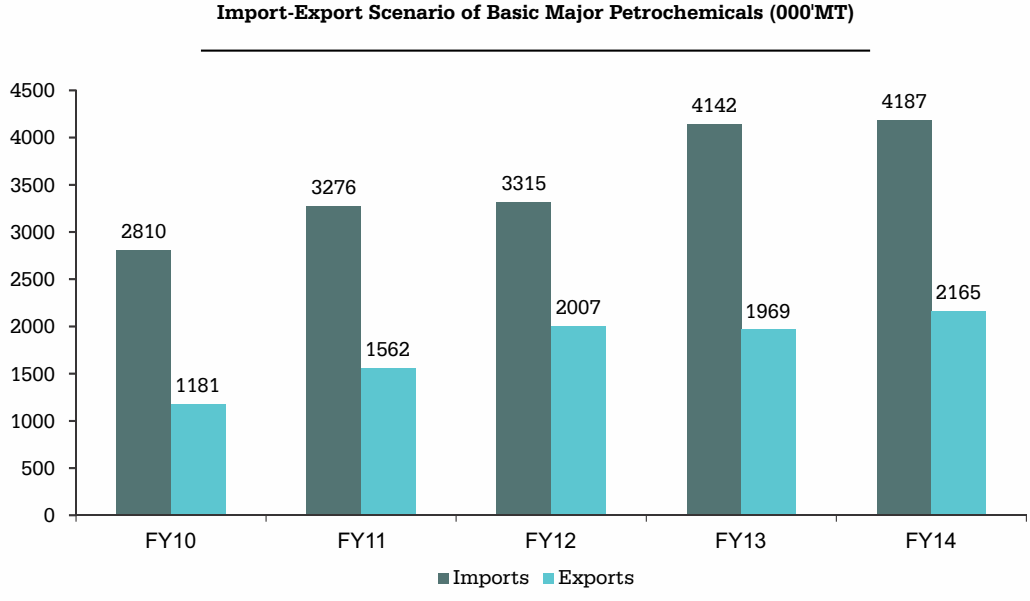
Figure 17: Supply Demand Scenario of Basic Major petrochemicals



Aromatics include benzene which is used in making dyes as well as in making synthetic detergents. Synthesis gas is used tomake ammonia and methanol which arefurther 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.

As a downstream of exploration and refining business, the petrochemicals are a significant industry for the Indian economy. The total petrochemical market has grown at a CAGR of 11% from USD 19.3 billion in FY11 to USD 26 billion in FY14. By global standards, its contribution to global market size is not very large, primary reason being low per capita consumption of polymers in India, only ~9.7 kg, compared to world average of ~25 kg. The total installed capacity of major basic petrochemicals in FY14 is 12.8 million metric tons per annum (MMTPA) against the total demand of 12.79 MMTPA (Fig 15). Imports have grown at a CAGR of 10% between FY10and FY14, whereas the exports have grown at a higher rate of 21% in the same period.

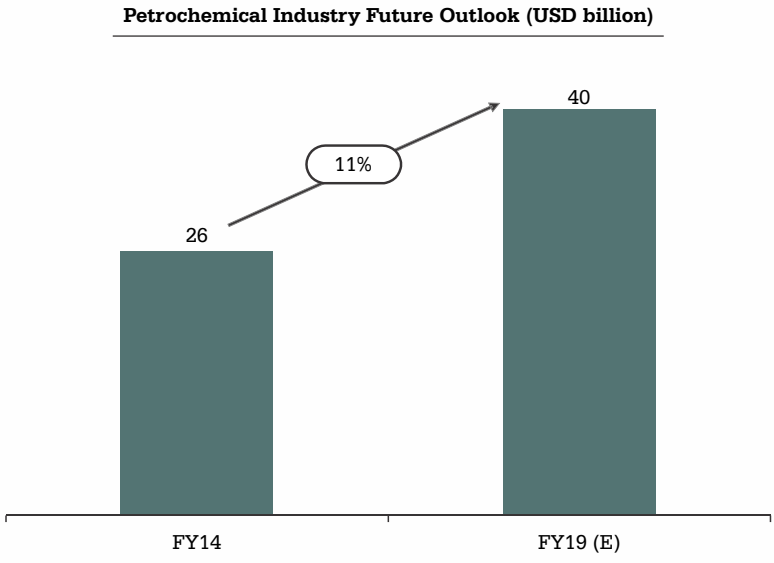
Figure 18: Import - Export Scenario of Basic Major petrochemicals



