



INDEPENDENT MARKET REPORT

India Chemical &
Specialty Chemical
Market Overview

A Frost & Sullivan Research Report

August 2023

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Abbreviations

GDP: Gross Domestic Product

IMF: International Monetary Fund

Foreign exchange average rate for 2022: USD TO INR: 82.4

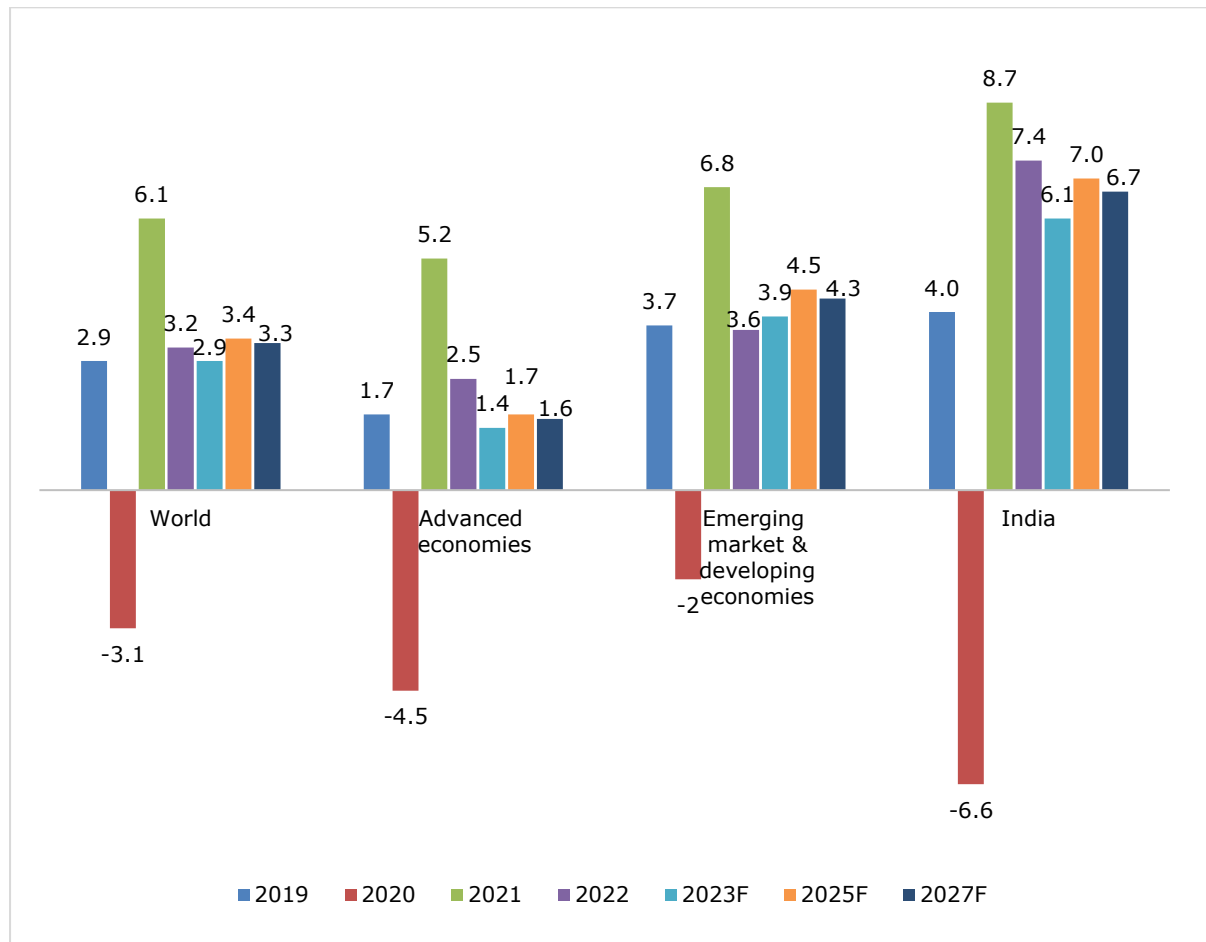
Source: <https://www.google.com/finance/quote/USD-INR?sa=X&ved=2ahUKEwiH2-Gtz836AhWLOHMBHV3kAJEQmY0JegQICBA&hl=en>,

1 Global & India Macro-Economic Overview



1.1 GDP growth rate

Exhibit 1: Global GDP growth (%) - CY 2019-2027F



Source: IMF, Frost & Sullivan Analysis

Even though, the pandemic triggered a deep global recession, the economy has started showing signs of a quick recovery. The demand in next five years is expected to show similar growth trends as prior to pre-Covid levels. Global growth projections indicate a healthy CAGR of around 4-5% over the next five years. (CY 2023 – 2027).

India, specifically is poised for a healthier growth compared to other economies of the world with a CAGR of 6-7% between CY 2023 and CY 2027.

1.2 India Macroeconomic Overview

1.2.1 GDP Growth and Outlook

Nominal GDP

India is among the top six countries in the world with a nominal GDP value of over USD 11.2 trillion in 2022 (current prices). India's nominal GDP is expected to reach 15.7 tn by 2026 based on current prices at a CAGR of 5.9%.

Table 1: India GDP Nominal (USD bn) and GDP PPP (USD bn) – Y-O-Y comparison

Year (CY)	GDP Nominal (USD bn)	GDP PPP (USD bn)
	Constant (2010)	Current prices
2010	1,676	5,229
2011	1,763	5,618
2012	1,860	6,153
2013	1,978	6,478
2014	2,125	6,781
2015	2,295	7,160
2016	2,484	7,735
2017	2,653	8,277
2018	2,827	9,029
2019	2,941	9,562
2020	2,707	8,907
2021	3,050	10,207
2022	3,313	11,162
2023F	3,737	12,192
2024F	3,885	13,281
2025F	4,199	14,438
2026F	4,534	15,671

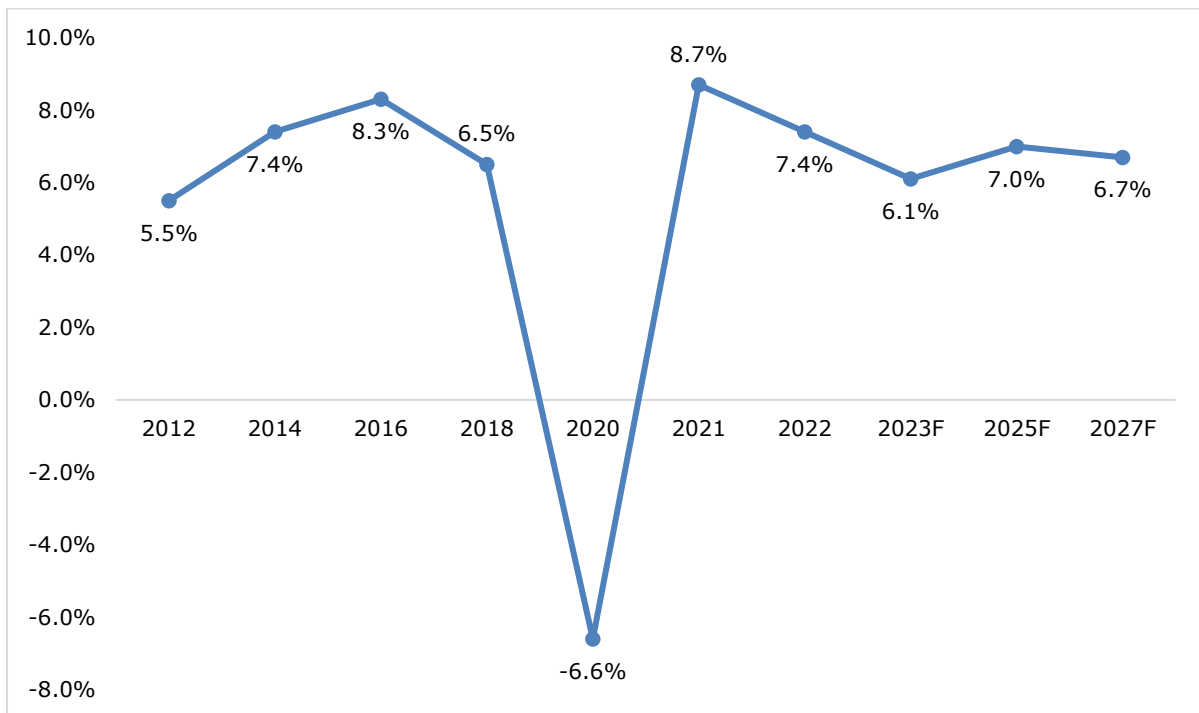
Source: World Bank, Frost & Sullivan Analysis

GDP growth rate

India witnessed a GDP growth rate of 7.4% in CY 2022 Y-O-Y, largely due to investments in the infrastructure and manufacturing sector. According to Frost & Sullivan Analysis, the medium-term growth outlook is expected to improve and record a growth rate of ~6% by CY2027F, on account of the strong macroeconomic fundamentals which include moderate inflation, implementation of key structural reforms and the improved fiscal and monetary policies. India further needs to boost its rate of employment growth and create 90 million non-farm jobs between 2023 and 2030 to increase productivity and economic growth. The net employment rate needs to grow by 1.5% per annum from 2023 to 2030 to achieve 8-8.5% GDP growth between this period. India's current account deficit (CAD), primarily driven by an increase in the trade deficit, stood at 1.2% of GDP in CY 2021-22.

Opportunities for exporting services, potential for domestic demand, and India's emergence as a desirable investment location will all contribute to the country's robust economic growth in the next 5-7 years.

Exhibit 2: India Real GDP growth - CY 2012-2027F



Source: World Economic Outlook, July 2022, Frost & Sullivan Analysis

1.2.2 Impact of COVID-19 on Indian Chemical Industry and the Future Outlook

India is expected to be the fastest-growing Asian economy in FY24. India's gross domestic product (GDP) growth is expected to average over ~6% during FY24 – the strongest among the largest economies – and contributing 28% and 22% to Asian and Global growth, respectively.

The key change in India's structural story lies in the clear shift in the policy focus towards lifting the productive capacity of the economy. Policymakers and the Government have taken up a series of reforms which are expected to catalyze an upswing in the private capex cycle, helping to improve productivity.

Table 2: India is expected to perform better post global impact of Covid-19

Specialty Chemicals	India will witness growth because of its low manufacturing costs and a resurgence in demand from rapidly developing emerging countries.
	India is expected to emerge as a hotbed for global M&A and strategic alliances. For e.g., 1. In order to strengthen its downstream integration into essential raw materials, the Belgian company, Solvay, invested in the Indian company Catasynth Specialty; 2. Frutarom, an Israeli company, may expand its market reach in rapidly developing nations like India; for example, they recently bought Sonarome (manufacturer of flavour and fragrances in India).
Agrochemicals	China accounts for over 50% of total agrochemical imports of India. Indian firms are expanding their product offerings, technical expertise and distribution networks by strengthening their inorganic growth via acquisitions or consolidations For e.g., 1. UPL, a company located in India, acquired the Chinese agrochemical firm Yoloo Biotechnology Co., enabling it to increase its technological offerings and product registrations; 2. Godrej Agrovet expanded into fungicides after purchasing Astec Lifesciences, an Indian company, and to strengthen its backward integration capabilities.
	Most of the imports involve intermediates and not the final product.
	Capacity utilisation of Chinese manufacturers is plummeting as Indian firms have started importing from other countries.
Paints, Dyes and Pigments	Indian businesses produce a significant portion of chemical intermediates for the domestic market, although they continue to rely on China for several colour intermediates.
	Due to the dependency on China for imports, there will be a short-term impact on input costs for the dye industry. Players involved in domestic integrated dye manufacturing would be better equipped to handle this problem.
	Low petroleum prices will temporarily boost the paint industry. However, long-term demand may remain muted, apart from basic demand in the segment from continued refurbishments and construction activities.
Chemical and Pharma APIs	Chinese imports of Key Starting Material (KSM) and Active Pharmaceutical Ingredient (API) are a major source of supply for Indian bulk pharma and formulation industries.
	China had resumed production a year back. The prices have undergone a cycle of upward revision and now being normalized, faring well for Indian pharma industry.
	Long-term benefits are anticipated for Indian API and chemical intermediate businesses, as clients look for other sources of raw materials, other than China.

Source: Investing.com, Press Information Bureau - Government of India, industry reports, News articles, Frost & Sullivan Analysis

2 Global and Indian Chemical and Specialty Chemicals Market

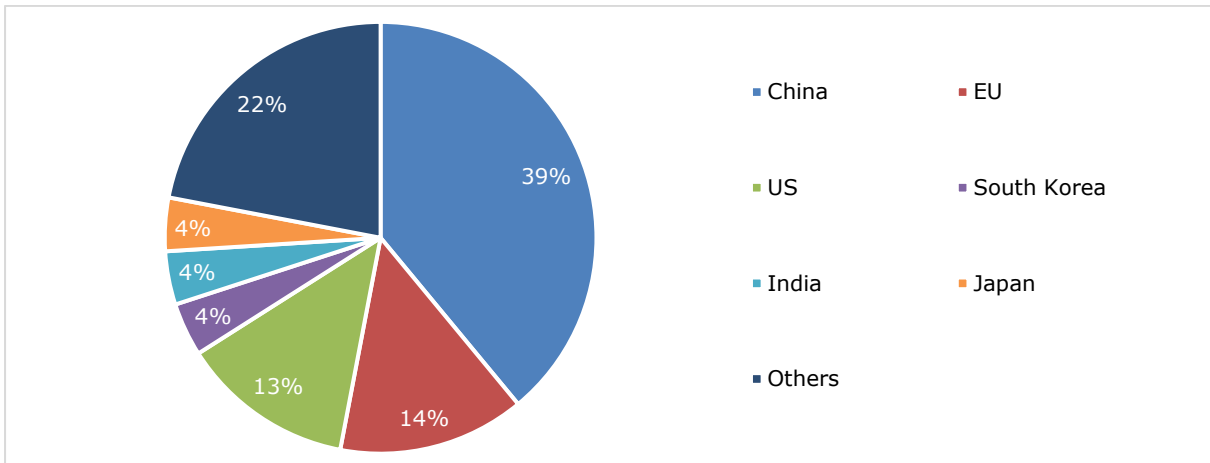


**Global and Indian Chemical and Specialty
Chemicals Market**

2.1 Global Chemicals Market

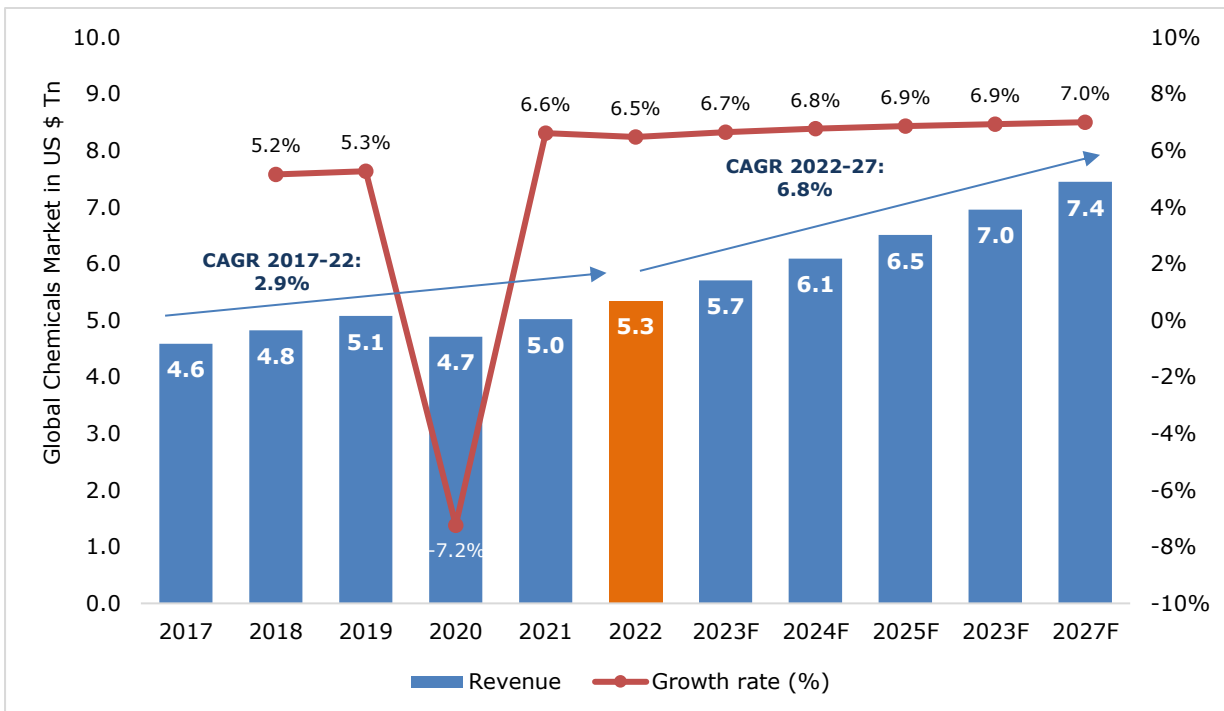
The global chemicals industry is expected to grow from USD 5,348 Bn in CY 2022 to USD 7,445 Bn in 2027 at a CAGR of 6.8%. China held a substantial market share by value (39%) in 2022, followed by the US (13%). Indian chemicals industry has emerged as a key player with a global market share of ~4% by value in CY2022. The country's chemicals industry is de-licensed, except for few hazardous chemicals. India holds a strong position in export of chemicals at a global level and ranks 14th in exports for CY2022. At the same time, India is a key importer of chemicals and ranks 8th at a global level by value in CY2022.

Exhibit 3: Global Chemicals Market* – Country-wise break-up (value share by production) CY 2022



Source: Annual Reports of relevant stakeholders, Secondary sources

Exhibit 4: Global Chemicals Market (USD Tn) CY 2017-2027F

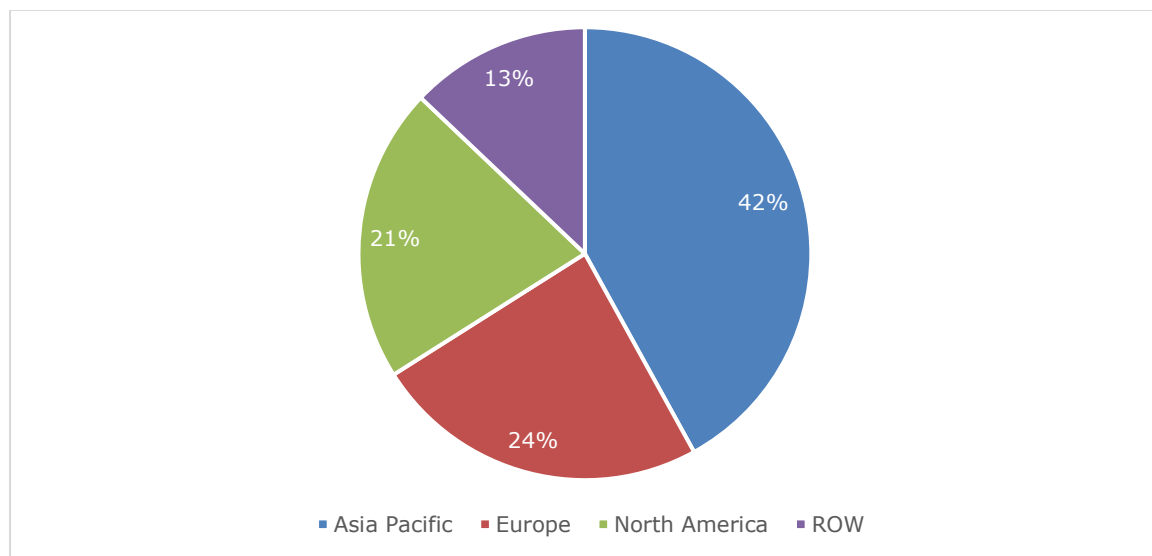


Source: Annual Reports of relevant stakeholders, F&S [Note: Numbers are derived using market numbers available in annual reports of stakeholders]

2.1.1 Global Specialty Chemicals Market

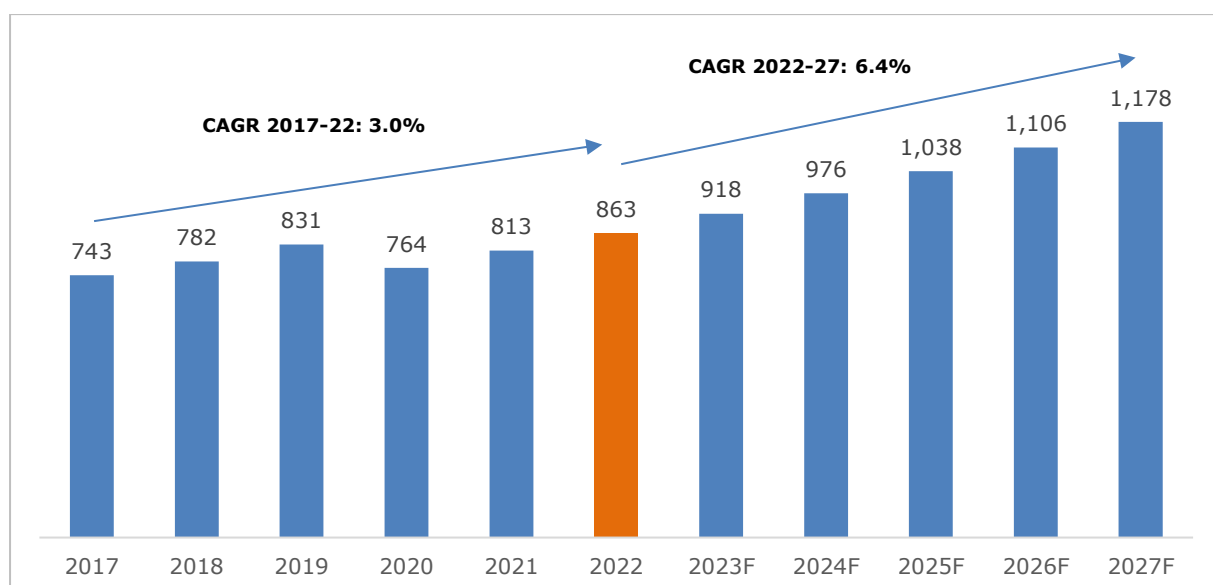
The global specialty chemicals market is expected to grow from USD 863 Bn in 2022 to USD 1,178 Bn in 2027 at a CAGR of 6.4%. This market growth is being driven by increasing demand for high-performance and function-specific chemicals across various end-use industries such as oil and gas, pulp and paper, and personal care and cosmetics. These chemicals are referred to as specialties because they are produced in lesser volumes and cater to only a few applications unlike the rest of the fine and commodity chemicals.

Exhibit 5: Global Specialty Chemicals Market – Region-wise break-up (Sales value share) – CY 2022



Source: Annual Reports of relevant stakeholders, Secondary sources

Exhibit 6: Global Specialty Chemicals Market (USD Billion) CY 2017-2027F



Source: Secondary Sources [annual report of prominent market participants for last 3 years], F&S

2.1.2 Segmentation by major industry wide uses and application

- **Agrochemicals** - Growth drivers like high population and subsequent increase in the demand for food, soil degradation, limited agricultural land, increase in awareness amongst consumers regarding the benefits of agrochemicals will aid the growth of the agrochemical industry. New demand for agricultural products would also be created by the use of agricultural products for industrial applications such as in fuel blending and polymer manufacturing, opening up new avenues of applications for agrochemicals. In India, the Indian government is encouraging the growth of the agrochemical manufacturing through the 'Make in India' initiative.
- **Construction** – Rise in construction projects across emerging markets in the world and increased adoption of construction chemicals for improvement in quality of projects is driving the construction sector. 'Smart City' projects by the Indian government are driving growth of plastics and polymer producing chemical companies in India. Availability of essential raw materials at low cost is anticipated to increase demand for construction chemicals.
- **Water treatment** - Increasing urbanisation and population is driving the demand for safe drinking water. Moreover, rising awareness of hygiene among the people is leading to increased water consumption. The concept of circular economy is also fuelling the re-use of industrial, agricultural and municipal water which will further drive the demand for water treatment chemicals.
- **Paints & coatings** - Increase in urbanisation, increase in middle-income households, high replacement demand, increase in per capita income, shortening of repainting cycles and the launch of innovative products at quicker pace are the factors driving the paints and coatings industry.
- **Personal care** - Industries such as cosmetics and FMCG are poised for robust growth with the pandemic receding and consumer spending levels increasing. This augurs well for segments such as perfumery cosmetics, essential oils, and sensory products where India has a competitive edge. While this would increase the consumption of specialty chemicals, it would also increase the usage of chemicals used in packaging of these products.

Exhibit 7: End-user segments and their contribution to the overall specialty chemicals market (CY 2017, 2022 and 2027F), Value share in USD Bn (Global)

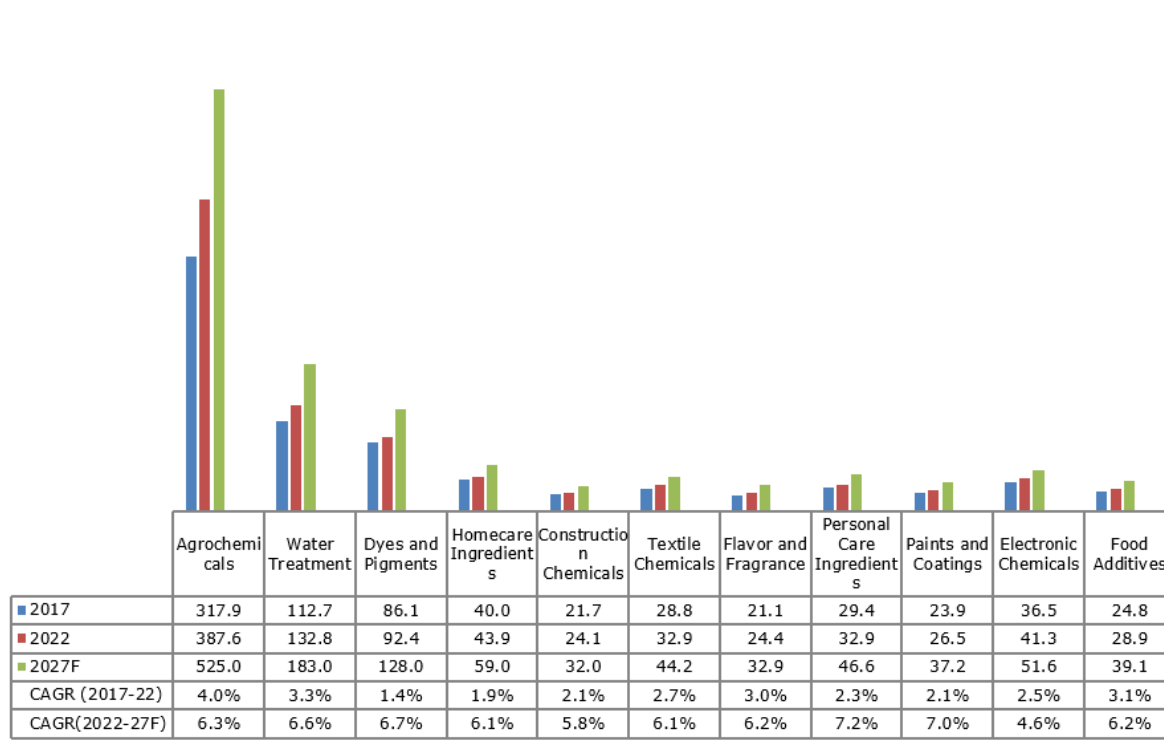
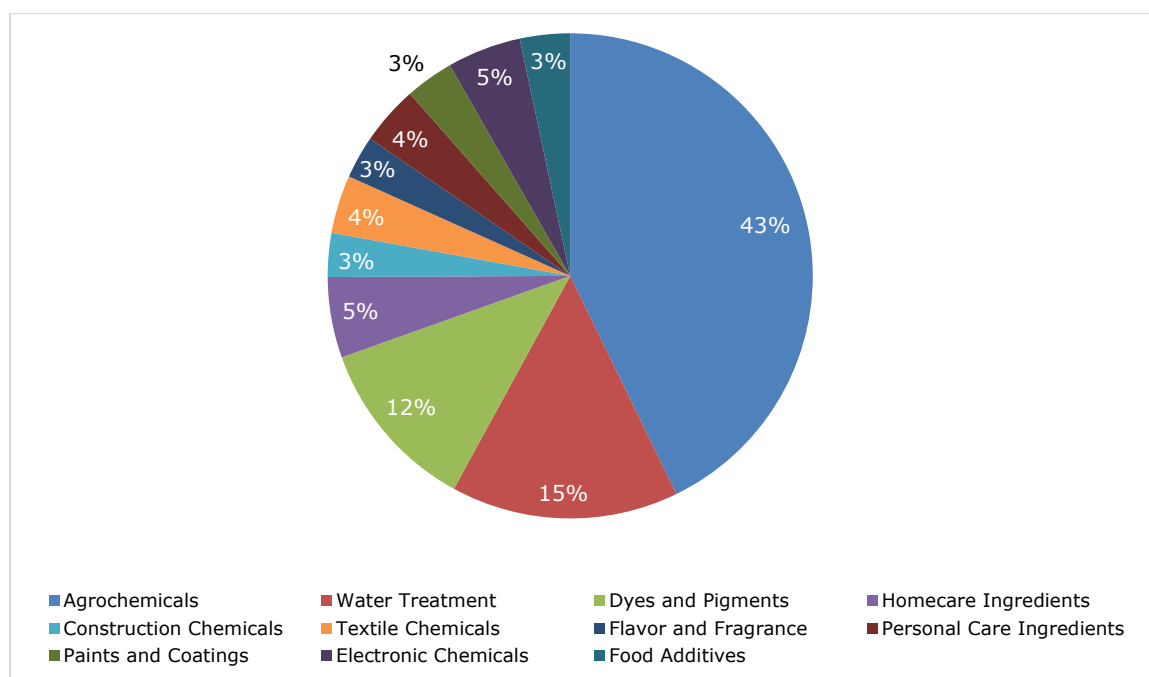


Exhibit 7.1: End-user segments and their contribution to the overall specialty chemicals market (CY 2022), % share (Global)

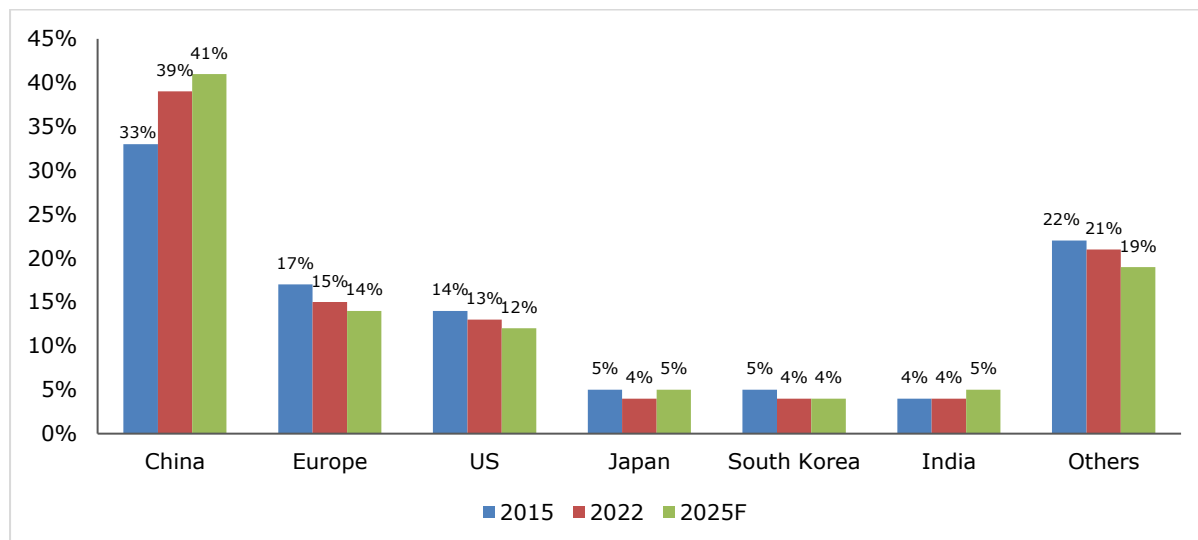


Source: Clean Science and Technology's annual report 2021-22, Secondary sources, F&S

2.1.3 Segmentation by geographies

China has ruled the roost in both value and volume terms over the last 7-8 years with almost 40% market share. China is expected to continue its market leadership going forward.

Exhibit 8: Leading Countries by Production (% Share) CY – 2015,2022, 2025F



Source: Anupam Rasayan's Annual Report 2022-23, F&S

The chemical capacities in Europe and North America, in the next 5-7 years will shrink owing to stringent climate norms. If no new trade restrictions are put in place, Indian manufacturers that export to regulated markets and maintain compliance standards will continue to grow.

2.1.4 Key Drivers - Global Specialty Chemicals Market

- Surging demand for personal care products:** Even post pandemic, its effects continue to sweep across the globe. Leading manufacturers are observing a considerable increase in the demand for hygiene products, such as hand sanitizers, liquid soaps, disinfectant sprays, and germ safeguard wipes. Over the past 12-18 months, chemical companies have noticed an expansion in the consumption of specialty items.
- Expansion and collaborations:** Global chemical giants are now resorting to inorganic growth measures to expand their product portfolios. Companies are looking to integrate across the full value chain to minimize the effect of supply chain disruptions and improve cost structures. In Jan 2021, Huntsman announced acquisition of Gabriel Performance Products, a North American manufacturing company dealing with specialty additives and epoxy curing agents, with the goal of expanding its product portfolio. Another example is of Lanxess which signed an agreement with Intace SAS, a French biocide company, in January 2021 to expand its business and achieve a competitive advantage as one of the world's leading manufacturers of antimicrobial biocides and fungicides for the packaging sector. Such arrangements help to unlock potential synergies existing between the companies.

- Growing R&D expenditure:** Companies around the world are increasingly focusing on improvising specialty chemicals by continuously investing in research & development activities. The sector has seen increased R&D activities that would embrace growth opportunities and play a pivotal role for chemical companies in cementing their presence in the global specialty chemical industry. Companies are strategically focusing on becoming a benchmark in specialty chemicals and pharmaceuticals space.

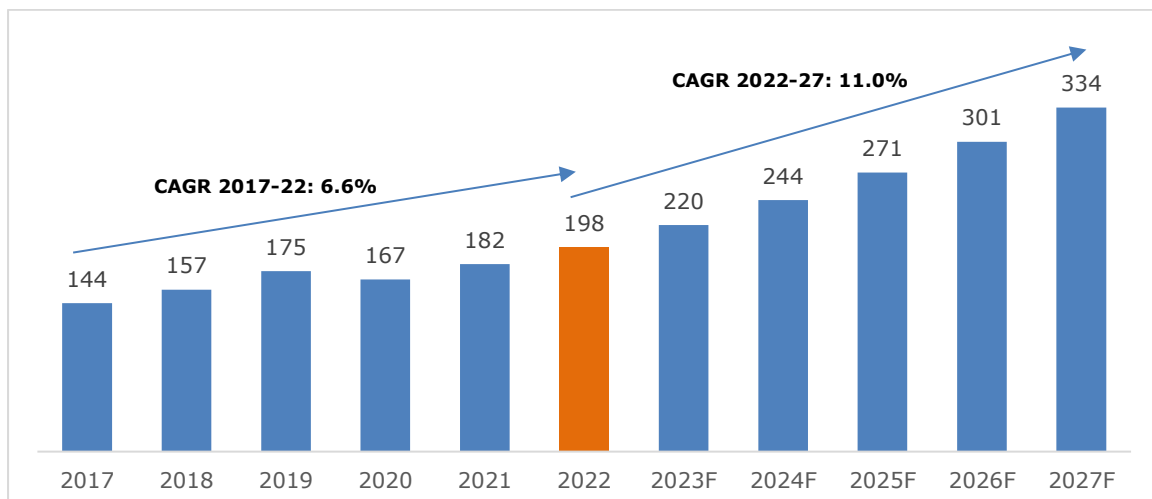
2.2 India Chemicals and Specialty Chemicals Market

2.2.1 India Chemicals Market

The chemical industry in India is highly diversified and can be broadly classified into bulk chemicals, specialty chemicals, agrochemicals, petrochemicals, polymers and fertilisers. The Indian chemical industry is expected to grow from USD 198 Bn in 2022 to USD 334 Bn in 2027 at a CAGR of 11%. Between 2023 and 2025, it is anticipated to draw investments of around USD 100 Bn. As multinationals are looking for an alternative to China to avoid further disruptions in supply, India’s chemical industry stands in a favourable spot to profit from this shift and take a sizable share of the market.

In terms of the worldwide sale of chemicals, India is one of the major chemical marketplaces and is rated sixth globally and fourth in Asia in CY2022. 3.5% of the world's chemical sales come from India. The nation manufactures more than 80,000 chemicals, which are used in a variety of end-use industries, such as textiles, automotive, agricultural, packaging, pharmaceuticals, healthcare, construction, electrical, and electronics. The chemical industry has a significant impact on every aspect of the Indian economy including the jobs being created by the sector.

Exhibit 9: India Chemicals Market (in USD Bn) CY 2017-2027F



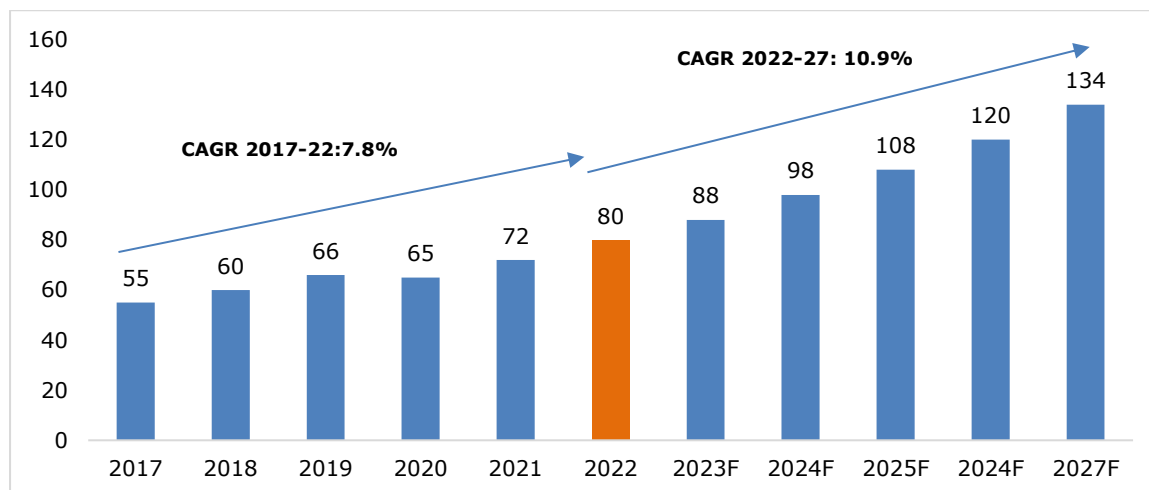
Sources: Annual reports and F&S estimation

Note: The market numbers do not comprise the petrochemicals share.

2.2.2 India Specialty Chemicals Market

The Indian specialty chemical industry is expected to grow from USD 80 Bn in 2022 to USD 134 Bn in 2027 at a CAGR of 10.9%.

Exhibit 10: Indian Specialty Chemicals Market (USD billion), CY 2017 to 2027F



Source: Secondary Sources, F&S

- India's specialty chemicals industry, driven by domestic and exports consumption, will continue to gain favour from global MNCs on account of the geopolitical shift post the outbreak of the COVID-19 pandemic.
- Increasing demand for high-performance and function-specific chemicals across end-use industries such as agrochemicals, pharmaceuticals, dyes & pigments, and paints & coatings is expected to be one of the major market growth factors.
- The other major factors attributed to the remarkable growth are the numerous applications in the pharmaceutical industry such as manufacturing of drugs for the treatment of skin diseases, cardiovascular diseases, and Hughes Syndrome.
- Crop protection and high yield products are the key market trends shaping the speciality agrochemicals market. Growing awareness amongst farmers regarding the application of pesticides in farm management is expected to boost the growth of the speciality chemicals market.
- Moreover, with the rising population, the demand for food products have increased which in turn will increase demand for pesticides with higher crop yields per hectare of land, fuelling specialty chemicals market growth during the forecast period. This move is orchestrated by the China + 1 strategy, wherein companies are looking to significantly reduce their dependence on China.

Key Trends of the Market

Some of the key trends of the India specialty chemicals market are:

Petrochemicals: Petrochemical products such as oxo-alcohols, acrylic acid, acrylic monomers, and specialty plasticizers continue to gain traction due to applications in various end user industries including paints and coatings, adhesives, a variety of flexible PVC applications such as wires and cables, and as solvents in the chemical industry. Since the petrochemicals segment caters largely to non-essential end user industries, 2022

witnessed increased level of participation from the public sector which is expected to boost possibilities of utilising by-products of petroleum and petrochemical industries for production of crucial intermediates for pharma and agro-chemical industries.

Agriculture: There is a strong impetus from the government to create a conducive Agri policy environment to help improve smallholder farmers' income. Even the recent regulatory guidelines on gene editing and deregulation of drones in agriculture are positive steps forward that will promote digitization and mechanization in the agricultural sector. Several companies have directed their efforts in advancing drone applications in India and making them accessible to smallholder growers. In horticulture, there is an adoption of a well-connected supply chain linked to city clusters. Agri exports, on the other hand, could see the need for produce certification. This will help established crop-focused value chains to address the major pain points of smallholders of accessing good quality inputs, agronomy knowledge and labour shortage, thereby driving mechanization with a strong linkage to produce markets.

Food and personal care: The industry is witnessing an increasing trend of environmentally viable and sustainable solutions in areas such as textile solutions. Owing to pandemic, few businesses were affected by volatile feedstock prices and currency fluctuations, which to some extent was contained through localization of resources, portfolio mix alteration, customer mix and price management.

2.3 Key Growth Drivers of the Market

Some of the key drivers of the Indian specialty chemicals market are:

- **Promising macroeconomic scenario:** The growth of the specialty chemical segment is anticipated to be driven by two major factors: tailwinds from shift in global supply and recovery in demand from the end-user industries. This is attributed to the growing end-use markets such as construction, textile, automotive and consumer durables, increased raw material availability amongst others. India is expected to grow at the second highest rate after China and is placed better in terms of labour cost, global trade dynamics and uncertainties, relatively lenient environmental norms, and regulatory policies to name a few.

Comparison of labour charges – India vs China

Labour Charges

India	US\$ 0.92/hour
China	US\$ 3.52/hour

Source: <https://eadn-wc03-877922.nxedge.io/cdn/wp-content/uploads/2015/11/MES-White-Paper-Series-China-vs.-India.-A-Sourcing-Experience.pdf>

- **R&D DNA of Indian manufacturers:** Since inception, product portfolio of most of the Indian manufacturers has grown rapidly based on their R&D expertise. This insulates the companies from any slowdown in a particular product or category and de-risks their business model. Such products, being of higher value and of strategic importance to customers, cater to multiple end-user industries, such as, agrochemicals and pharmaceuticals. More importantly, an extensive product portfolio helps the organizations to win more customers across the globe as it meets multiple requirements and functionalities.

- **Make In India campaign further bolstering the speciality chemicals sector:**
The Government of India has been rigorously implementing different initiatives and schemes to add impetus to the emergence of India as a manufacturing hub for the chemicals industry in the medium term. The Government is providing incentives, subsidies and grants under this campaign. Indian companies could benefit from these initiatives and could further reduce their dependencies on imports of raw material and ingredients.

3 Overview of Identified Product Groups (Global and India)



3.1 Acid Chlorides

3.1.1 Overall market size, historical and projected growth of Acid Chlorides

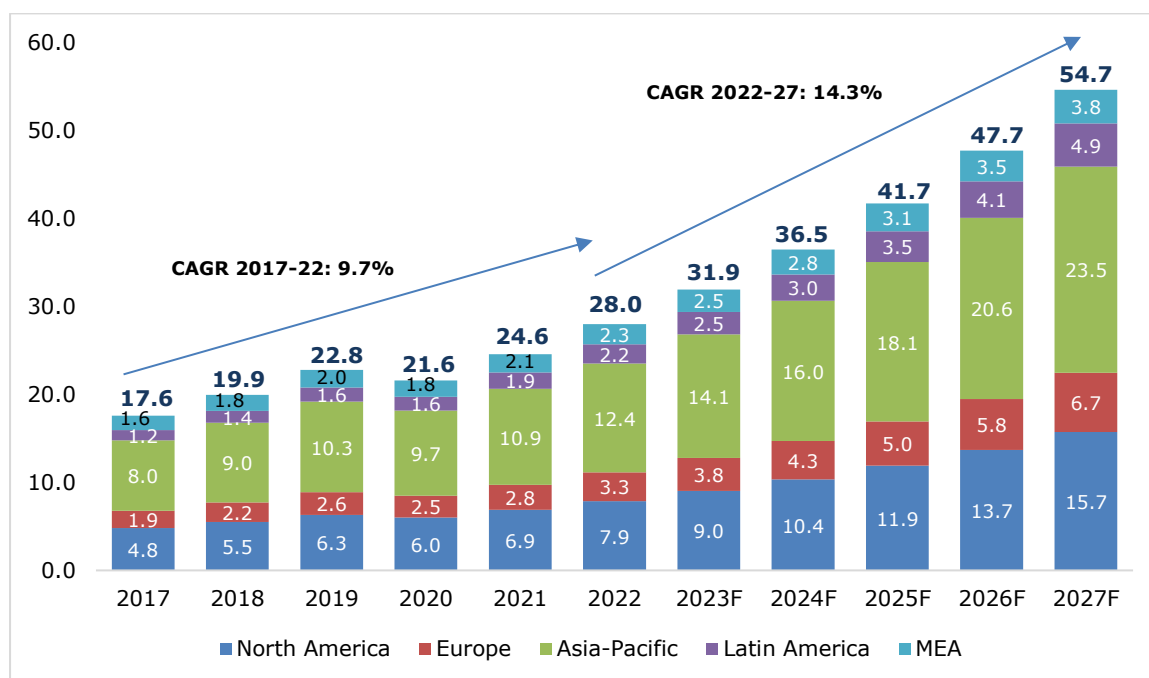
Acid Chlorides are compounds that are produced by reacting carboxylic acids with chlorosulfuric, phosphorus trichloride or thionyl chloride. Phosgene is used as an intermediate for manufacturing different acid chlorides. Products from these reactions find their use in various industries such as pharmaceuticals, polymers, agrochemicals, etc.

Acid Chlorides are primary ingredients for different products in agrochemicals. They are used for manufacturing different herbicides, pesticides and weed killing drugs. They are also used in manufacturing commercial products such as flavouring agents, perfumes, and resins. Different acid chlorides such as valeroyl chloride, propionyl chloride and pivaloyl chloride are used in pharmaceutical industry as building blocks and protective groups.

Polymers is another major application of acid chlorides. They are required in the automotive industry for manufacturing different parts that involve the use of plastic. With growing demand for fuel efficiency, the metal parts are increasingly being replaced by the plastic ones, giving long term boost to the acid chlorides market.

The Global acid chlorides market was estimated at USD 28,000 million in CY 2022 and is projected to reach USD 54,646 million in CY 2027. The market is expected to witness a CAGR of 14.3% between 2022 and 2027. The rising demand for fuels and oils and the growth of automotive industry will fuel the growth of acid chlorides in the forecast period.