4.2 Market Outlook

The market for basic petrochemicals is expected to grow at a CAGR of ~11% to reach 40.3 USD billion by FY19. The demand growth will be driven by olefins segment including ethylene, propylene and butadiene. Demand as well as capacity growth in aromatics such as benzene and toluene will be marginal compared to overall market size.

Figure 19: Petrochemical Industry Future Outlook



4.3 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.

4.4 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.

4.5 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 inMiddle 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.

5. Speciality Chemicals



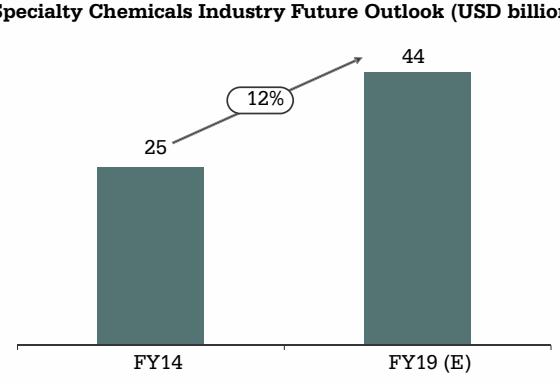
5.1 Introduction

Speciality chemicals are a unique group of high value and low volume products known for their end usages and/or performance enhancing properties. Speciality chemicals are a largely fragmented segment in chemical industry. It encompasses products from paints, coatings and plastics to home care surfactants, flavours and fragrances. Being so "usage-specific", speciality chemicals touches upon every segment of population these days.

5.2 Market Outlook

The Indian Speciality Chemical market is valued at ~25.3 billion USD as of FY14. Speciality chemicals have observed a high growth rate in the past as well. A growth of ~9.6% p.a. was witnessed since FY10when the market size was ~16

Figure 20: Speciality Chemical Industry Future Outlook



billion USD. The end usage, which defines speciality chemicals, has been the key growth driver in the past. This has led to increment in consumption. The growth potential of consumption of speciality chemicals is strong and is expected to reach ~44billion USD by FY19.Indian speciality chemicals production is generally much higher than global standards, as the speciality chemicals usage is at an early stage in India. 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 speciality chemicals within India's end markets is low. With an increased focus on improving products, usage intensity of speciality chemicals within these end markets 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.

5.3 Key Trends

- **Focus on R&D**: Spending on innovation has escalated. This is basically because of the increased sales in the automotive and consumer electronics segments. Recently, the focus has been shifting towards the R&D sector. National research institutes like NCL and private sector companies are concentrating on developing speciality chemicals and polymeric additives for specific end user segments like automobile, textiles, etc.
- **Green Transformation**: A cohesive approach across the value chain including procurement, product development, manufacturing process and marketing along with adequate risk management and reporting at each step is becoming critical. Companies establishing "Sustainable Leadership" among all other stakeholders would have a distinct edge over others.

5.4 Key Challenges

- **Improve infrastructure:** There is a growing need to have adequate power and water to support the utilities such as transportation, storage, etc. There is poor connectivity by roads, rail and water which should be looked upon.
- **Complex regulations**: Currently, multiple licenses and certification are required to operate a plant in India. The process for a new up and running plant is very complex and tedious. This poses a resistance for new players.
- **Develop better catalysts**: There is a lack of good catalysts and processes for better processing and value addition to feedstock. One of the key reasons is the lack of autonomous research centres in catalysis.

5.5 Key opportunities

- Availability of feedstock: For production of commodity petrochemicals, basic building blocks like ethylene, propylene, etc. are required by crackers in India. But unavailability of these in the production is a concern. Due to alternate fuel availability like rap-seed oil, castor oil etc., Indian companies can overcome the challenge by using alternative feedstock.
- **Innovation**: With a huge pool of technical human resource, scientists and researchers, technology will play vital role in growth of this sector. With the processes being very energy and resource intensive, there is an opportunity to optimize at every step during production and operation.

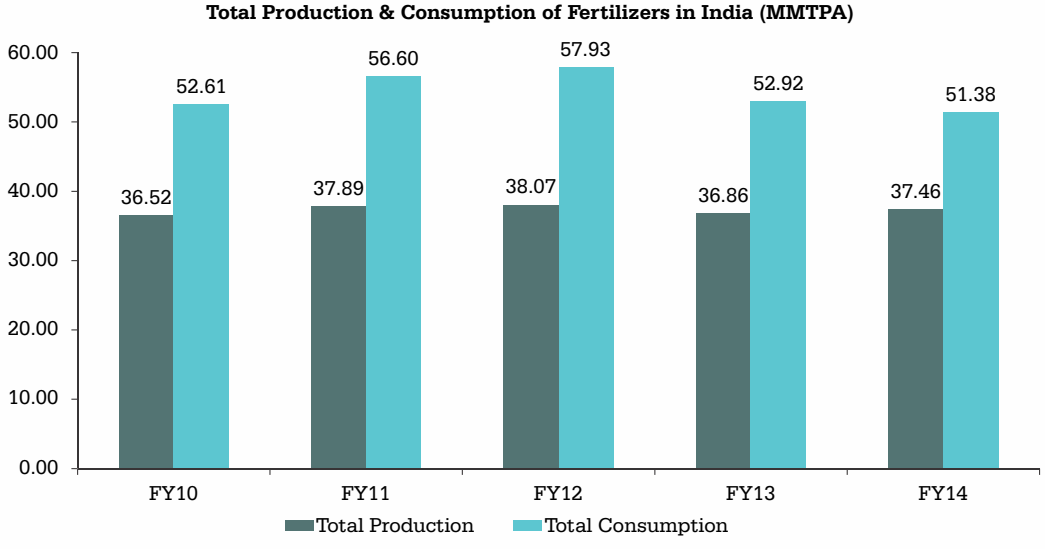
6. Fertilizers



6.1 Introduction

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. From a level of about 52 million tonnes in 1951-52, food grains production has gone above 370 million tonnes in 2013-14. Fertilizer consumption increased from 43 million tonnes in FY08 to 58 million tonnes in FY12, led by a rise in phosphorus and potash consumption. But due to adverse climate and price issues consumption fell to an estimated 52 million tonnes in FY14.

Figure 21: Total Production & Consumption scenario of Fertilizers



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6.2 Market Outlook

Lack of monsoon and relatively higher prices of complex fertilizers has impacted the overall consumption of fertilizers in 2014-15. The demand is expected to grow at a CAGR ~3% as compared to the nogrowth in the past 5 years. Due to new government policies, the fertilizer demand in India is expected to grow from FY14to reach 71.5 Million tonnes in FY19, higher than the global growth rate of 2% during the same period.Though urea consumption is expected to grow at relatively slower pace, non-urea fertilisers would register a steady growth. Companies' efforts to educate farmers about balanced usage of nutrients would drive the demand of non-urea fertilisers.

6.3 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.

6.4 Key Challenges

Demand for urea is expected to decline marginally by 1-2% in FY16 after growing by 1% in the previous year. Also, the 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. Thus, urea demand is estimated to grow relatively slower at ~2% CAGR to 33-35 Mntonnes over FY14 to FY19, compared with the previous 5 years when urea consumption was estimated to have recorded a 3% CAGR.

6.5 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.