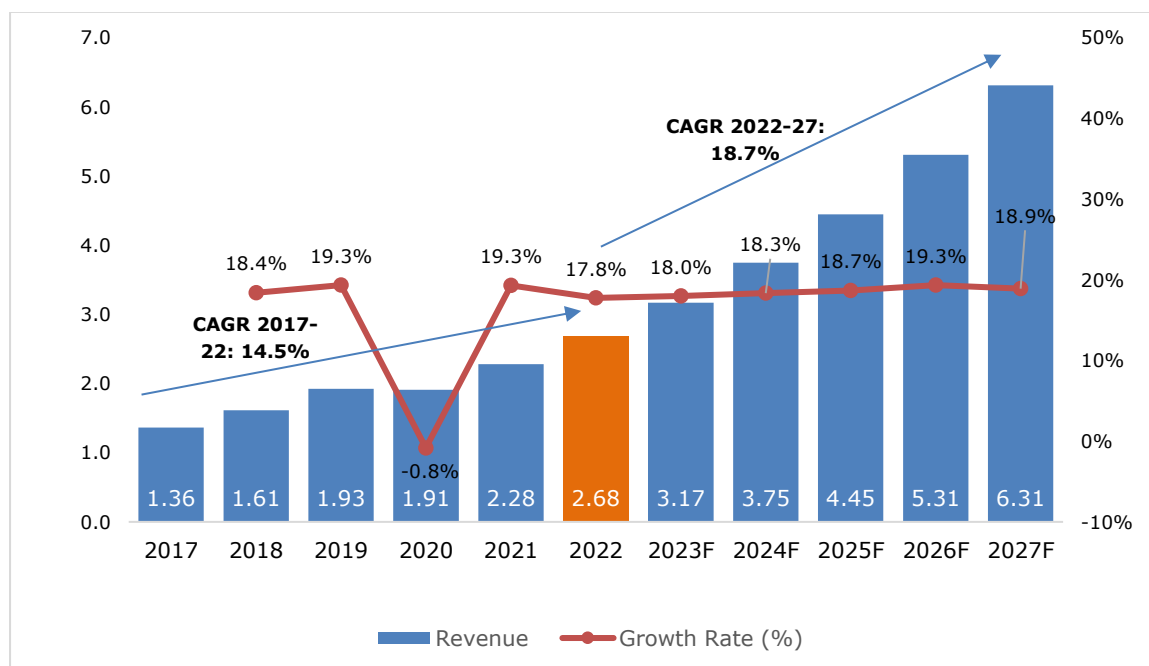
Exhibit 11: Global Acid Chlorides Chemicals Market by Region (USD Bn) CY 2017-2027F



Sources: Annual reports and F&S estimation

The Indian acid chlorides market was estimated at USD 2,684 million in 2022, which is ~1 percent of the Indian Chemical market of 198 Bn in 2022 and is projected to reach USD 6,312 million in 2027. The market is expected to witness a CAGR of ~19% between 2022 and 2027. In India, acid chlorides are majorly used in agrochemicals and polymer application. India is a highly agriculture dependent economy and almost 20% of the GDP share is captured by agriculture segment. In agrochemicals, acid chlorides are used for production of herbicides and pesticides. They are also used for manufacturing many anti-fungal and weed-killing pesticides.

Exhibit 12: India Acid Chlorides Chemicals Market (USD Bn) CY 2017-2027F



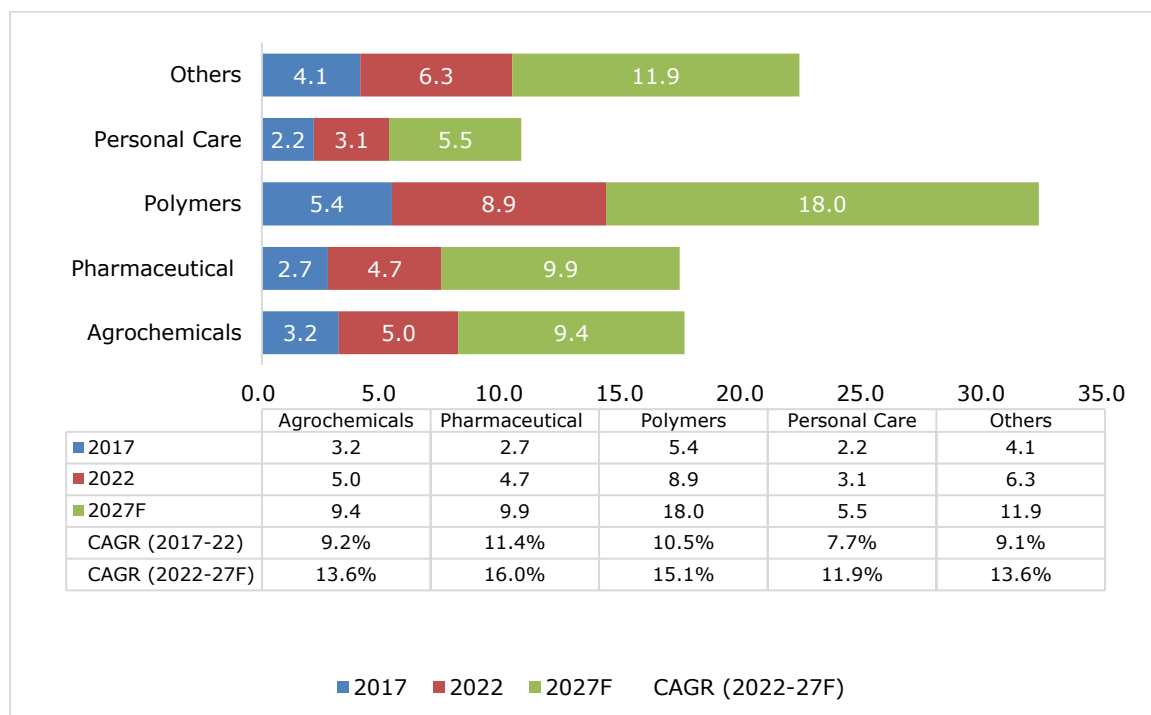
Sources: Annual reports and F&S estimation

Acid Chlorides are further bifurcated into Aromatic Carbonyl Chlorides and Aliphatic Carbonyl Chlorides.

3.1.2 Market size – Acid Chlorides – Global and India – Based on Application

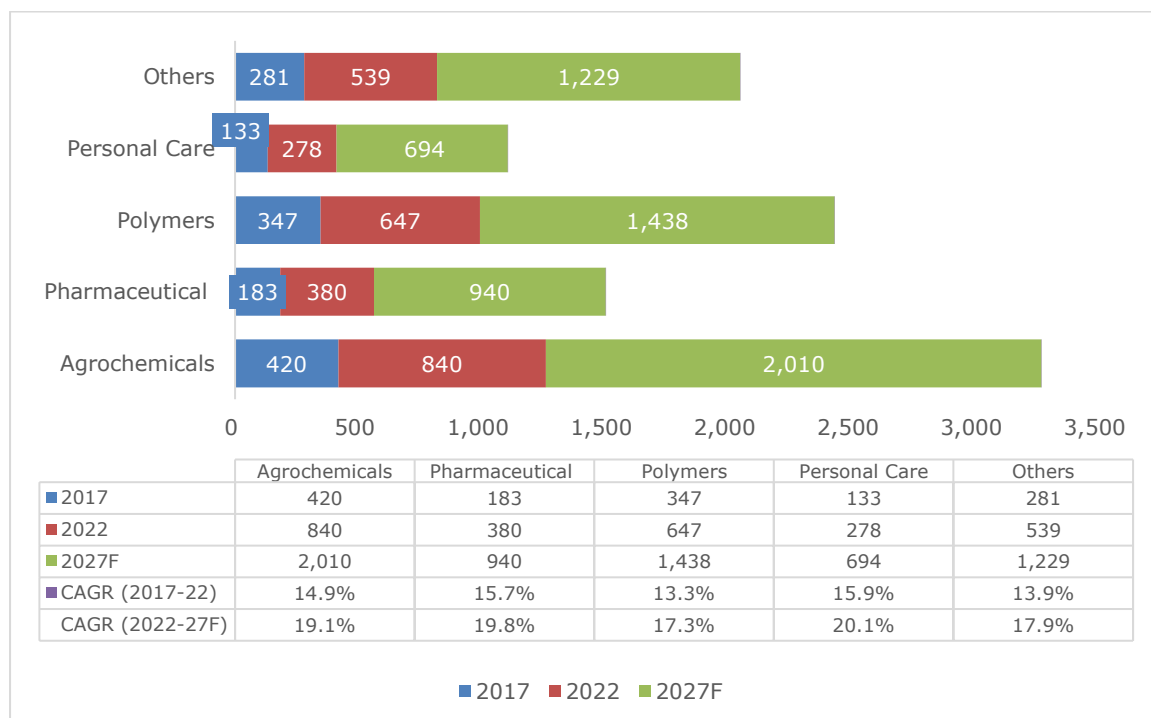
Based on application, pharmaceutical is the fastest growing segment in the forecast period, growing at a CAGR of 15.96% between 2022 to 2027. The requirement of acid chlorides for preparing different types of acetylating agents that are further used for different pharmaceutical formulations is driving the demand of acid chlorides in pharmaceuticals operation. Additionally, it is also used for manufacturing perfumes and tannins in personal care applications. They are also being increasingly used in pigments and polymers. These are some of the growing applications that are contributing to the growth of acid chlorides in the forecast period.

Exhibit 13: Historic and Projected growth of select End-user segments of Acid Chloride, global, in USD bn



Sources: Annual reports and F&S estimation

Exhibit 14: Historic and Projected growth of select End-user segments of Acid Chloride, India, in USD million

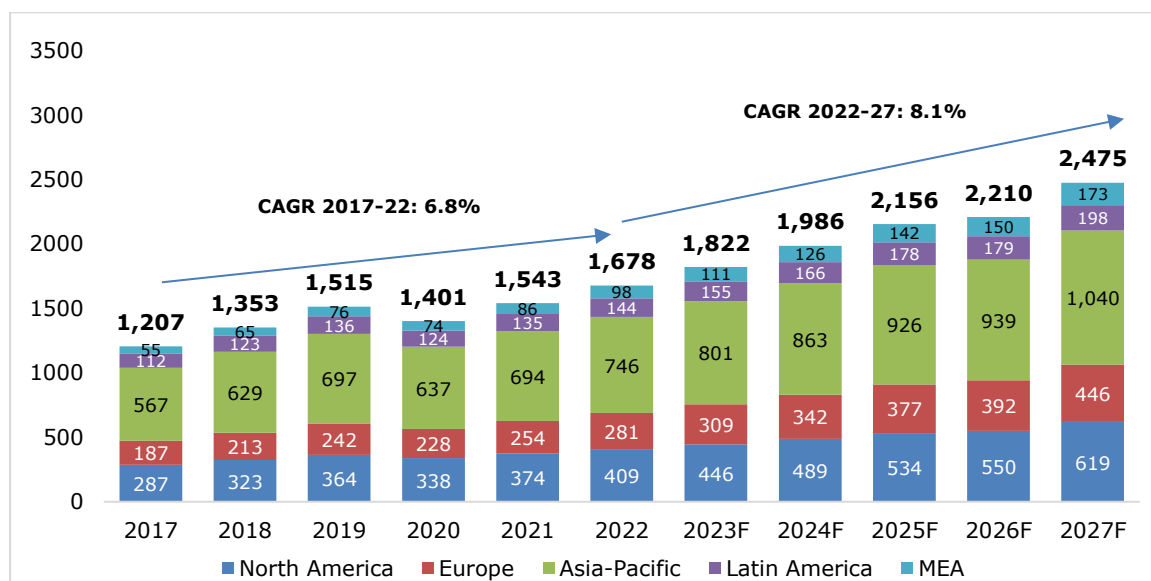


Sources: Annual reports and F&S estimation

3.2 Aromatic Carbonyl Chlorides Market

The Global aromatic carbonyl chloride market was estimated at USD 1,678 million in 2022 and is projected to reach USD 2,475 million by 2027. The market is expected to witness a CAGR of 8.1% between 2022 and 2027. The rising demand of aromatic carbonyl chloride in making organic chemicals, polycarbonate resins, dyestuffs, and isocyanates for making polyurethane resins is driving the demand of aromatic carbonyl chloride in the forecast period.

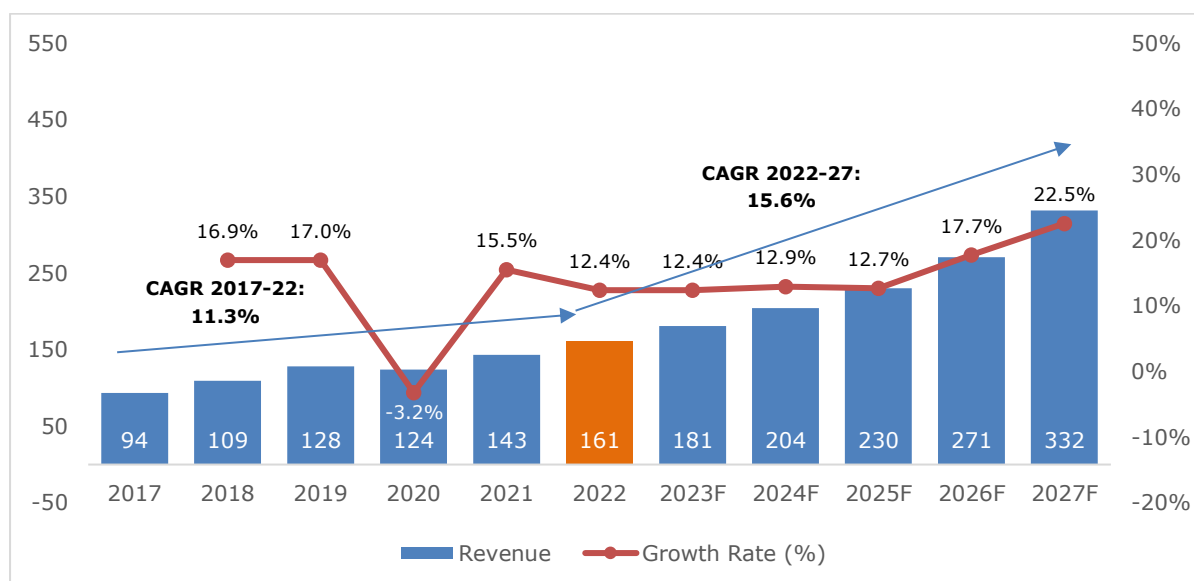
Exhibit 15: Global Aromatic Carbonyl Chloride Market by Region (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

The Indian aromatic carbonyl chlorides market was estimated at USD 161 million in 2022 and is projected to reach USD 332 million by 2027. The market is expected to witness a CAGR of around 15.6% between 2022 and 2027.

Exhibit 16: India Aromatic Carbonyl Chloride Market (USD Million) CY 2017-2027F



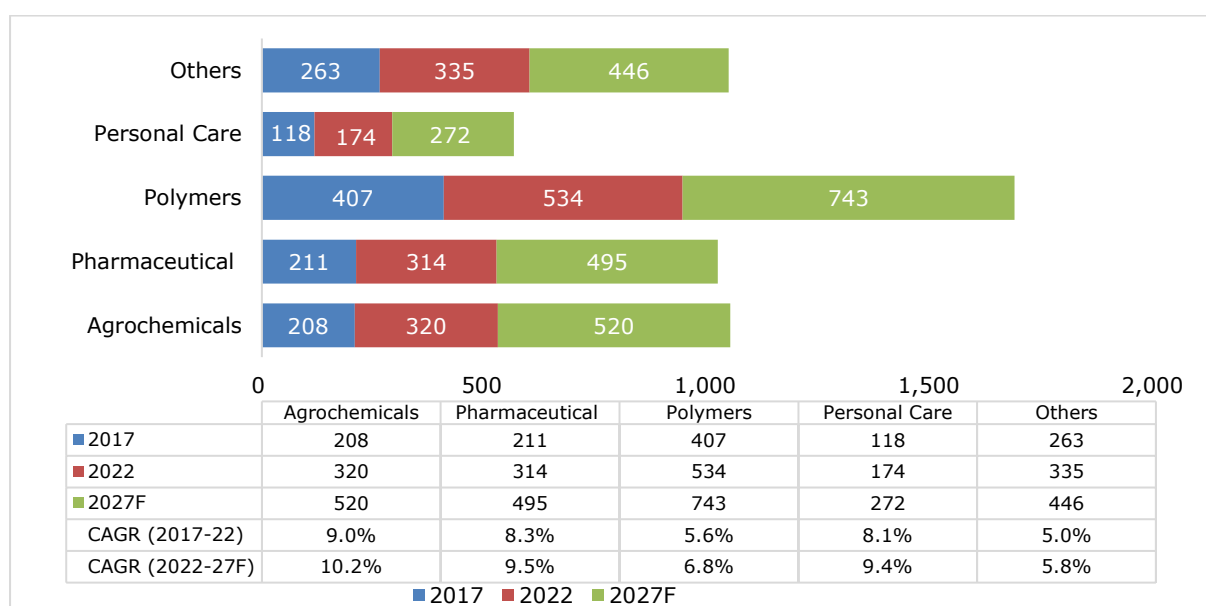
Sources: Annual reports and F&S estimation

3.2.1 Market size – Aromatic Carbonyl Chloride – Global and India – Based on Application

Globally, aromatic carbonyl chlorides are majorly used in polymers and the trend is expected to continue over the forecast period, contributing to around 32% of aromatic carbonyl chloride market in 2022. Polymers made using aromatic carbonyl chloride hold a market size of USD 534 million in 2022 and is expected to reach a value of USD 743 million by 2027. Some of the major applications in the polymer industry include production of plastics, dyes and pigments.

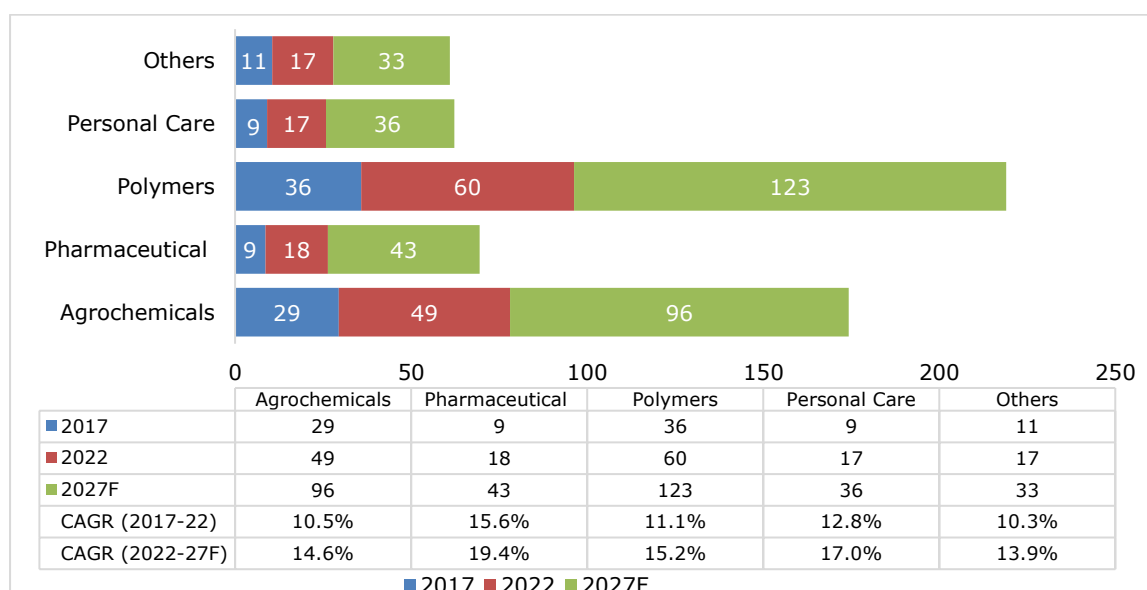
Additionally, aromatic carbonyl chlorides are required in commercially important medicines such as acetaminophen and aspirin and have applications in agriculture and personal care.

Exhibit 17: Historic and Projected growth of select End-user segments of Aromatic Carbonyl Chloride, global, in USD million



Sources: Annual reports and F&S estimation

Exhibit 18: Historic and Projected growth of select End-user segments of Aromatic Carbonyl Chloride in India, in USD million

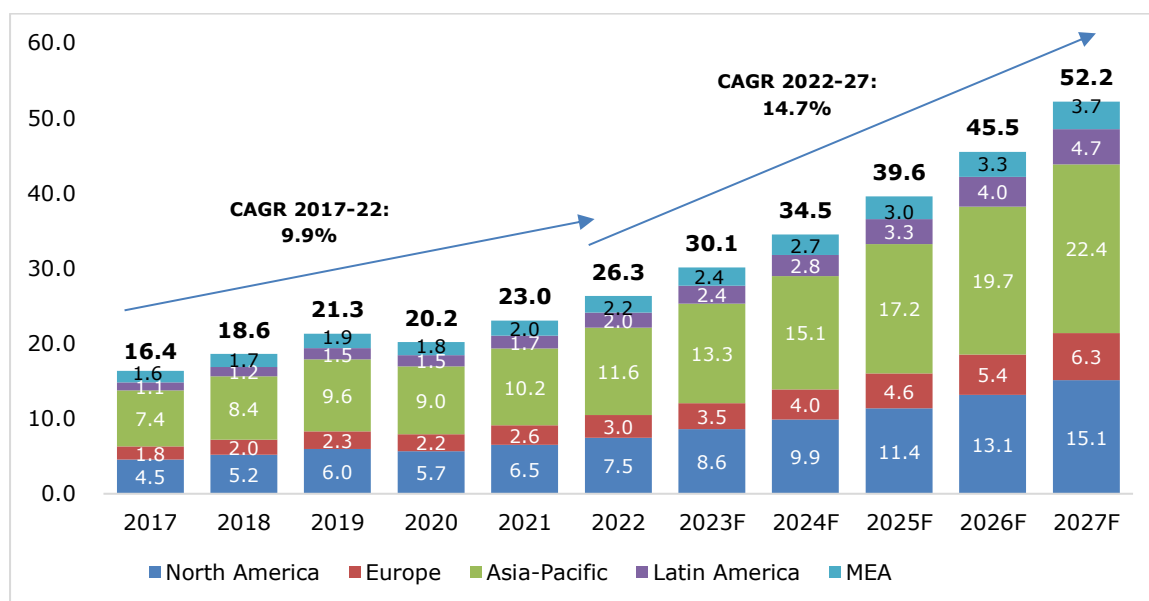


Sources: Annual reports and F&S estimation

3.3 Aliphatic Carbonyl Chlorides Market

Aliphatic compounds can be acyclic or cyclic which means they can contain either close chains or rings of carbon atoms in their molecule. The Global aliphatic carbonyl chloride market was estimated at USD 26,322 million in 2022 and is projected to reach USD 52,171 million by 2027. The market is expected to witness a CAGR of 14.7% between 2022 and 2027. The rising demand of aliphatic carbonyl chloride in manufacturing products such as household cosmetics and chemicals, pesticides, fuels, and essential oils is driving the growth of aliphatic carbonyl chlorides in the forecast period.

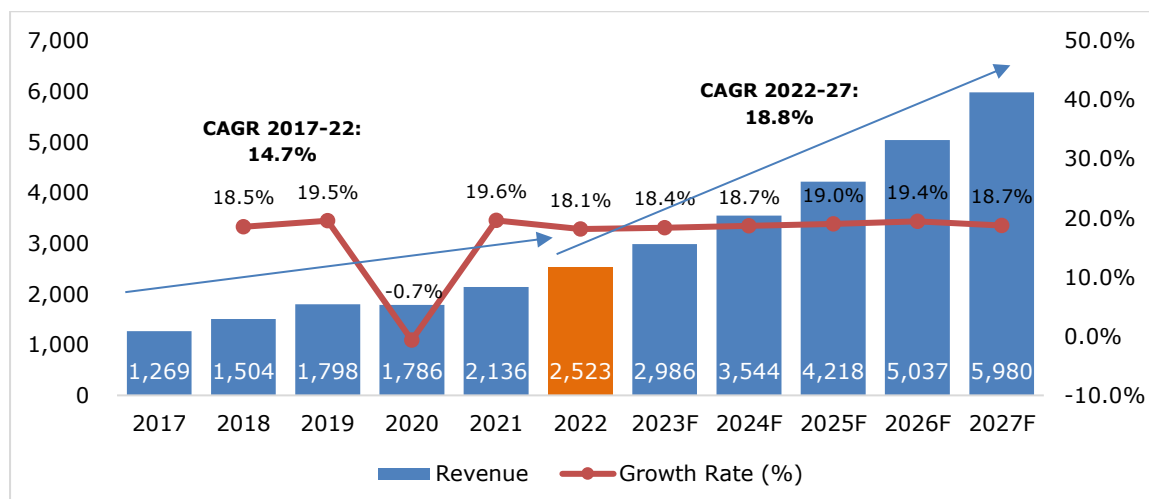
Exhibit 19: Global Aliphatic Carbonyl Chloride Market by Region (USD Bn) CY 2017-2027F



Sources: Annual reports and F&S estimation

The Indian aliphatic carbonyl chlorides market was estimated at USD 2,523 million in 2022 and is projected to reach USD 5,980 million by 2027. The market is expected to witness a CAGR of around 18.8% between 2022 and 2027.

Exhibit 20: India Aliphatic Carbonyl Chloride Market (USD Million) CY 2017-2027F

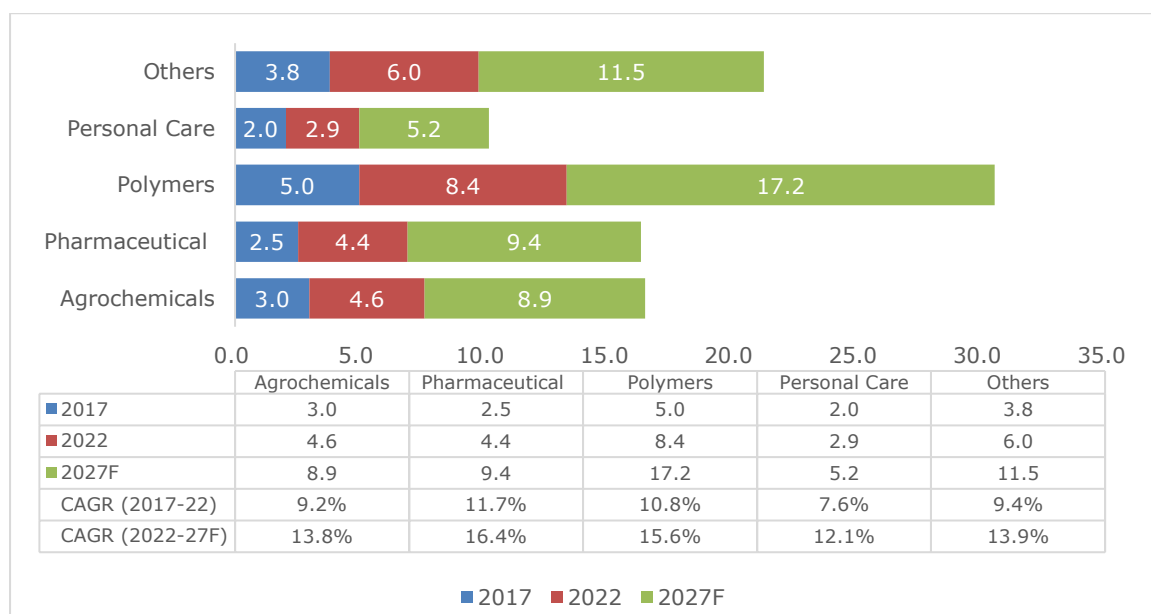


Sources: Annual reports and F&S estimation

3.3.1 Market size – Aliphatic Carbonyl Chloride– Global and India – Based on Application

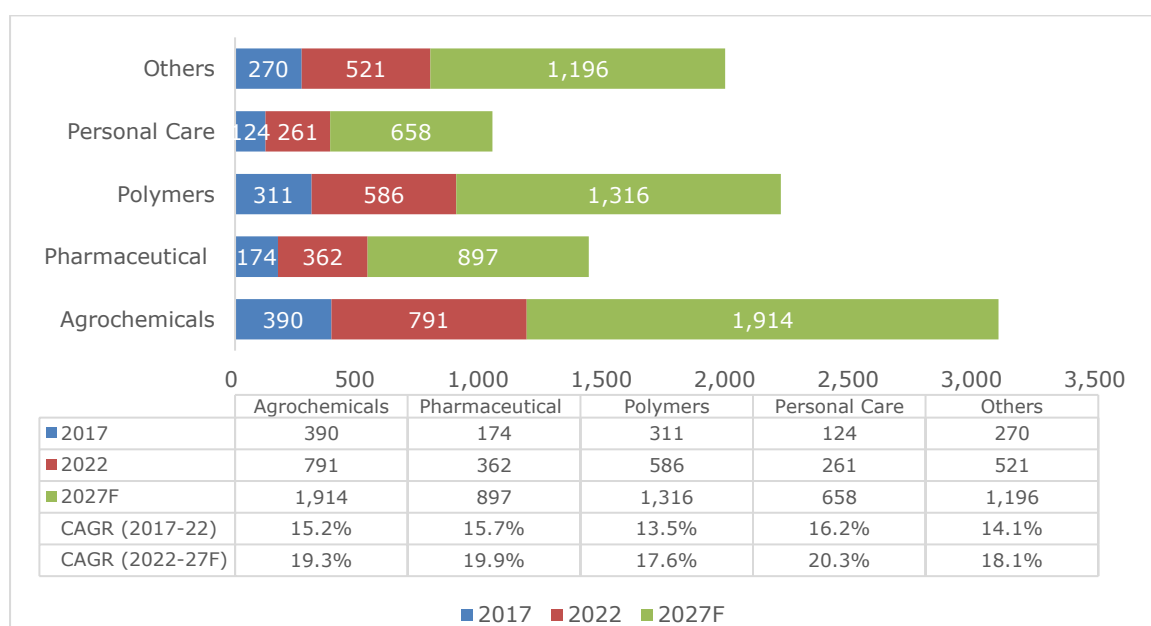
Globally, aliphatic carbonyl chlorides are majorly used in polymers and the trend is expected to continue over the forecast period. Polymers made using aliphatic carbonyl chloride hold a market size of USD 8,353 million in 2022 and is expected to reach a value of USD 17,216 million by 2027. Aliphatic carbonyl chlorides are also used in making fuels and essential oils. This is the major reason why the “Others” segment captured around 23% market share of the total aliphatic carbonyl chloride market in 2022. They are also actively used in pesticides and cosmetic products.

Exhibit 21: Historic and Projected growth of select End-user segments of Aliphatic Carbonyl Chloride, Global, in USD bn



Sources: Annual reports and F&S estimation

Exhibit 22: Historic and Projected growth of select End-user segments of Aliphatic Carbonyl Chloride, India, in USD million



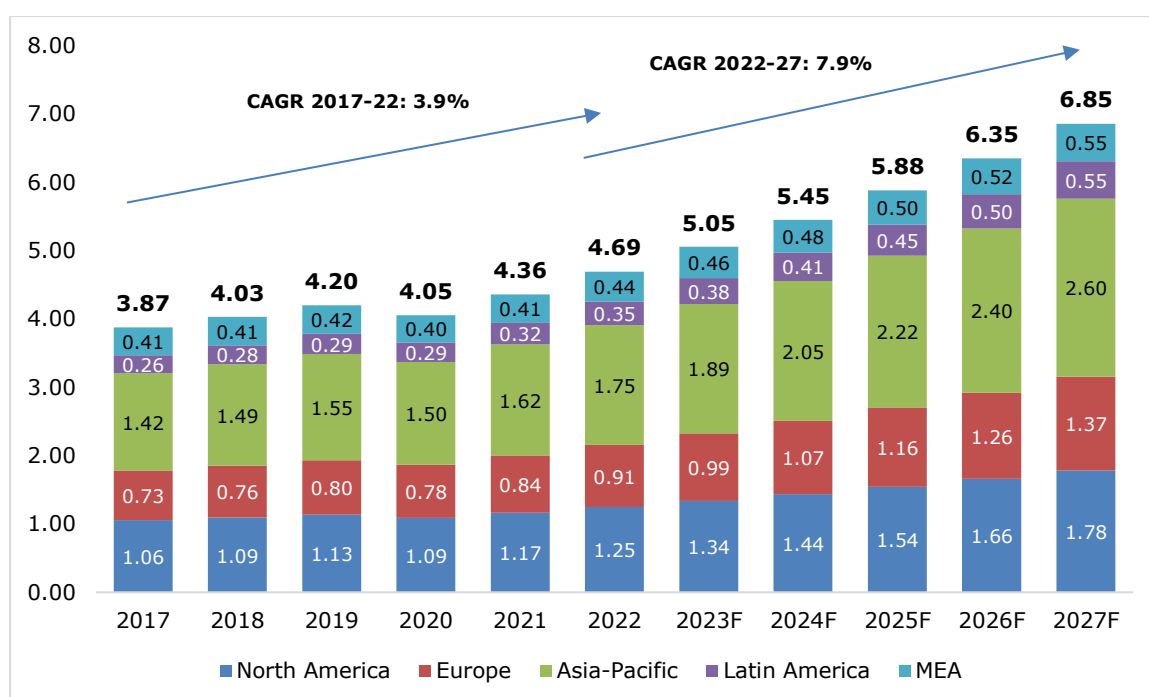
Sources: Annual reports and F&S estimation

3.4 Aromatic and Fluoro Aromatic Nitriles

3.4.1 Overall market size, historical and projected growth of Aromatic and Fluoro Aromatic Nitriles

Aromatic and Fluoro Aromatic Nitriles are often prepared in the laboratory from aniline through diazonium compounds. Exposure to nitriles by humans can result in hepatic, neurologic, cardiovascular, renal, and gastrointestinal disorders. The Global aromatic and fluoro aromatic nitriles market was estimated at USD 4,690 million in 2022 and is projected to reach USD 6,854 million by 2027. The market is expected to witness a CAGR of 7.9% between 2022 and 2027. Polymers application is the major application of the aromatic and fluoro aromatic nitriles chemicals. This is majorly attributed to the increasing demand of aromatic and fluoro aromatic nitriles in making gloves, seals, and hoses.

Exhibit 23: Global Aromatic and Fluoro Aromatic Nitriles Chemicals Market by Region (USD Bn) CY 2017-2027F

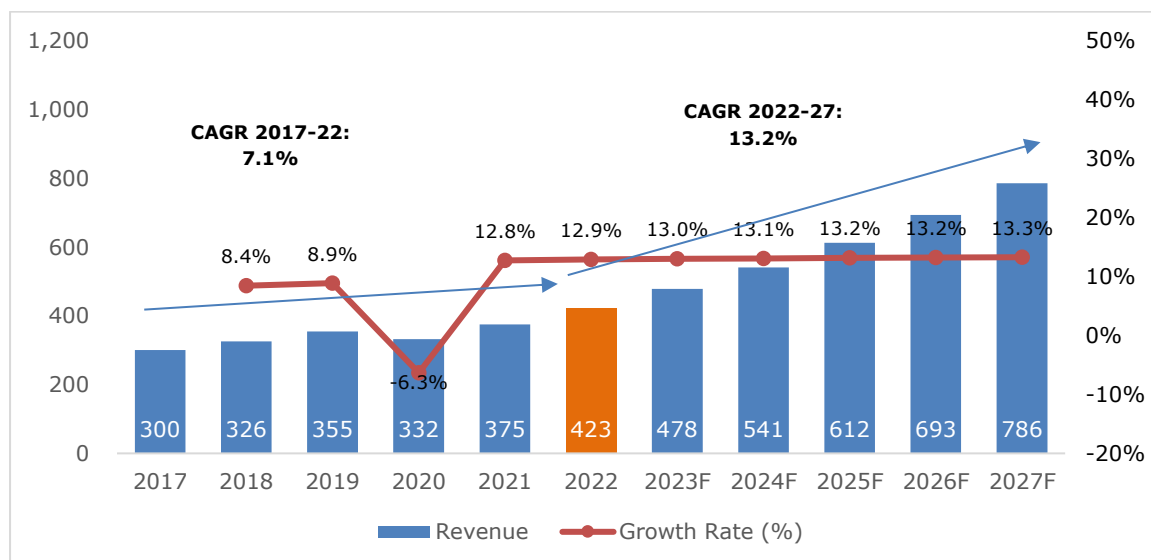


Sources: Annual reports and F&S estimation

The Indian aromatic and fluoro aromatic nitriles market was estimated at USD 423 million in 2022 and is projected to reach USD 786 million by 2027. The market is expected to witness a CAGR of around 13.2% between 2022 and 2027.

In India, aromatic and fluoro aromatic nitriles are majorly used in polymer, pharmaceuticals, adhesives, and personal care. The growing polymer industry coupled with increasing investments in pharmaceuticals industry by Indian government is driving the aromatic and fluoro aromatic nitriles market in India.

Exhibit 24: India Aromatic and Fluoro Aromatic Nitriles Chemicals Market (USD Million) CY 2017-2027F

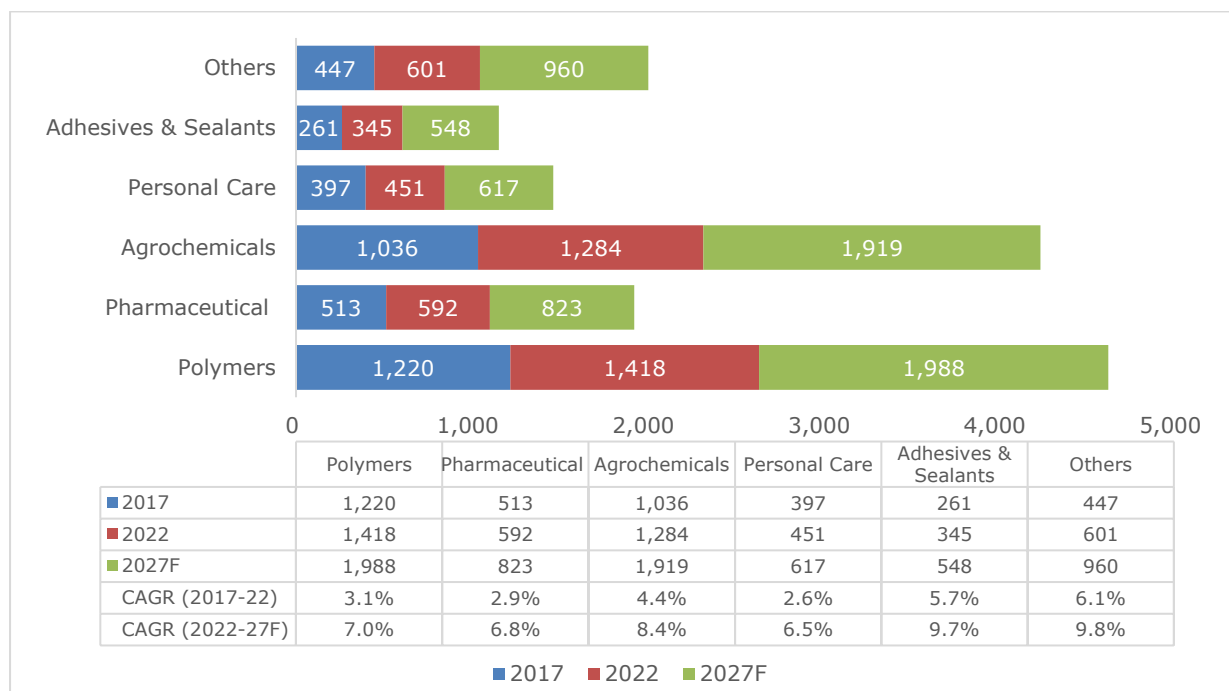


Sources: Annual reports and F&S estimation

3.4.2 Market size – Aromatic and Fluoro Aromatic Nitriles – Global and India – Based on Application

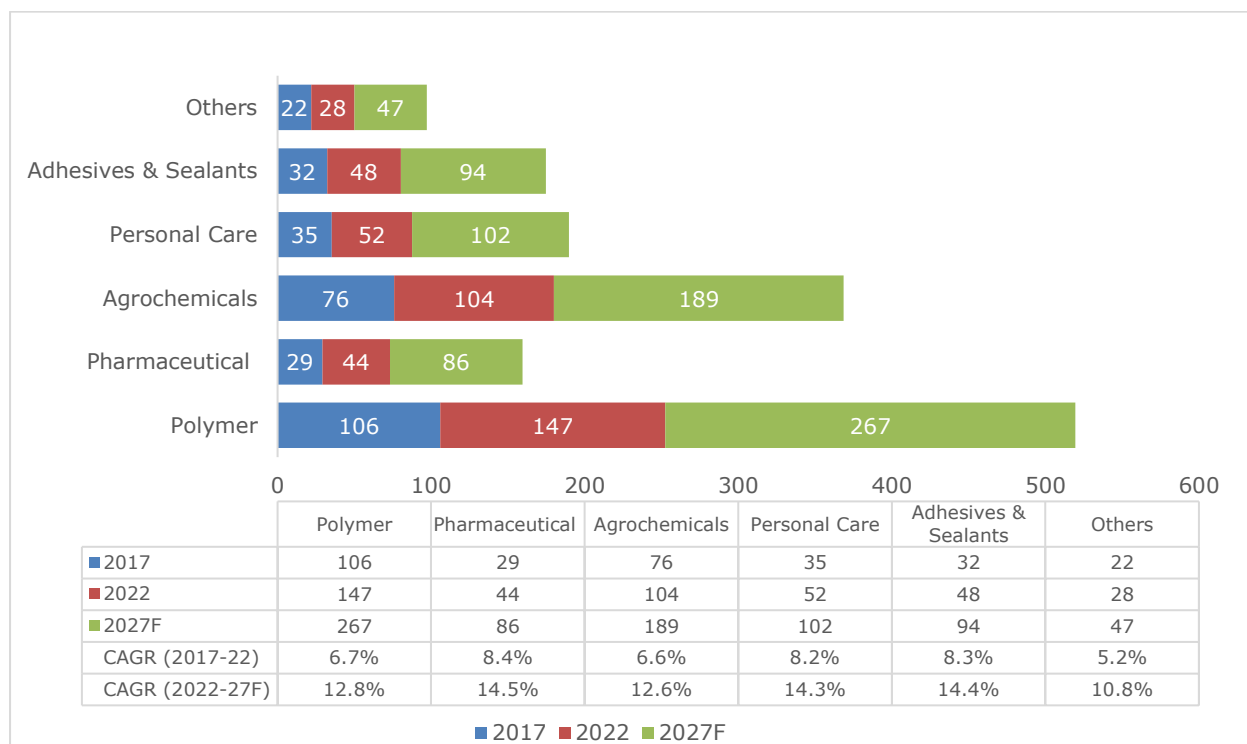
Aromatic and Fluoro Aromatic Nitriles exhibit resistance to some chemicals. They are also used as an antidiabetic drug which is used in the treatment of breast cancers. The compound of aromatic nitrile called pericyazine is used as an antipsychotic. Aromatic and fluoro aromatic nitriles are majorly used in polymer and latex industry. For the same reason, the polymers’ application is expected to contribute to the largest share of 30% in 2022 in the aromatic and fluoro aromatic nitriles market.

Exhibit 25: Historic and Projected growth of select End-user segments, Global, in USD million



Sources: Annual reports and F&S estimation

Exhibit 26: Historic and Projected growth of select End-user segments in India, in USD million



Sources: Annual reports and F&S estimation

3.4.3 Application (Established and Emerging) of Aromatic and Fluoro Aromatic Nitriles

Aromatic and Fluoro Aromatic Nitriles are primarily used in the polymer industry for manufacturing different plastic materials. They have a special compound called methyl cyanoacrylate, that is extensively used in super glue and nitrile rubber, which is the major reason why they are used in adhesives & sealants application. They are widely used in the automotive industry for sealing vital parts since they are resistant to fuels and oils. Furthermore, the growing application in the pharmaceutical industry is the major reason for this application to grow at the fastest CAGR of 14.53% in the forecast period.

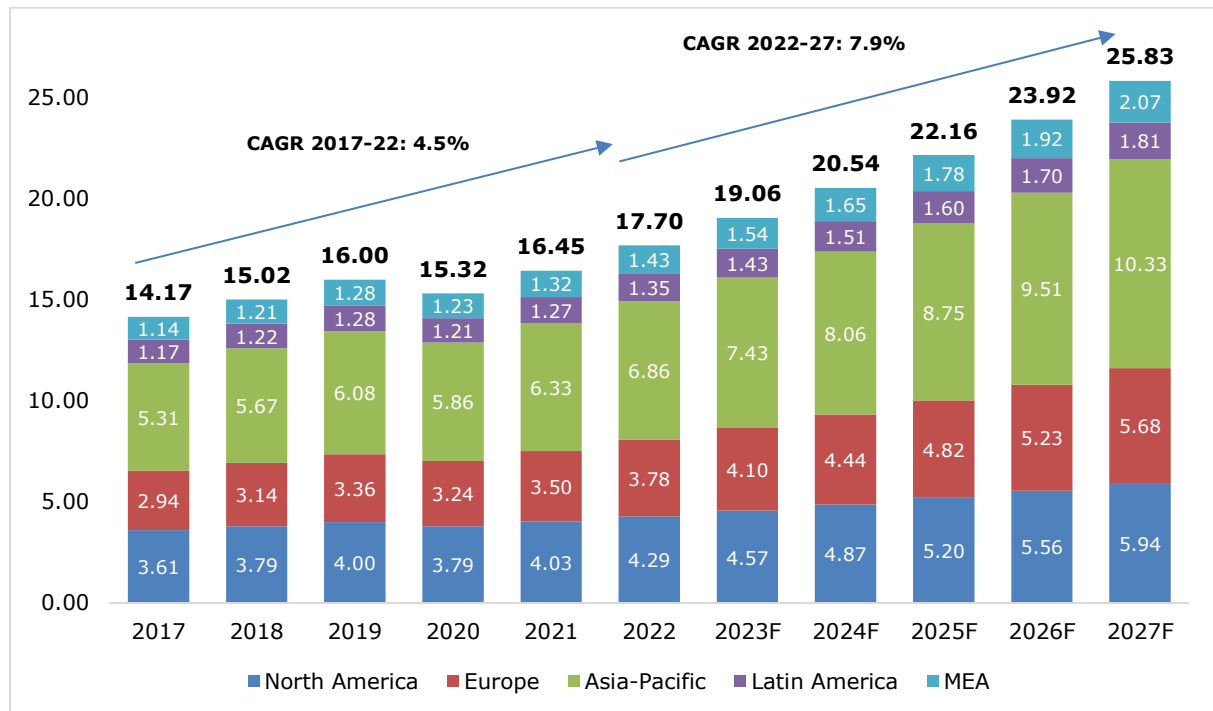
3.5 Fluoro Aromatic Amines

3.5.1 Overall market size, historical and projected growth of Fluoro Aromatic Amines

Fluoro aromatic amines are organic compounds that have an aromatic ring attached to a fluoro amine. Phosgene is used as an intermediate for manufacturing different acid chlorides. Products from these categories find usage in various industries such as pharmaceuticals, polymers, agrochemicals, and some other industries.

The Global Fluoro Aromatic Amines market was estimated at USD 17,700 million in 2022 and is projected to reach USD 25,833 million by 2027. The market is expected to witness a CAGR of 7.9% between 2022 and 2027.