7. Agrochemicals



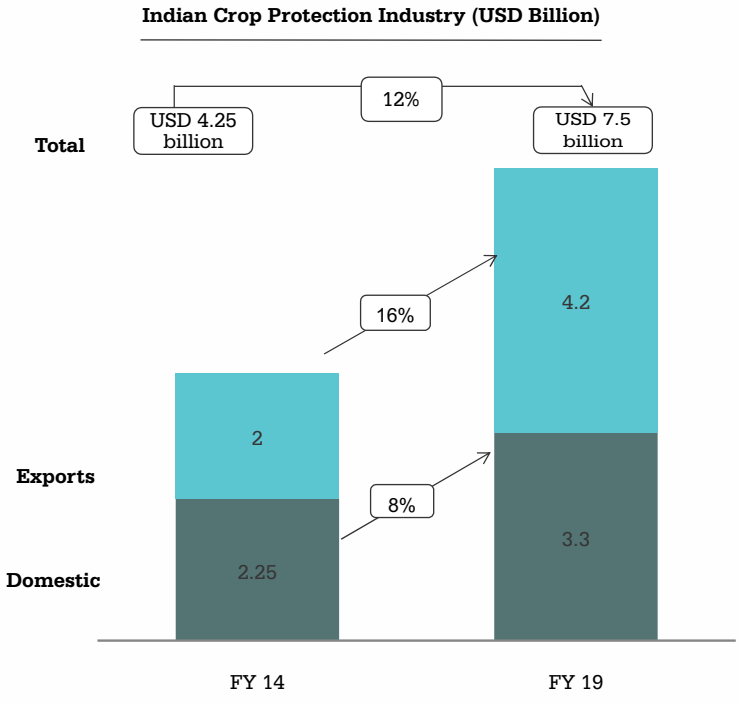
7.1 Introduction

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.

7.2 Market Outlook

Indian Agrochemical industry is valued at USD 4.25 billion in FY14 and is estimated to grow at a CAGR of 12% to reach USD 7.5 billion by FY19. Out of this, the domestic market is ~USD 2.25 billion in FY14. Almost 50% is constituted by exports, which is expected to grow by 16% CAGR to reach USD 4.2 billion by FY19, resulting in 60% market share in Agrochemical industry. On the other hand, domestic market will grow at ~8% CAGR to reach USD 3.3 billion by FY19. India is fourth largest producer of agrochemicals worldwide, after United States, Japan and China.

Indian Crop Protection Industry Outlook



Source: Industry Analysis by Tata Strategic

7.3 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.

7.4 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.

7.5 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.

8. Reverse SEZ – An opportunity for Indian chemicals & Petrochemicals Industry



8.1 Current Scenario

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

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

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

8.2 The Possibility

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

Select regions globally such as Mozambique, Iran & Myanmar can be good investment options for us as they are resource rich but lack technical know-how, capital or both to build their own industry. These countries are also low on priority for other countries due to their macroeconomic situation. This can be an opportunity for Indian companies wherein help can be provided to these countries to develop their Chemical & Petrochemical industry by providing capital/ sharing technical know-how and in return get access to gas at competitive prices.

8.3 Way Forward

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

- Setup a gas cracker to produce ethylene and its derivatives. These can be sent to India for the manufacture of further downstream value added products. For example, India is a net importer of MEG. MEG can be manufactured in these countries and can be sent to India for the manufacture of PET or Polyester fibers.
- Co-invest in upcoming plants and secure an off-take agreements
- Co-invest in an integrated complex in Iran and other possible geographies
- Setup fertilizer plants in these countries to cater to demand both at these geographies as well as India

The Indian government can encourage such investments by incentivizing the import of products manufactured from such locations. The Indian government has to work closely with the governments of these countries to implement this model and provide sufficient protection to the companies investing in these countries.

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Crop Protection Chemicals industry-Imperatives of growth

by

Mr. P. S. Singh

1. The future of Crop Protection Chemicals industry is bright. It is expected to grow at a CAGR of 12% between FY 14 and FY 19 to reach USD 7.5 Bn. In coming years, agrochemical industry should focus on developing new processes and products with sustainability as the core principle. This requires developing a collaborative platform in which the academia, government and regulatory bodies, farmers associations, manufacturers and farmers come together to promote safe and judicious usage of pesticides. Going ahead, opportunities for the Indian crop protection industry will come from exports, higher production of generic products, product portfolio expansion, and growth in herbicides and fungicides.

2. 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.

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

4. 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.

5. 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

6. 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.

7. 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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Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

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