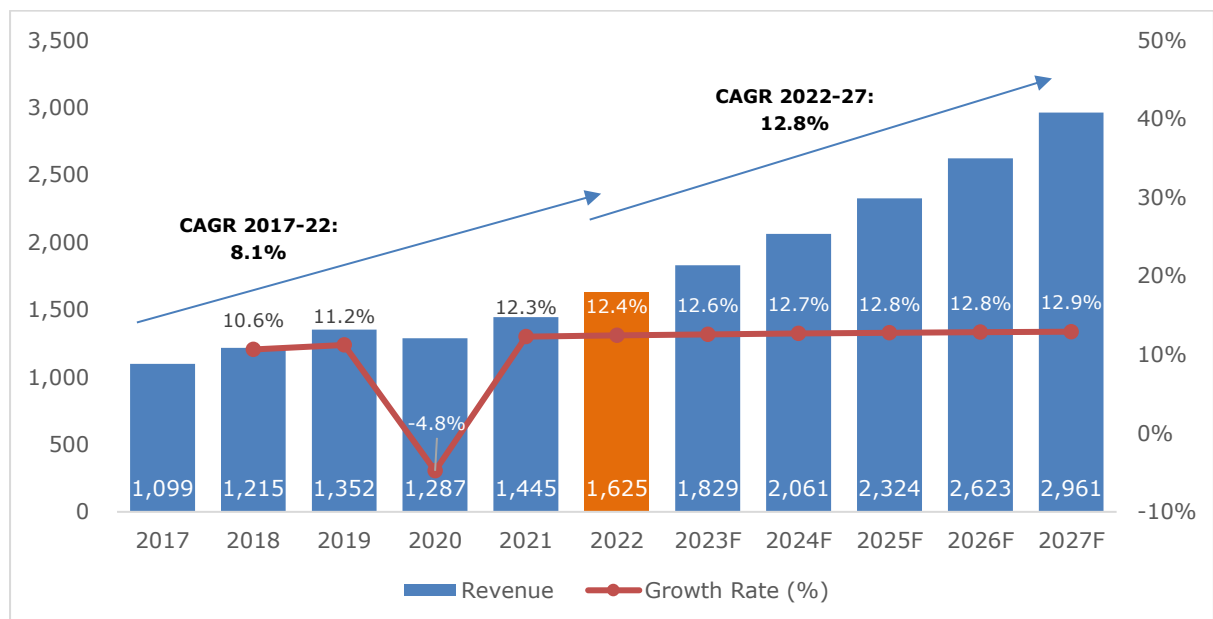
Exhibit 27: Global Fluoro Aromatic Amines Chemicals Market by Region (USD Bn) CY 2017-2027F



Sources: Annual reports and F&S estimation

The Indian fluoro aromatic amines market was estimated at USD 1,625 million in 2022 and is projected to reach USD 2,961 million by 2027. The market is expected to witness a CAGR of around 13% between 2022 and 2027. In India, fluoro aromatic amines are majorly used in agrochemicals (herbicides and pesticides) and polymer application.

Exhibit 28: India Fluoro Aromatic Amines Chemicals Market (USD Million) CY 2017-2027F

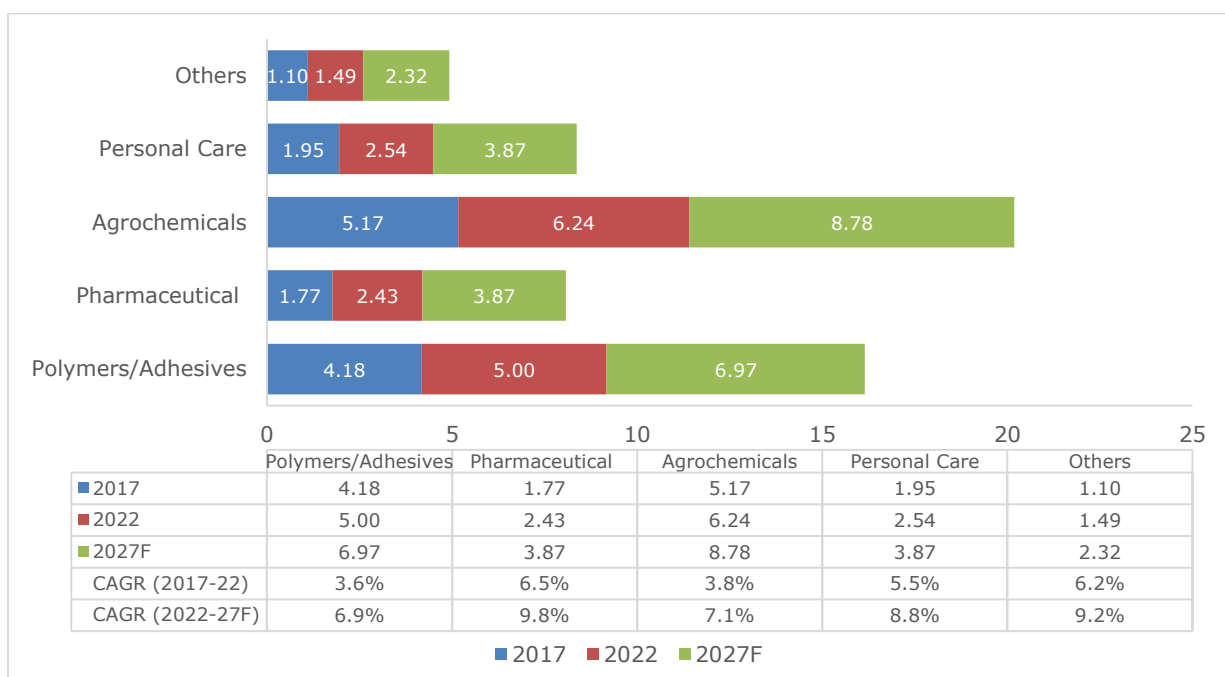


Sources: Annual reports and F&S estimation

3.5.2 Market size – Fluoro Aromatic Amines – Global and India – Based on Application

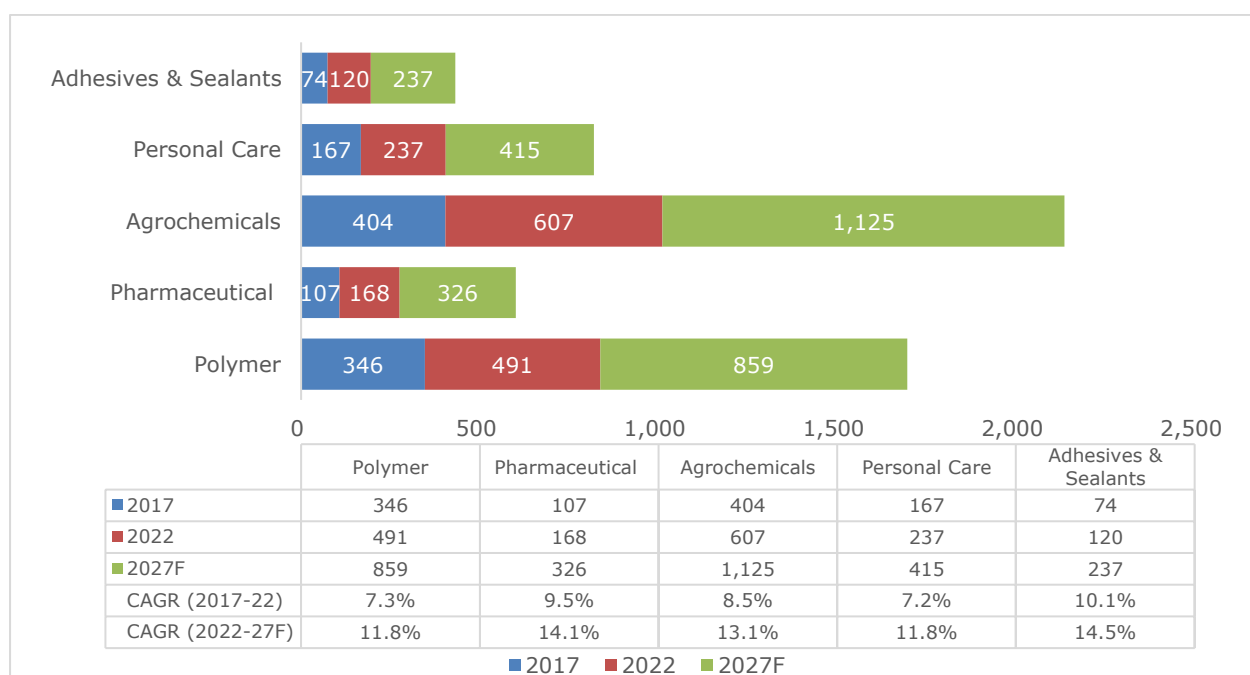
Fluoro aromatic amines are frequently used in demerol and morphine which are popular pain killers. Fluoro aromatic amines are also used as solvents for antihistamine diphenhydramine which are used in cough syrups. They are also used to prepare anesthetics which is extremely useful to athletes around the world.

Exhibit 29: Historic and Projected growth of select End-user segments, global, in USD bn



Sources: Annual reports and F&S estimation

Exhibit 30: Historic and Projected growth of select End-user segments in India, in USD million



Sources: Annual reports and F&S estimation

3.5.3 Application (Established and Emerging) of Fluoro Aromatic Amines

Fluoro aromatic amines are primarily used in manufacturing pharmaceuticals, agrochemicals, and polymer materials. Agrochemicals sector is expected to hold the largest share of 37% in 2022 owing to its usefulness in preparing different pesticides and herbicides. In India, farmers are increasingly using agrochemicals made from fluoro aromatic amines, which is why it is expected that by 2027, agrochemicals will hold the largest share.

3.6 Background on chlorination and phosgenation

Phosgene is produced when chlorinated hydrocarbon compounds are exposed to high temperatures. Chlorinated hydrocarbons contain the elements, chlorine, hydrogen, and carbon. Carboxylic acids react with Thionyl Chloride (SOCl_2) to form Acid chlorides. During the reaction, the hydroxyl group of the carboxylic acid is converted to a chlorosulfite intermediate making it a better leaving group.

Phosgenation and chlorination is a difficult process to master due to the nature of risks associated with this process. Sometimes, exposure to phosgenation may cause delayed symptoms on human body, that may not be evident before 48 hours. The major symptoms include breathing issues, low blood pressure and heart failure. Phosgene inhalation may temporarily cause symptoms like shortness of breath, post which patients again feel fine, but die later due to the fluid built up in lungs. Most people who recuperate after exposure to phosgene do make a complete recovery. Yet, emphysema and chronic bronchitis has been caused in many patients due to phosgene exposure.

BASF is a major player that has been handling phosgene derivatives for more than 40 years. They have adopted a traditional method that is the most effective method to prevent any hazards. The company enforces their employees to read the safety data sheet (MSDS) before handling any phosgene or chlorination products. The company also has safety drills in case any person gets exposed to phosgene and how to handle those situations. Moreover, an operating procedure manual is provided to the person working on phosgene. BASF is also the first company that has been certified by the SuCCES (Sustainable Castor Caring for Environmental & Social Standards) Code and has successfully finished the certification process by an external body. Shiva Pharmachem Ltd. is also "Responsible Care" certified ensuring safety, pollution free process and employee health which is an integral pre-requisite of phosgenation and chlorination process.

3.7 Key growth drivers

- **Promising growth of end-use segments:** The Global Agriculture market currently stands at USD 222 billion in CY 2022 and it is expected to grow by 3% per annum over the forecast period till CY 2027. Similarly, the polymer market currently stands at USD 626 billion and is expected to grow at 3.2% p.a. between CY 2022-27. The acid chlorides segment contributes a significant portion to polymer chemicals market, with agrochemical, polymer and pharmaceuticals being the biggest end user segments. India's significant dependence on agriculture is driving the demand of agrochemical products that require acid chlorides, aromatic amines and aromatic and fluoro nitriles.
- **Increasing credit facilities in agriculture and polymer market:** According to RBI, credit activities in India from agriculture increased from 0.4 % in 2021 to 10.5% in 2022. Growing consumer awareness about different schemes of agriculture sector and other industries is propelling the credit services facilities. These industries are recuperating from COVID-19 effects and therefore availing more credit facilities to compensate the losses in previous financial years. Better incentives and credit facilities for starting new ventures in agriculture and polymer market in India is further fuelling the advanced intermediate chemicals market.

4 Global & India CSM/CRAMS Market

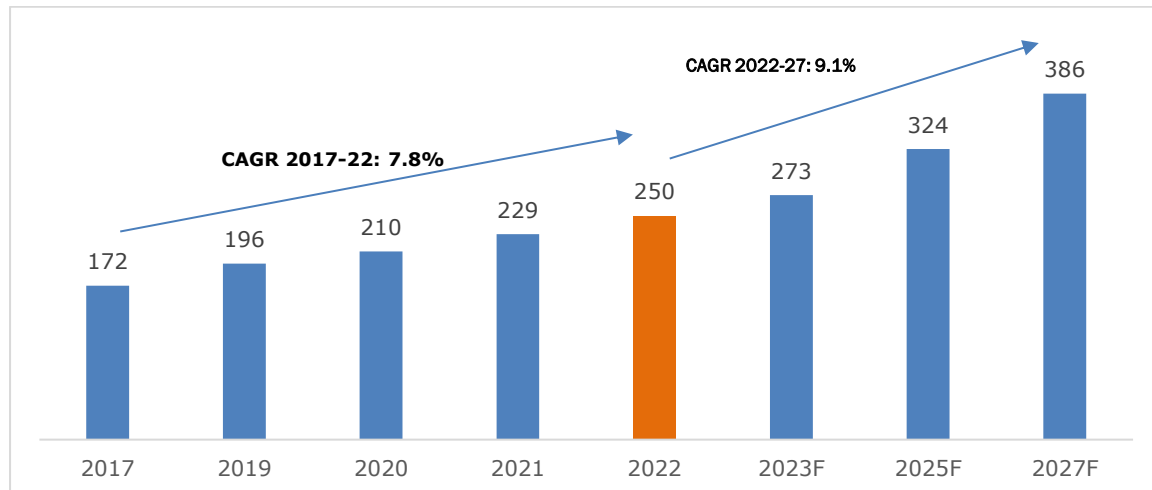


Global & India CSM/CRAMS Market

4.1 Overview of the Global CSM/CRAMS Market

In CY 2022, the global market for Custom Synthesis Manufacturing (CSM)/ Contract Research and Manufacturing Services (CRAMS) was estimated to be worth USD ~250 billion. In the following five years (between 2022 and 2027), the market is expected to grow at a CAGR of 9.1% to reach USD 386 Bn by CY 2027 as compared to the 7.8% growth market saw between CY 2017 and CY 2022.

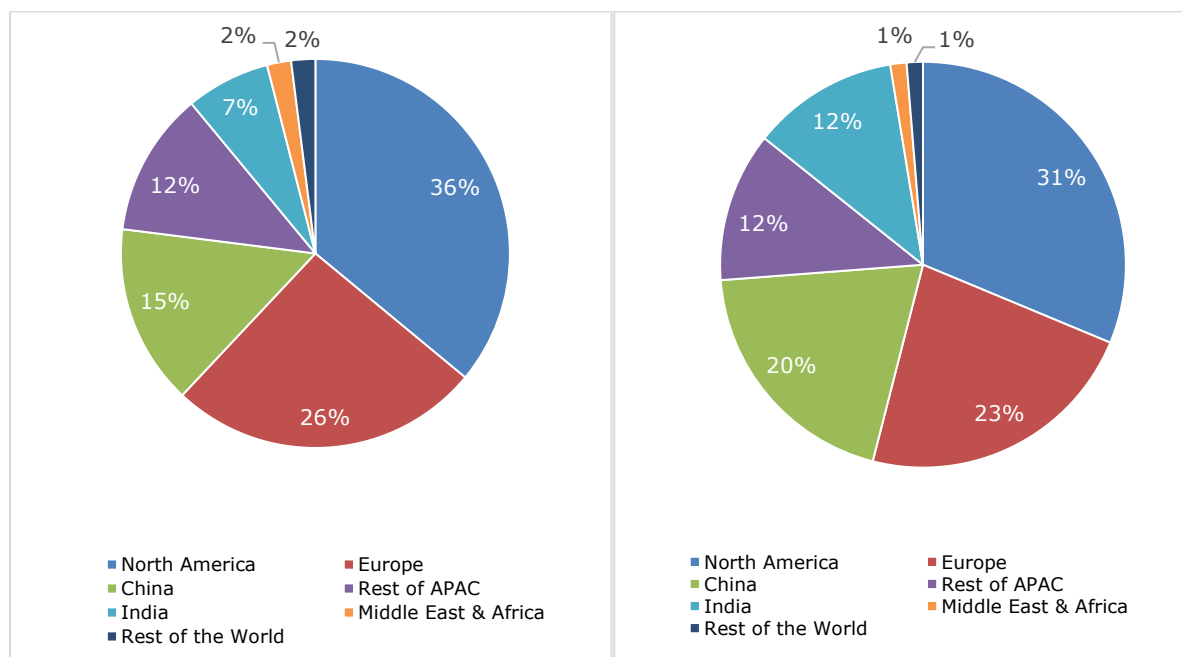
Exhibit 31: Global CSM/CRAMS Market (USD Bn), CY 2017-2027F



Source: Secondary Research, Frost & Sullivan analysis

The CSM/CRAMS market is predicted to be dominated by Asia Pacific in 2022. Asia-Pacific is anticipated to have the fastest growth during the forecast period owing to efficient and cost-effective labour, low-cost production rates, and increased investment in pharmaceutical manufacturing.

Exhibit 31: Regional Share of the Global CSM/CRAMS Market, CY 2022 vs 2027F

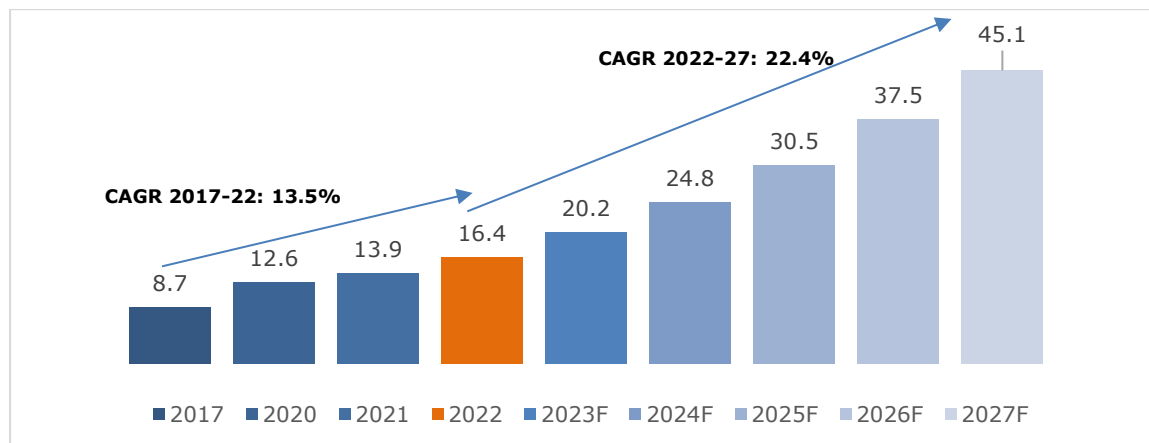


Source: Secondary Research, Frost & Sullivan analysis

4.2 Overview of the India CSM/CRAMS Market

Indian CSM/CRAMS market valued at USD 16.4 billion in 2022. It is expected to grow to USD 45.1 billion by 2027 at a CAGR of 22.4%.

Exhibit 32: India CSM/CRAMS Market CY 2017 – 2027F (in USD Bn)



Source: Secondary Research, Frost & Sullivan analysis

Provided no new trade restrictions are put in place, Indian contract manufacturers that export to regulated markets and maintain compliance standards will continue to witness strong growth.

India's CSM/CRAMS market is expected to witness growth during the forecast period due to the below mentioned reasons:

- After China, India is APAC's second-largest generics market with market leadership in bulk drug manufacturing sector, which is dominated by generics and biosimilars. India ranks first in the number of FDA-approved production facilities outside of the US for manufacturing these drugs and generics. Besides having the manufacturing capabilities, India is strongly focussing on product development innovation which makes a preferred outsourcing destination for global pharma giants.
- Indian Companies like Anupam Rasayan are concentrating their focus towards research & development, operational scale-up, and increased commercialization of their manufacturing services within CRAMS/CSM space. This will help them leverage the innovators' shift in focus towards core competencies, development of new active ingredients and outsourcing of production activities in the chemicals sector.
- The increasing outsourcing trend in the specialty chemicals industry demonstrates the success of this outsourcing partnership, as CRAMS/ CSM are increasingly becoming an integral part of their value chain.

The specialty chemicals CRAMS market is driven by the growth of the end-use industries, such as the electronics, healthcare, and personal care industries. These industries are using specialty chemicals in a variety of applications, such as in the manufacturing of electronic components, pharmaceuticals, and cosmetics.

The Government of India has taken several initiatives and schemes to drive the growth of the specialty chemicals' CRAMS market in India. One such initiative is - The National

Chemical Policy (NCP): The NCP was launched in 2018 with the aim of making India a global hub for the specialty chemicals industry. The NCP includes a number of measures to promote the growth of the industry, such as tax breaks, investment incentives, and research and development support.

Across India, the recent revision of Market Access Initiative by the Ministry of Commerce and Industry aims at benefiting the small to mid-segment newer industry players which do not possess global sales and marketing reach. As a result of the revised MAI policies, the robust growth in CRAMS industry in India will support newer economies such as Myanmar, Cambodia to collaborate with the local Indian players beneficial for the overall growth of the Asian economy.

Moving forward, in pharmaceutical sector, with a total of over 300 USFDA approved manufacturing sites, the country can become the global leader in the CRAMS industry with the implementation of mandates including Schedule M (Good Manufacturing Practices (GMP) for Premises & Materials and Requirements of GMP in Plant and Equipment) outlining various requirements for manufacturing good quality drugs and pharmaceuticals, by applying Current Good Manufacturing Practice (CGMP) guidelines. Furthermore, with a cost advantage of almost 40-50% as compared to regulated markets and the availability of sufficient R&D infrastructure, India is expected to continue to enjoy a competitive advantage in the region there by assuring a strong CRAMS industry growth.

The Government of India is committed to ensuring delivery of affordable healthcare in the country as well as ensuring that there is a steady supply of critical drugs and specialty intermediates. This has resulted in the launch of the Production Linked Incentive Scheme (PLI) for APIs, KSMs as well as the Scheme for Promotion of Bulk Drug Parks and other chemicals. These schemes have been constructed to incentivize large-scale manufacturing of critical chemicals and to build the required infrastructure for developing manufacturing clusters for across India. This aligns with the Government's mission for self-reliance (Atmanirbhar Bharat).

4.3 Increasing Opportunities for CRAMS/CSM in India

In Asia, India is particularly becoming an attractive destination for global investments at a rapid pace as more and more multinationals are focusing on R&D activities and wish to outsource their manufacturing activities to low-cost destinations. India has also emerged as the most preferred destination for innovation in Asia and the third largest globally. The MNC R&D centers in India have seen a gradual growth over the years from 911 in 2020 to over ~1,050 in 2022 at 7.3% CAGR and are expected to reach ~1,500 by end of 2025. India's R&D ecosystem has grown at a phenomenal pace in the last ten years. About 42% (CY2022) of the global 500 R&D spenders have centers in India, with the figure expected to reach ~50% by 2023.

Increasing Government Incentives


The Government has been announcing several fiscal incentives for the private sector to increase R&D expenditure including:

- Tax deduction: Companies can claim a deduction of up to 200% of their R&D expenditure under the R&D Tax Incentive (RTDI) Scheme
- Capital allowance: Companies can claim a capital allowance of 100% on the cost of plant and machinery that is used for R&D activities
- Excise duty exemption: Companies are exempted from paying excise duty on the sale of products that are developed as a result of R&D activities
- Customs duty exemption: Companies are exempted from paying customs duty on the import of equipment and materials that are used for R&D activities
- Incentives for start-ups: Start-ups that undertake R&D activities are eligible for a number of incentives, such as tax breaks, funding support, and mentoring

In addition to these fiscal incentives, the government is also providing funding for R&D through the National Science Foundation (NSF) and the Department of Science and Technology (DST). The NSF and the DST provide grants to researchers in a variety of fields, including engineering, medicine, and the physical sciences.

The government's initiatives to promote R&D are expected to help India to become a global leader in innovation.

5 Advanced Intermediates Overview



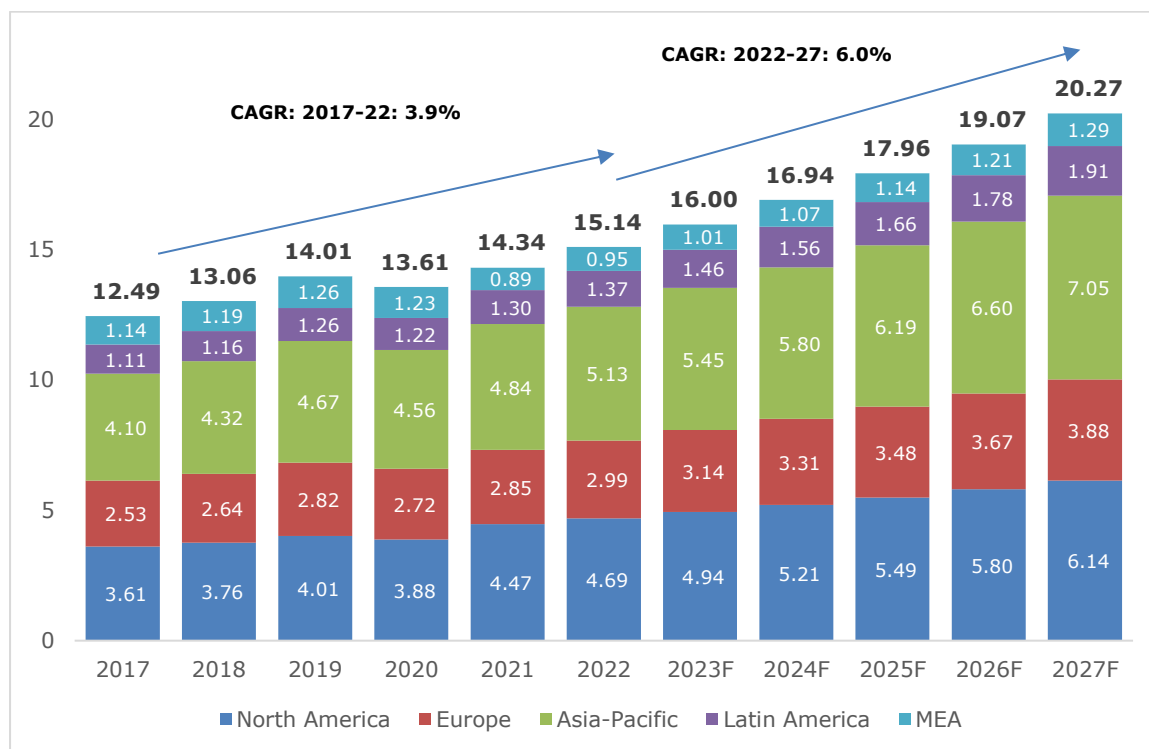
**Advanced Intermediates Market
Overview**

5.1 Overview and Outlook

5.1.1 Global Advanced Intermediates Market

The Global advanced intermediates* market was estimated at a value of USD 15,136 Mn in 2022 and is projected to reach USD 20,265 Mn in 2027. The market is expected to witness a CAGR of 6% between 2022 and 2027. APAC holds the largest share of the advanced intermediates market in 2022 and the trend is expected to continue over the forecast period.

Exhibit 33: Global Advanced Intermediate Chemicals Market by Region (USD Bn) CY 2017-2027F



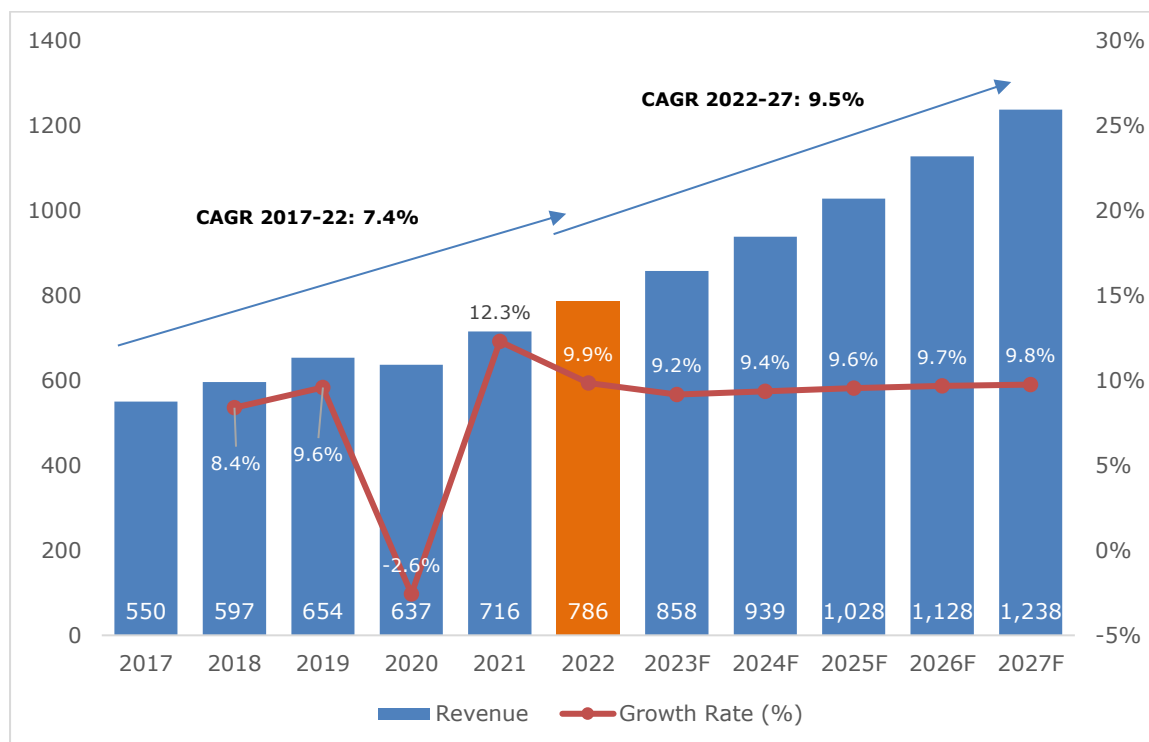
Sources: Annual reports and F&S estimation

Note: *The Global advanced intermediates market size includes market size (by Sales value) for total of 9 identified products, that are being covered under advanced intermediates in chapter 5.

5.1.2 India Advanced Intermediates Market

The Indian advanced intermediates market was estimated at USD 786 million in 2022 and is projected to reach at USD 1,238 million by 2027. The market is expected to witness a CAGR of around 9.5% between 2022 and 2027.

Exhibit 34: India Advanced Intermediate Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Note: The India advanced intermediates market size includes market size (by sales value) for total of 9 identified products, that are being covered under advanced intermediates in chapter 5.

Advanced Intermediates are prominently used in various industrial applications such as agrochemicals, polymer, flavours & fragrances, pharmaceuticals, and personal care. India’s rapid industrialisation, abundant availability of skilled manpower, upsurge in consumption of polymer-based products and favourable macroeconomic conditions is driving the growth of Advanced Intermediates market.

This is further facilitated by the government initiatives of managing plastic and its disposal. The key contributor in the polymer market is the rising demand from the automotive sector for manufacturing of spare parts. The demand for agrochemicals has been increasing in recent years due to growing food demand from increasing population and well-being of the crop plants. The components that are used in the production of agrochemicals are sometimes advanced intermediate chemicals, which ultimately help in controlling the pests from damaging the crops or helps improve soil fertility. Post COVID-19, the agricultural activities have normalized, which has helped the companies to deliver to target geographies. Further, the rising cost of imports have created opportunities for domestic producers.

5.2 Terephthaloyl Chloride

5.2.1 Overview

Terephthaloyl Chloride (TC) is an acid chloride of terephthalic acid that is primarily used for manufacturing synthetic fiber such as Kevlar. It is also widely used in aerospace and defence industry as an intermediate. Terephthaloyl Chloride is an effective water scavenger that is used to stabilize urethane and isocyanates prepolymers.

5.2.2 Established and Emerging Applications

The chemical finds use in automotive market as it possesses the required technical, mechanical, and physical properties. It is also used in manufacturing of aramid fibers which are further used in aerospace and defense applications for ballistic-rated body armor fabric and ballistic composites, marine cordage, marine hull reinforcement, and as an asbestos substitute.

5.2.3 Key growth drivers

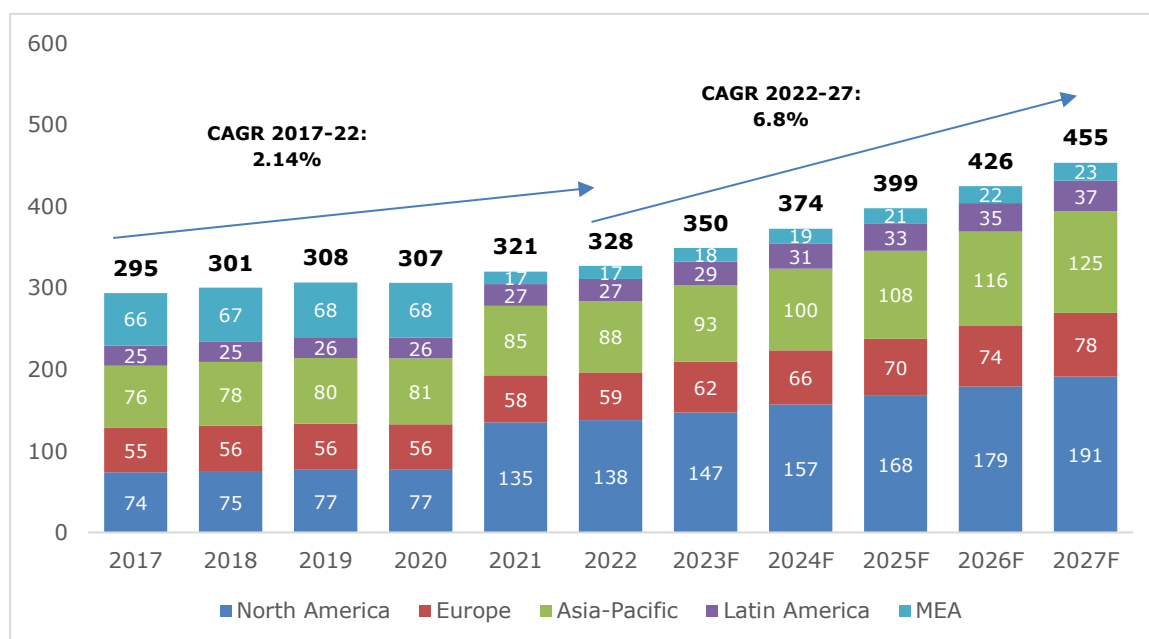
The rising demand of industrial gadgets that require terephthaloyl chloride is expected to drive its demand in the near future. The growing usage of terephthaloyl chloride in protective clothing for aerospace, defense and industrial sector owing to its light weight and easy manufacturing is driving its demand in the forecast period.

5.2.4 Market size - Global and India – Based on Region

The Global Terephthaloyl Chloride market is expected to grow from USD 328 Mn in 2022 to USD 455 Mn in 2027 at a CAGR of 6.8%.

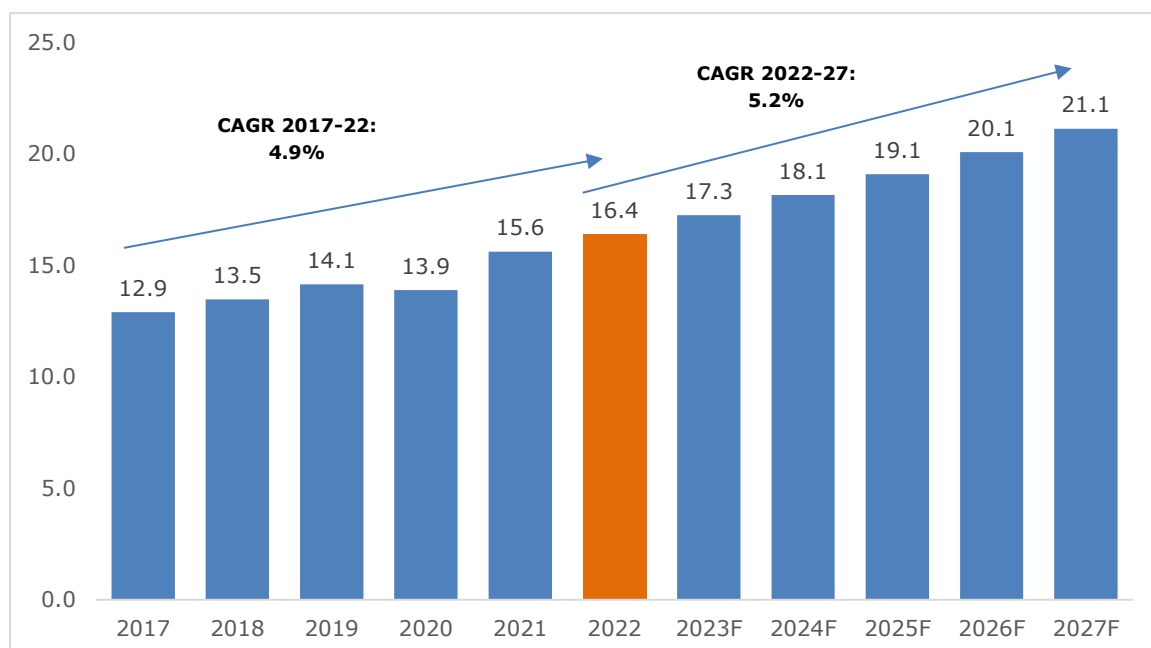
The Indian Terephthaloyl Chloride market is expected to grow from USD 16 Mn in 2022 to USD 21 Mn in 2027 at a CAGR of 5.2%.

Exhibit 35: Global Terephthaloyl Chloride Chemicals Market by Region (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 36: Indian Terephthaloyl Chloride Chemicals Market (USD Million) CY 2017-2027F

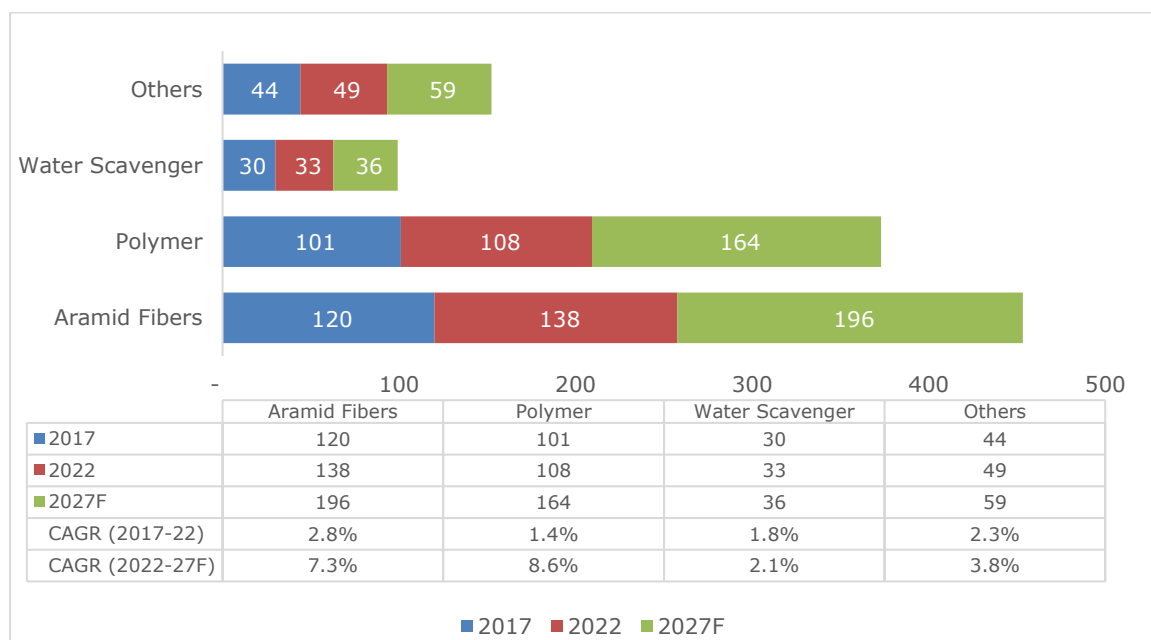


Sources: Annual reports and F&S estimation

5.2.5 Market size - Global and India – Based on Application

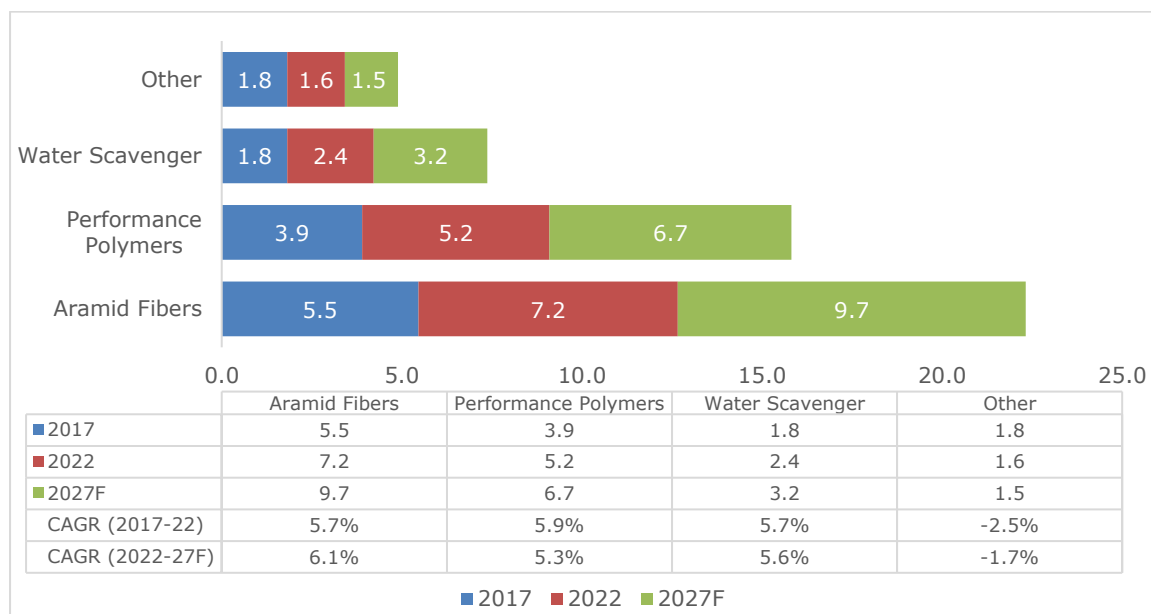
Terephthaloyl Chloride is used in preparing liquid crystalline thermosets by thermal cyclotrimerization of di-cyanate compounds of ring substituted bis (4-hydroxyphenyl) terephthalates. Additionally, it is involved in the condensation reaction with difunctional alfa, μ -diaminopolystyrene to get chain-extended polystyrene containing amide bonds along the polymer backbone.

Exhibit 37: Global Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

Exhibit 38: India Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

5.3 Isophthaloyl Chloride (ICL)

5.3.1 Overview

Isophthaloyl Chloride (IPC, or isophthaloyl dichloride) is an advanced intermediate chemical that is primarily used in a wide variety of polymers. Isophthaloyl chloride is an organic compound with the chemical formula C₈H₄Cl₂O₂.

5.3.2 Established and Emerging Applications

It has a white appearance, and it imparts flame resistance, temperature stability, chemical resistance, and flexibility. It is also an effective stabilizer that could be used to stabilize urethane prepolymers due to its capability to scavenge water. The growing polymer market is further driving the demand of isophthaloyl chloride in India. It is also used as a raw material in aromatic fiber.

5.3.3 Key growth drivers

Isophthaloyl chloride is an acid chloride and is utilized in a variety of fibres and performance polymers. Due to its capacity to pass through water, isophthaloyl chloride is the most efficient stabilizer for urethane prepolymers. It serves as a powerful stabilizer and is utilized in the manufacture of drugs and insecticides. Pharmaceuticals, insecticides, dyes, pigments, & fibres and polymers can all be made using isophthaloyl chloride.

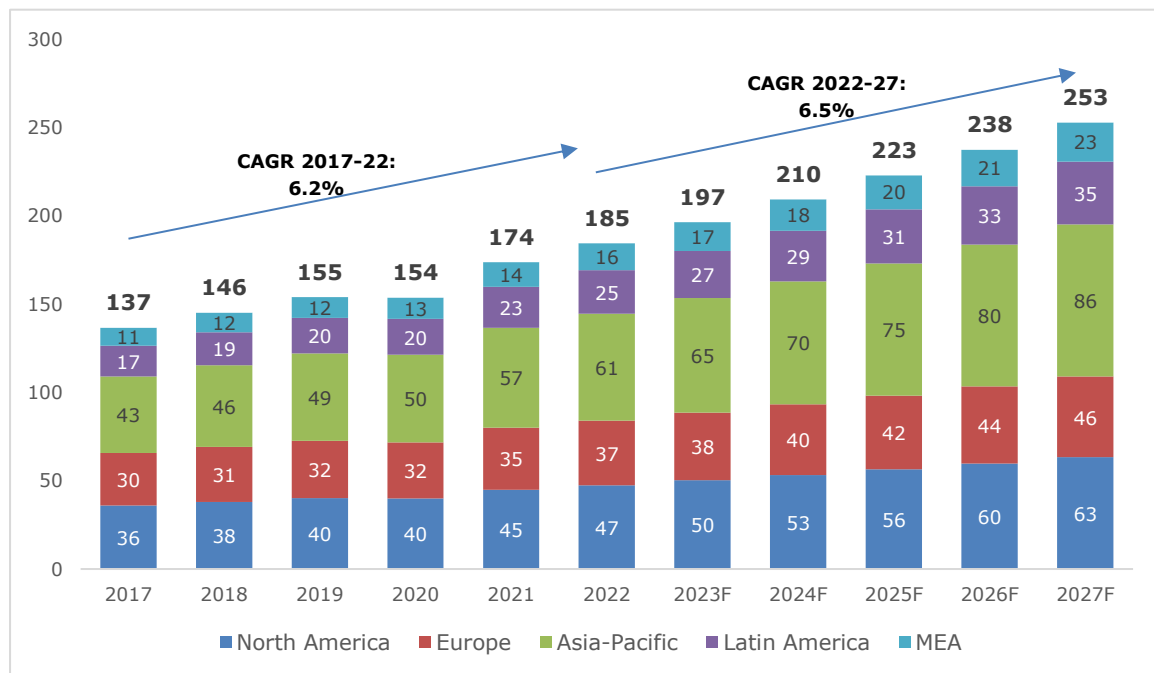
Based on form, the isophthaloyl chloride market is segmented into solid and liquid form. The liquid form accounts for a significant share due to increasing demand for production of chemical-resistant materials. Solid isophthaloyl is consumed in the production of high-performance polymers and is anticipated to create productive opportunities for development of the segment.

5.3.4 Market size - Global and India – Based on Region

The Global Isophthaloyl Chloride market is expected to grow from USD 185 Mn in 2022 to USD 253 Mn in 2027 at a CAGR of 6.5%.

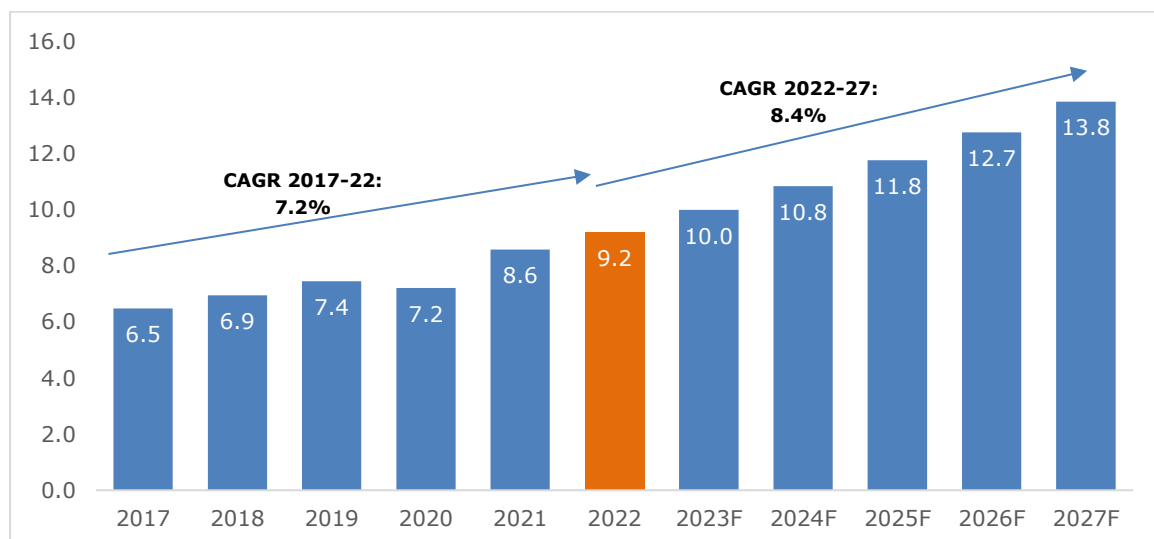
The Indian Isophthaloyl Chloride market is expected to grow from USD 9 Mn in 2022 to USD ~14 Mn in 2027 at a CAGR of 8.4%.

Exhibit 38: Global Isophthaloyl Chloride (ICL) Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 39: India Isophthaloyl Chloride (ICL) Chemicals Market (USD Million) CY 2017-2027F

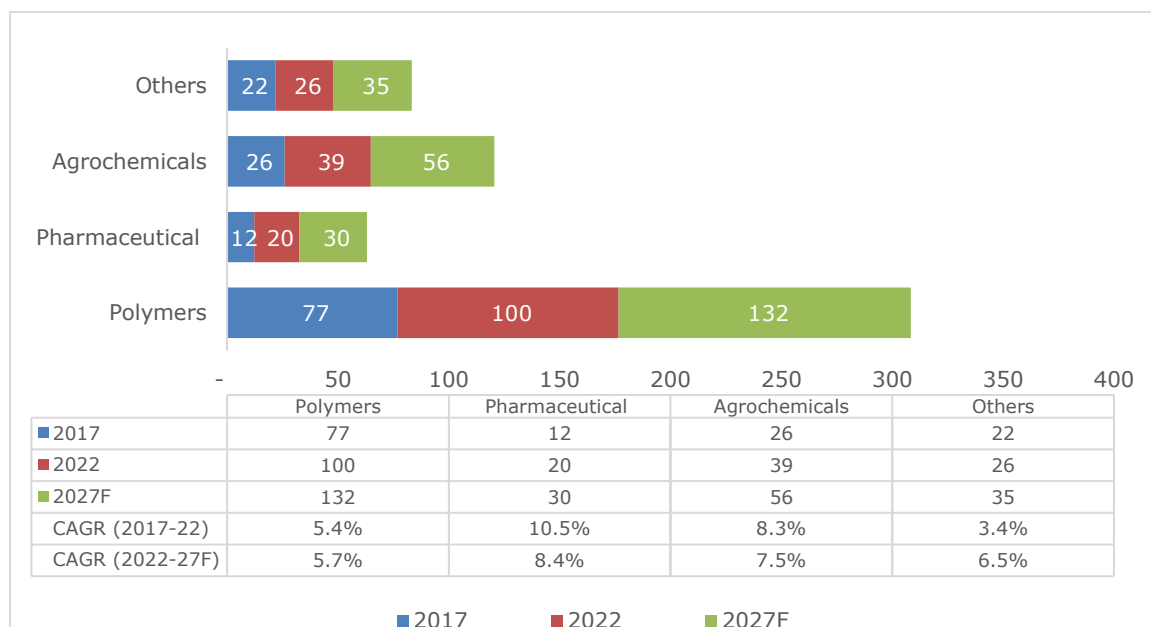


Sources: Annual reports and F&S estimation

5.3.5 Market size - Global and India – Based on Application

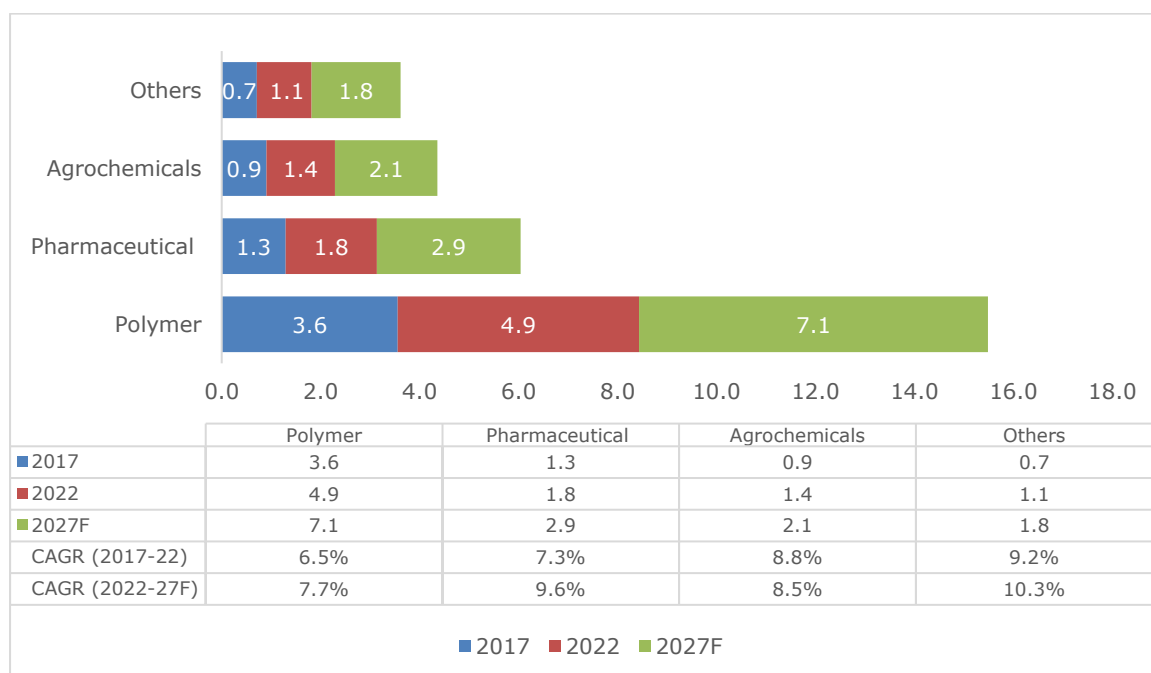
It is used in the production of pesticides for crop protection. Its increasing usage in agrochemicals will drive the isophthaloyl chloride market in the forecast period.

Exhibit 40: Global Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

Exhibit 41: India Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

5.4 Pivaloyl Chloride

5.4.1 Overview

Pivaloyl Chloride is a colorless reactive medical intermediate. Pivaloyl chloride is used as an input in the manufacture of some drugs, insecticides, and herbicides.

5.4.2 Established and Emerging Applications

It is used as a raw material for preparation of many amides and phenolics. It is widely used in pharmaceuticals, polymers and agrochemicals market. The major application remains in pharmaceuticals market for manufacturing of drugs such as cefaclor benzyl, benzyl hydroxylamine penicillin, cefazolin, and dual valeryl adrenals. It is also used for producing peracid ester initiators of polyvinyl chloride.

5.4.3 Key growth drivers

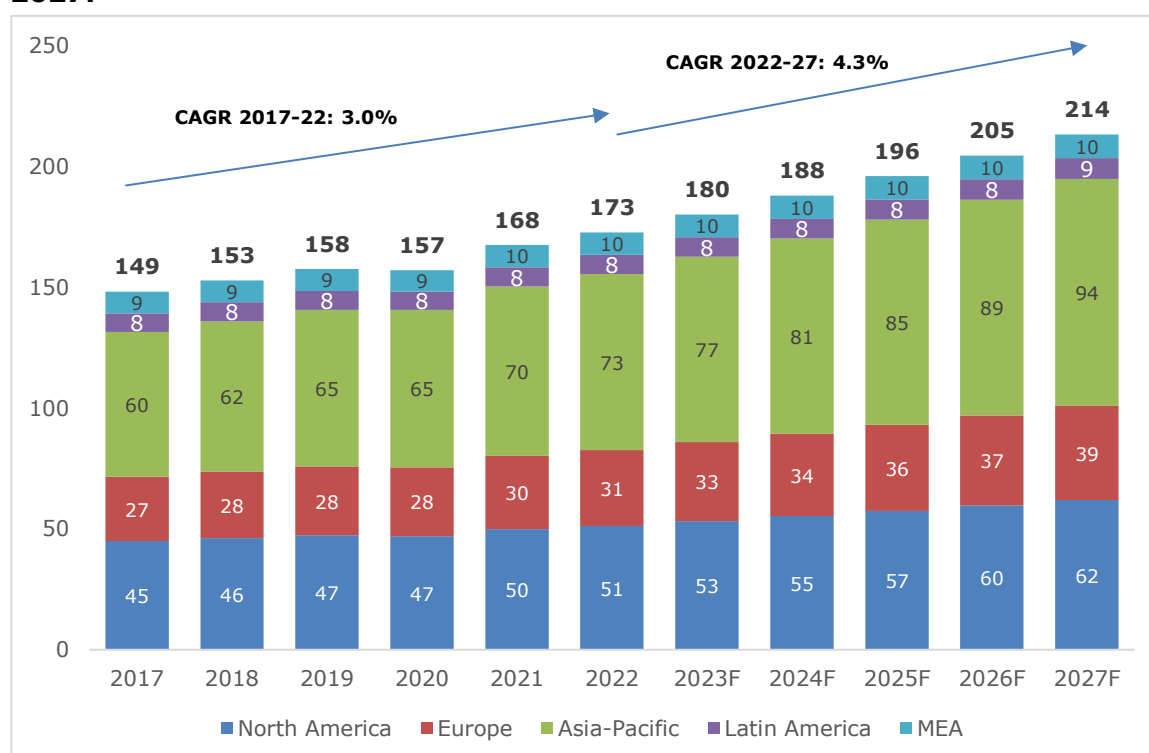
The ongoing rapid expansion of agrochemical, pharmaceuticals and polymer industry triggered by rising demand of herbicides, pesticides and infectious disease drugs is expected to push the demand for pivaloyl chloride during the forecast period.

5.4.4 Market size - Global and India – Based on Region

The Global Pivaloyl Chloride market is expected to grow from USD 173 Mn in 2022 to USD 214 Mn in 2027 at a CAGR of 4.3%.

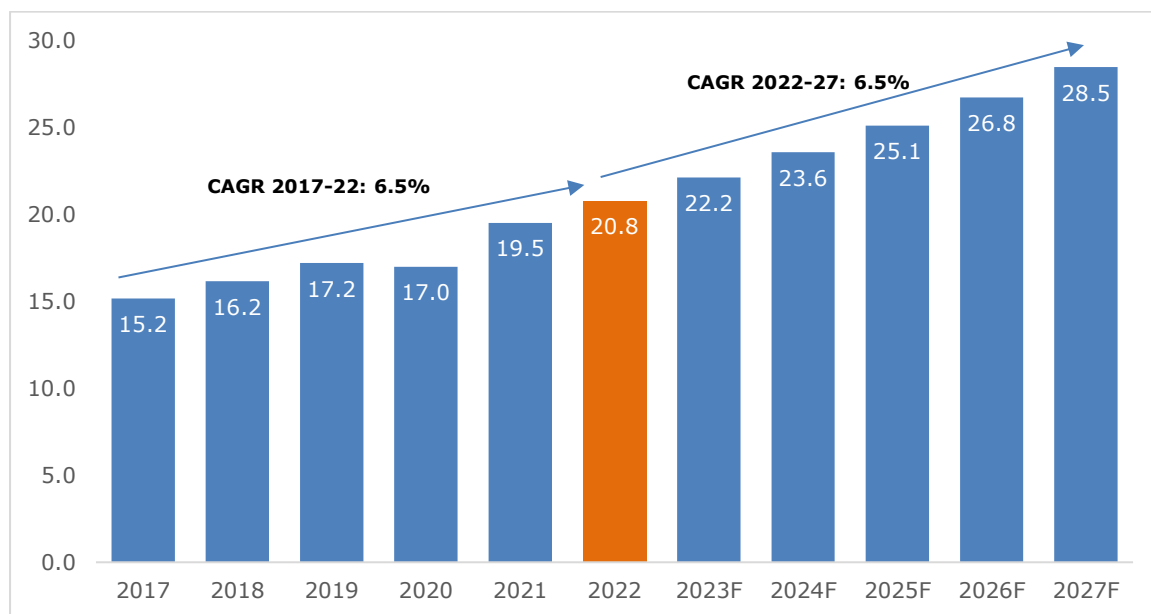
The Indian Pivaloyl Chloride market is expected to grow from USD ~21 Mn in 2022 to USD 28 Mn in 2027 at a CAGR of 6.5%.

Exhibit 42: Global Pivaloyl Chloride Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 43: Indian Pivaloyl Chloride Chemicals Market (USD Million) CY 2017-2027F

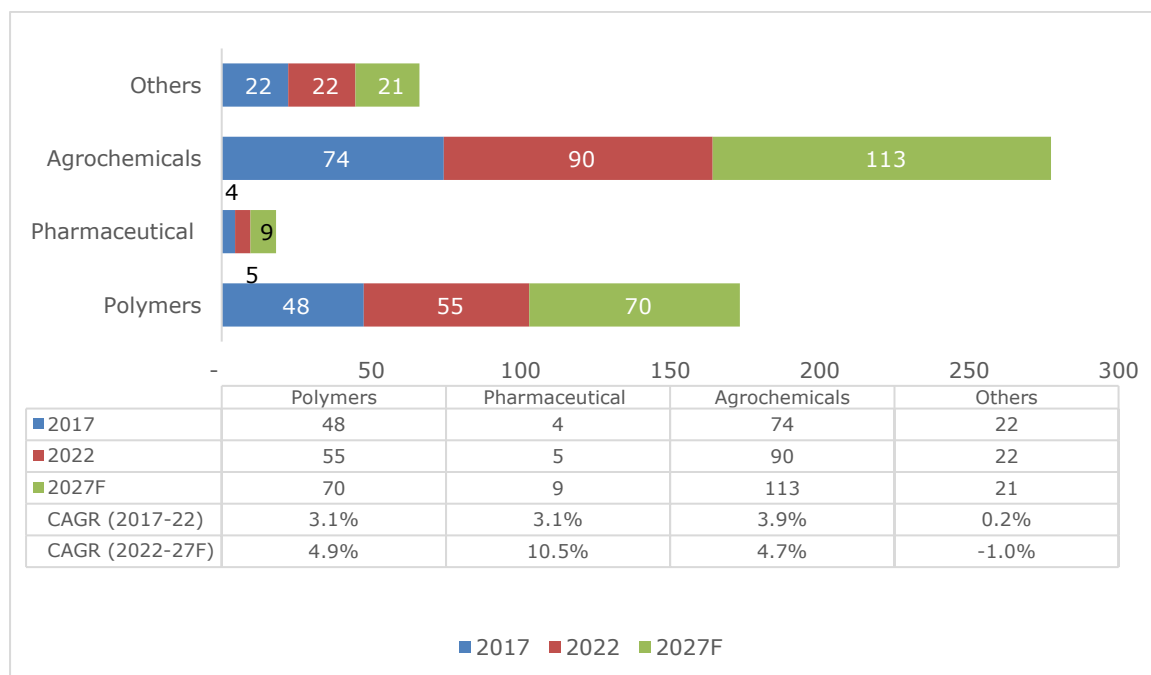


Sources: Annual reports and F&S estimation

5.4.5 Market size - Global and India – Based on Application

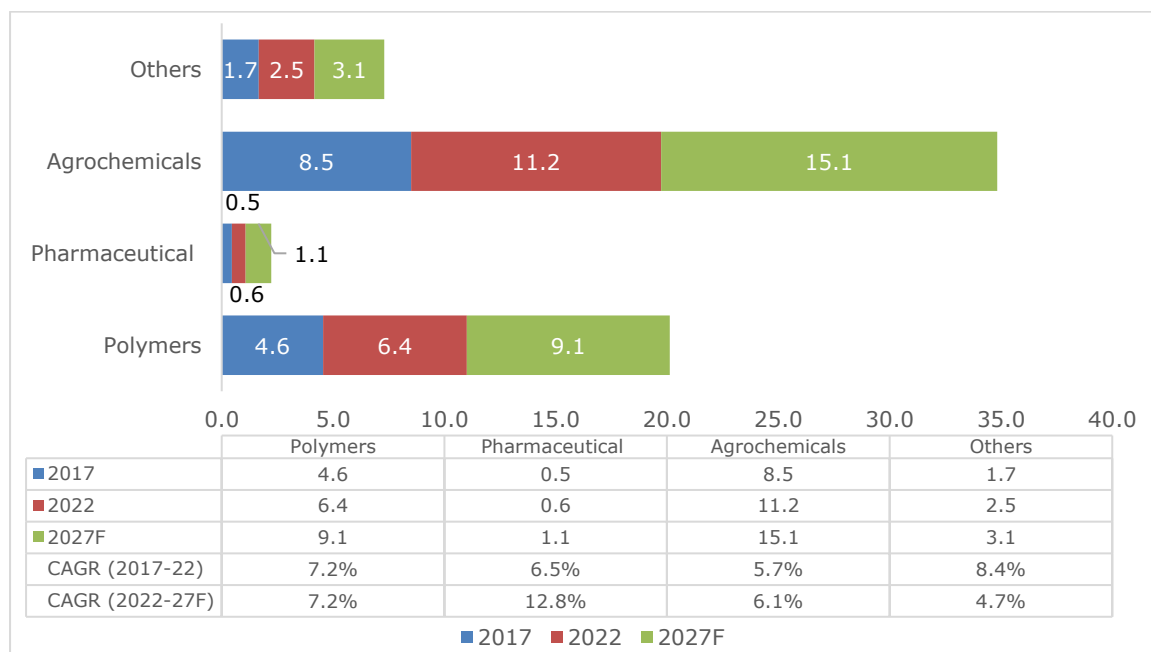
Pivaloyl chloride has become a commonly used intermediate for the production of agricultural chemicals like herbicides, insecticides, and pesticides, pharmaceutical compounds, and in peroxyesters’ manufacturing. For this reason, the agrochemicals application contributes to the largest share in the forecast period.

Exhibit 44: Global Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

Exhibit 45: India Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

5.5 Octanoyl Chloride

5.5.1 Overview

Octanoyl Chloride is a colorless and odorless advanced intermediate that reacts with water to form hydrochloric acid and caprylic acid. It reacts with bases, alcohols, water, and oxidizing agents to form hazardous chemicals and is also combustible in nature.

Established and Emerging Applications

The major applications of the advanced intermediate are in polymer/adhesives, pharmaceuticals, and agrochemicals. It is used for producing adhesives that cater to different end use industries like automotives, industrial and retail. In pharmaceuticals, this intermediate is used for synthesis of (R)-2-propyloctanoic acid, a therapeutic agent for Alzheimer’s disease. It is also used for synthesis of a variety of N-n-octyl-D-gluconamide based organogels.

5.5.2 Key growth drivers

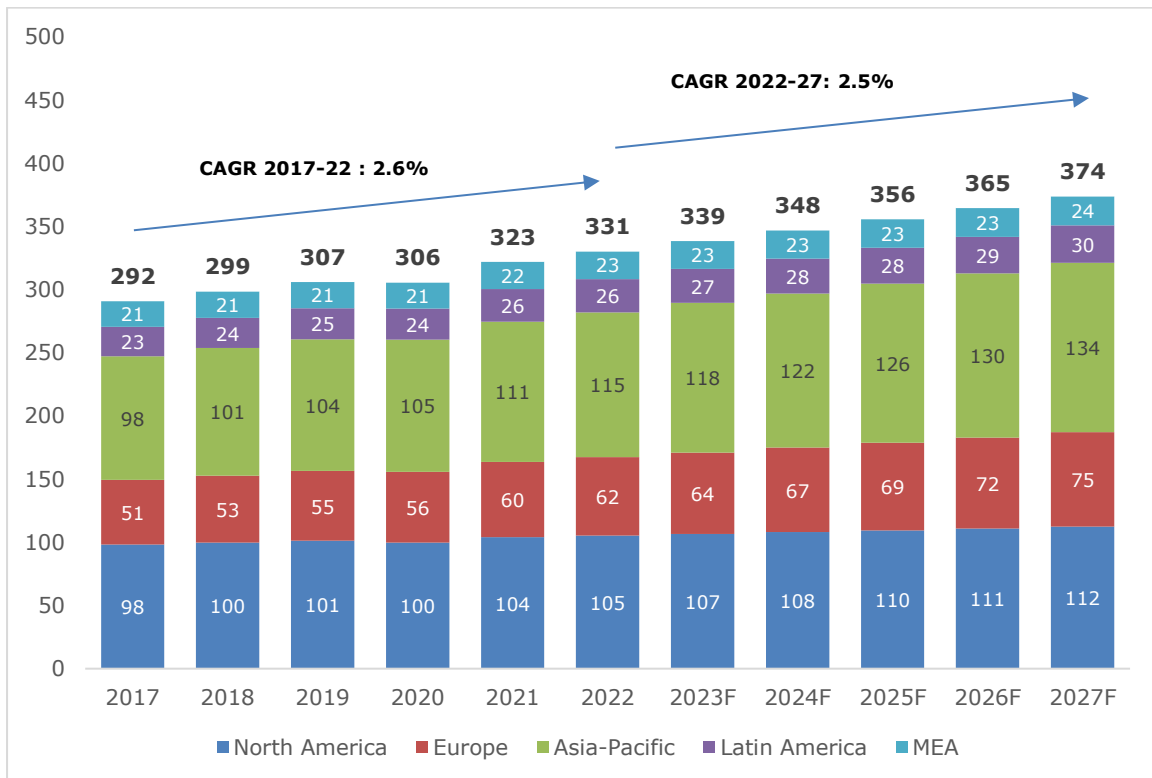
It is expected that in the coming few years, this intermediate would be used for synthesis of pharmaceutical intermediates that would be beneficial in cancer treatment.

5.5.3 Market size - Global and India – Based on Region

The Global Octanoyl Chloride market is expected to grow from USD 331 Mn in 2022 to USD 374 Mn in 2027 at a CAGR of 2.5%.

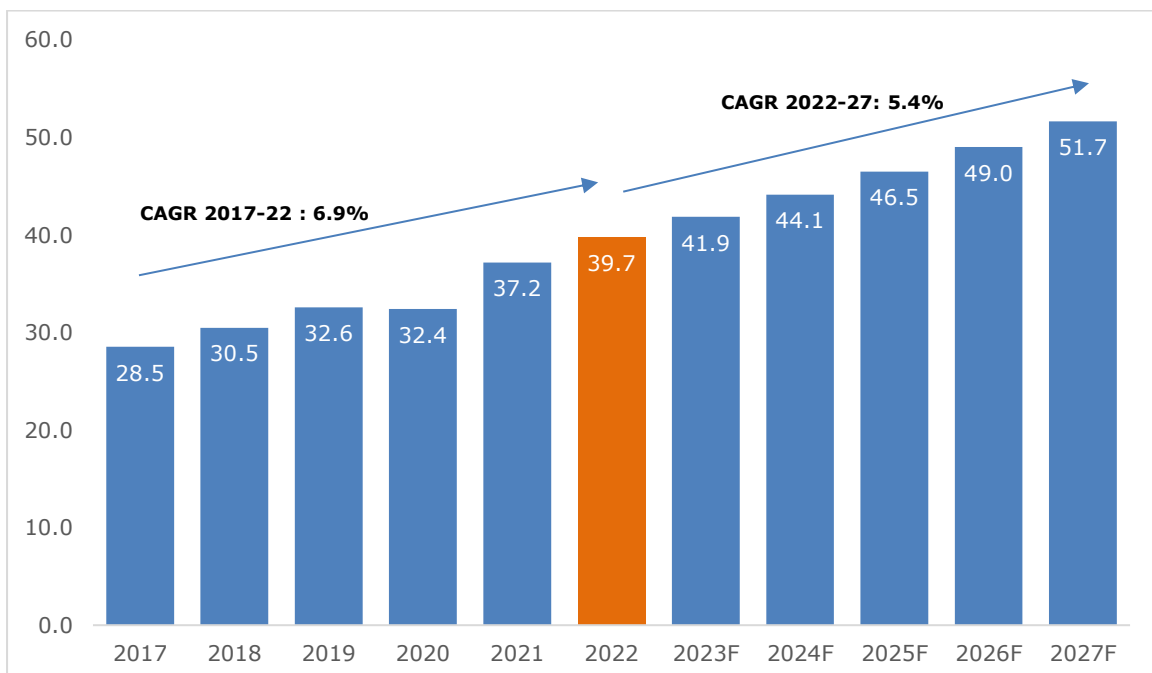
The Indian Octanoyl Chloride market is expected to grow from USD 40 Mn in 2022 to USD 52 Mn in 2027 at a CAGR of 5.4%.

Exhibit 46: Global Octanoyl Chloride Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 47: Indian Octanoyl Chloride Chemicals Market (USD Million) CY 2017-2027F

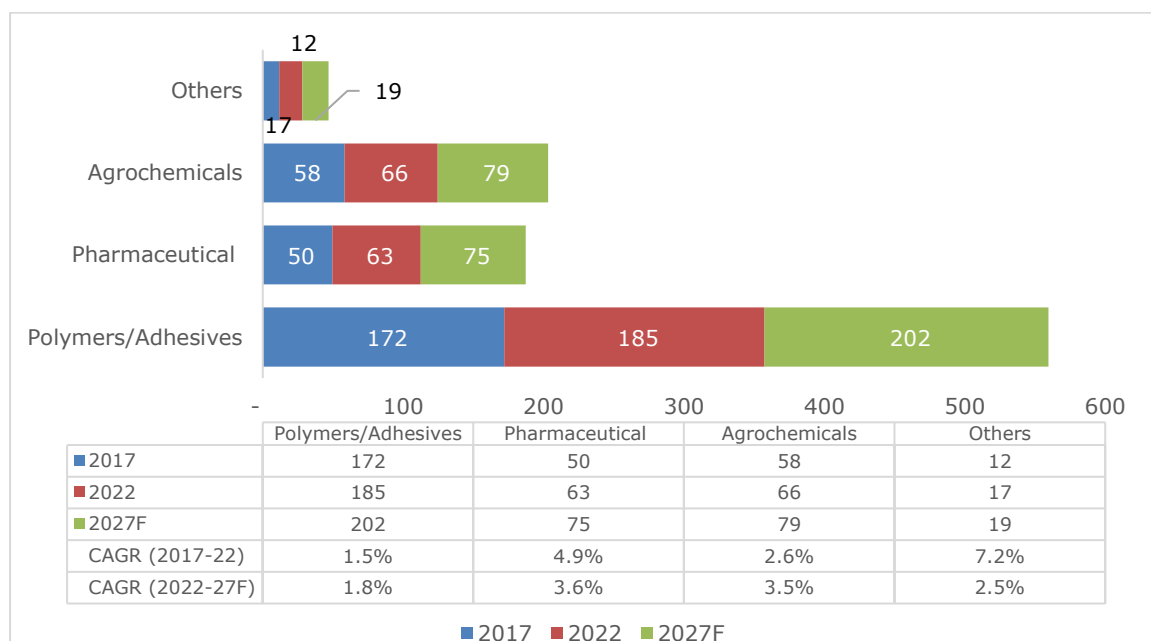


Sources: Annual reports and F&S estimation

5.5.4 Market size - Global and India – Based on Application

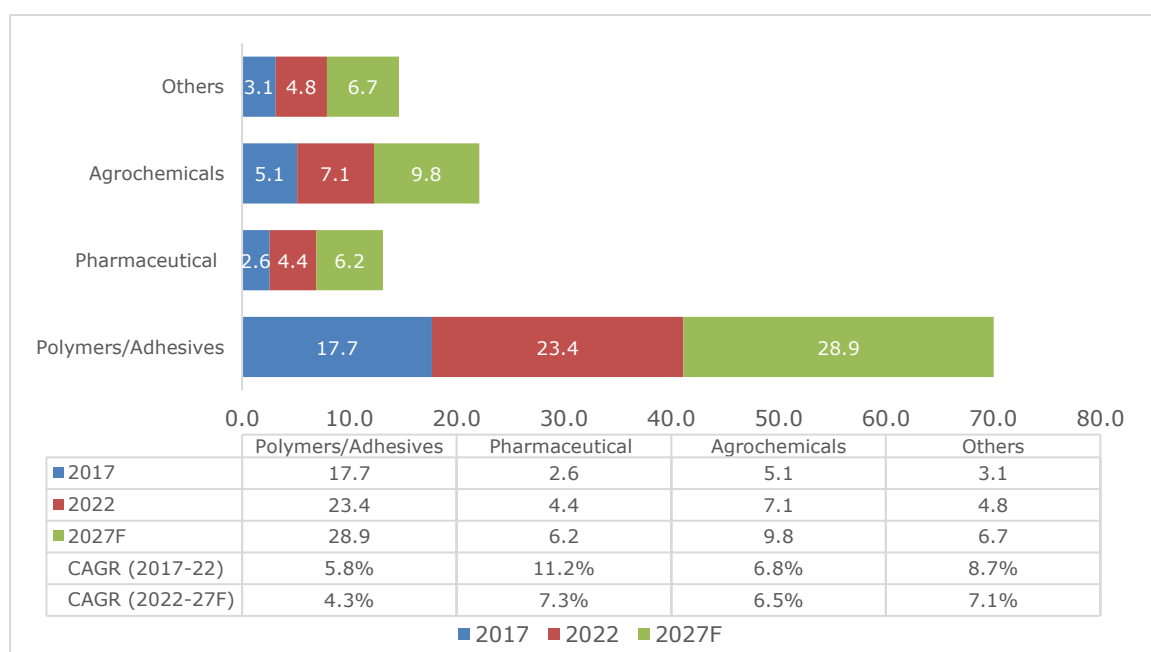
Octanoyl chloride is used to manufacture adhesives. It is used as an acylating agent for a variety of compounds such as sugars (e.g., Sucrose, aromatic compounds Anisole and monoglycerides). Therefore, it holds a major share in polymers/adhesives application in the forecast period. The rising demand of adhesives in automotives and packaging industry is the primary reason for polymers/ adhesives application to contribute to the largest market share in the forecast period.

Exhibit 48: Global Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

Exhibit 49: India Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

5.6 Cloquintocet Mexyl

5.6.1 Overview

Cloquintocet Mexyl has a white appearance and is widely used in agrochemicals market. The major industries that it caters to include agrochemicals and pharmaceuticals.

5.6.2 Established and Emerging Applications

It is used as an herbicide safener to improve crop tolerance and crop immunity. This would further prevent crop damage and enhance crop life. Cloquintocet-mexyl specifically protects cereals against the harmful effects of herbicides that combat grass insects; these are for example clodinafop-propargyl, pyroxsulam, fenoxaprop-P-ethyl and pinoxaden. The safener is spurted in a mixture together with the actual herbicide and acts as an antidote to the herbicide for the crop plants.

5.6.3 Key growth drivers

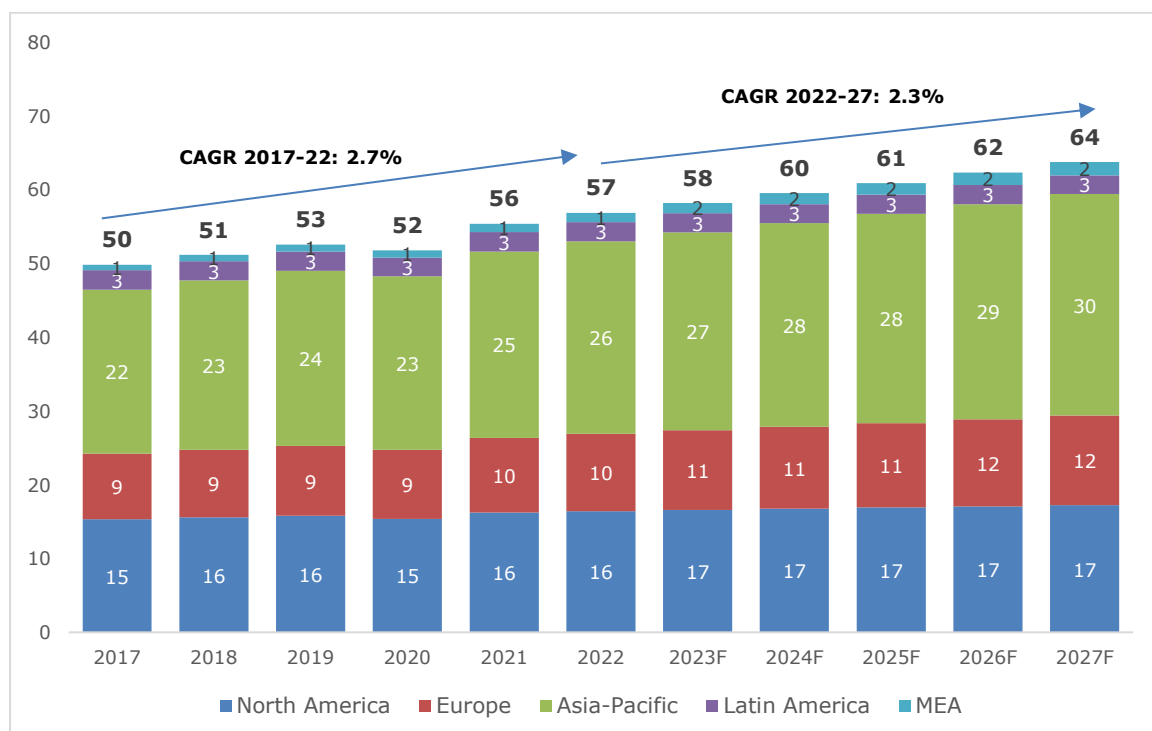
It is expected that the rising demand of safener in India for controlling weeds coupled with the rising expenditure by the Indian government is expected to propel the cloquintocet market in the forecast period.

5.6.4 Market size - Global and India – Based on Region

The Global Cloquintocet Mexyl market is expected to grow from USD 57 Mn in 2022 to USD 64 Mn in 2027 at a CAGR of 2.3%.

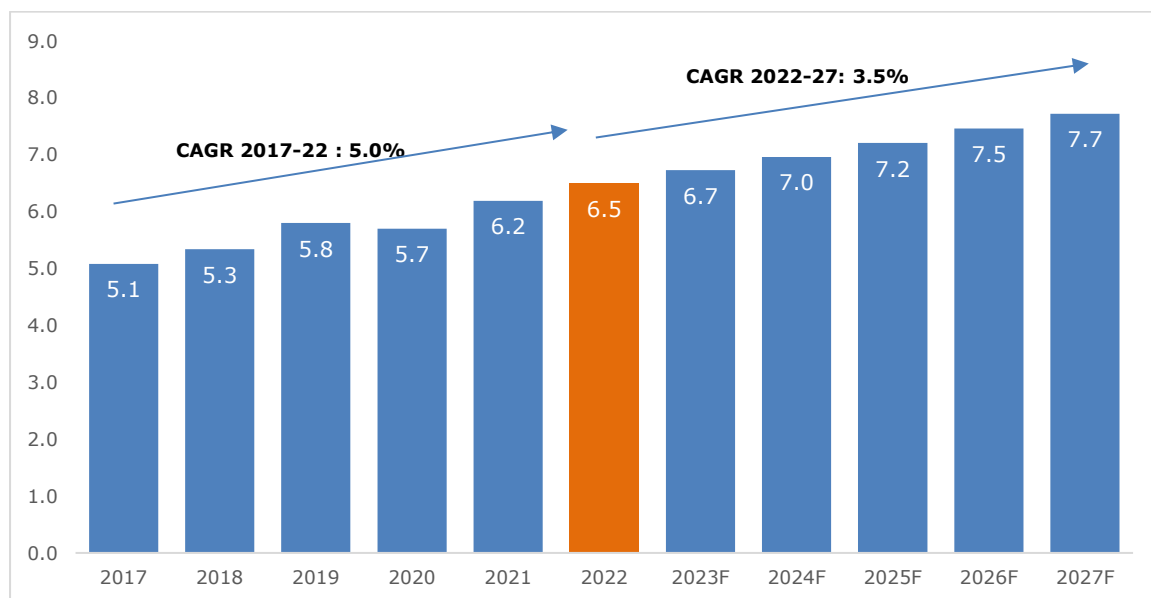
The Indian Cloquintocet Mexyl market is expected to grow from USD ~7 Mn in 2022 to USD ~8 Mn in 2027 at a CAGR of 3.5%.

Exhibit 50: Global Cloquintocet Mexyl Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 51: Indian Cloquintocet Mexyl Chemicals Market (USD Million) CY 2017-2027F

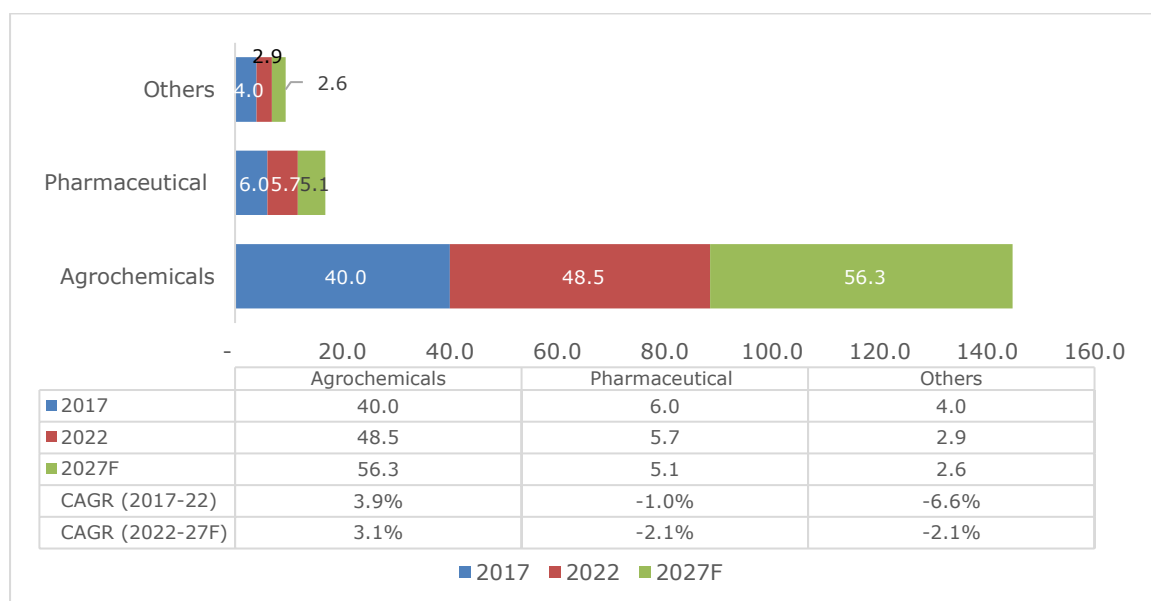


Sources: Annual reports and F&S estimation

5.6.5 Market size - Global and India – Based on Application

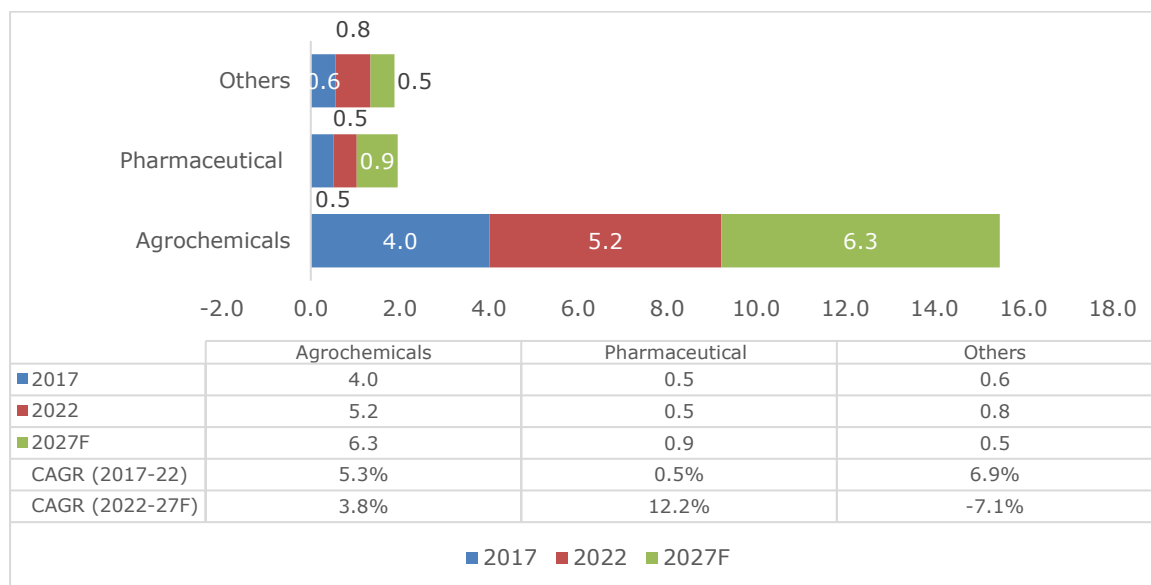
Cloquintocet-mexyl is a safener needed in formulations to prevent damage to target crops due to phytotoxic effects. The agrochemical application demand is being driven by a robust demand from domestic as well as export market. Rising population and increasing subsidies allocated by government in emerging economies for supporting agricultural mechanisms are some of the key factors driving the growth of Cloquintocet Mexyl market. Agrochemicals is expected to continue to be the largest application going forward.

Exhibit 52: Global Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

Exhibit 53: India Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

5.7 2-Cyano Phenol

5.7.1 Overview

2-Cyanophenol is an off white to brownish coloured advanced intermediate that has toluene like odour. It can be synthesised by reacting hydrogen peroxide with phenol in the presence of sephadex g-100, which provides a high yield of product.

5.7.2 Established and Emerging Applications

It has been shown to have antimicrobial properties against Gram-positive bacteria, such as Staphylococcus aureus, and Gram-negative bacteria, such as Escherichia coli and Pseudomonas aeruginosa. 2-Cyanophenol has capability to react with metal hydroxides such as ferric chloride or zinc chloride to form precipitates. It is a phenolic compound that is used as an intermediate for the synthesis of pharmaceuticals and agrochemicals. The major application of this advanced intermediate is as a pesticide and it is also used as a disinfectant. It is used for wastewater treatment and to remove salicylaloxime from contaminated water.

5.7.3 Key growth drivers

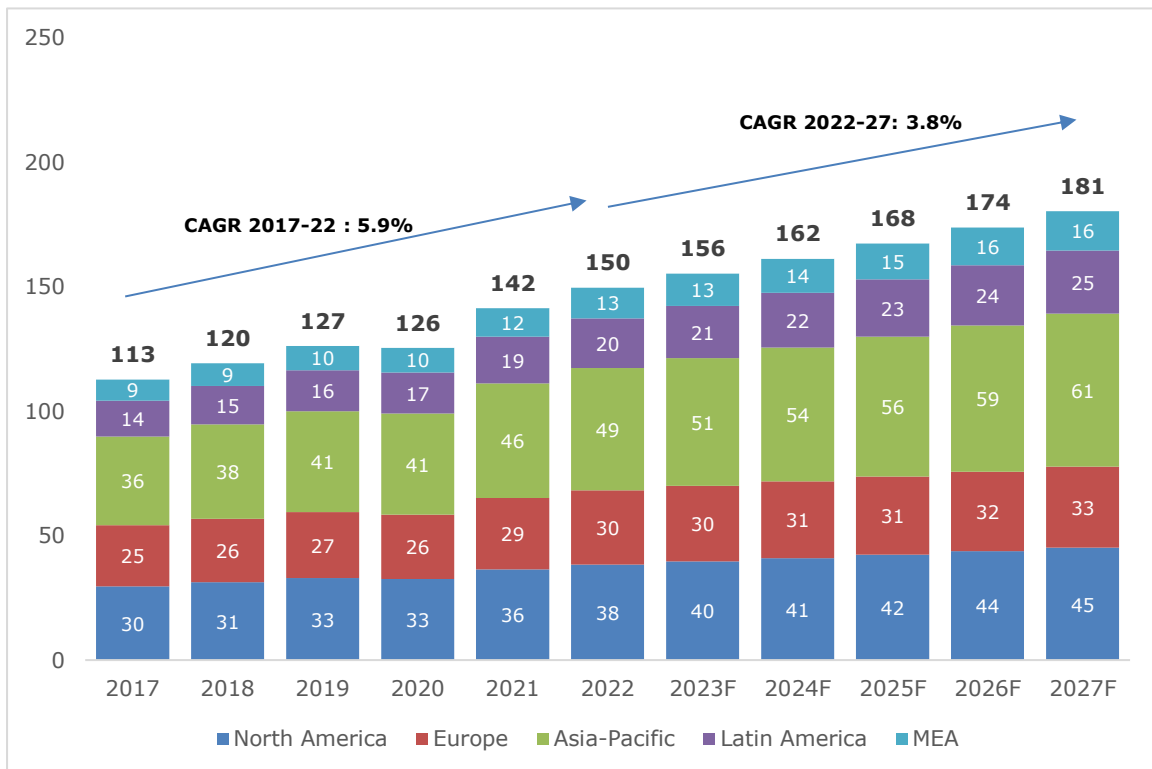
The growing usage of 2-Cyanophenol in healthcare sector ((As an intermediate to produce some pharmaceuticals (antianginal compounds, anti-malarial agents, antiseptics, disinfectants, etc.), also used as an intermediate to produce some fungicides)) and in the agriculture sector is driving the demand of 2-Cyanophenol in the forecast period.

5.7.4 Market size - Global and India – Based on Region

The Global 2-Cyanophenol market is expected to grow from USD 150 Mn in 2022 to USD 181 Mn in 2027 at a CAGR of 3.8%.

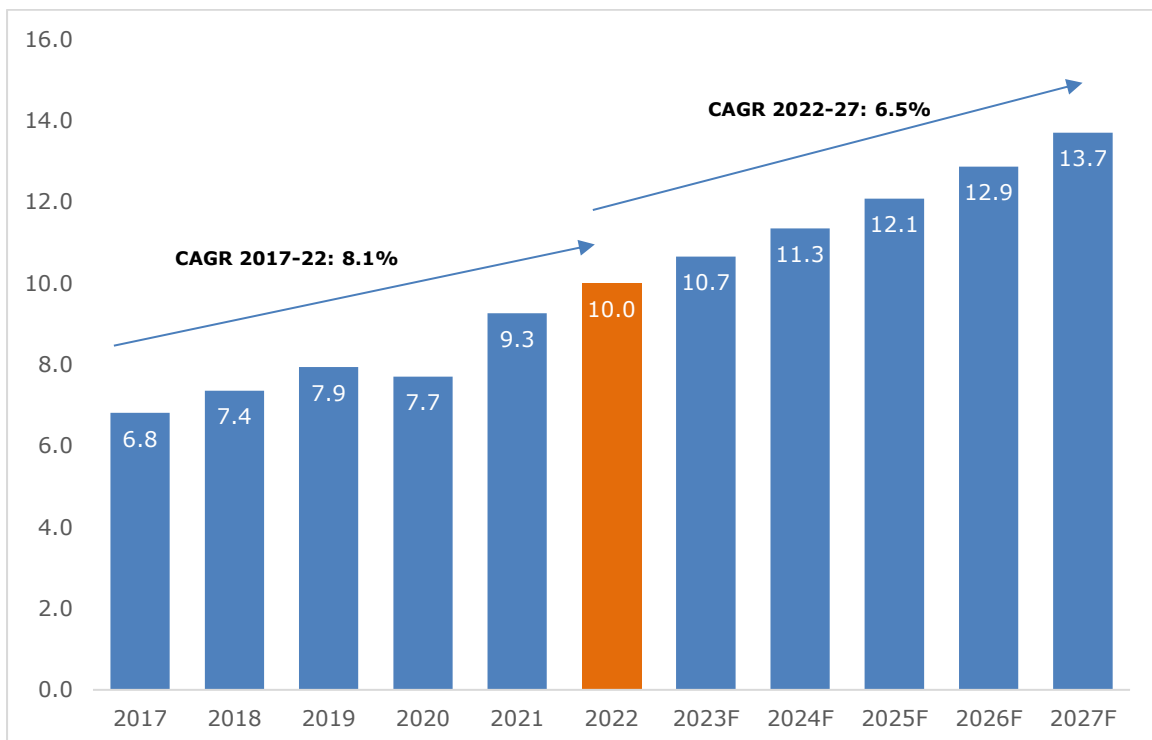
The Indian 2-Cyanophenol market is expected to grow from USD 10 Mn in 2022 to USD ~14 Mn in 2027 at a CAGR of 6.5%.

Exhibit 54: Global 2 Cyano Phenol Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 54: Indian Cyano Phenol Chemicals Market (USD Million) CY 2017-2027F

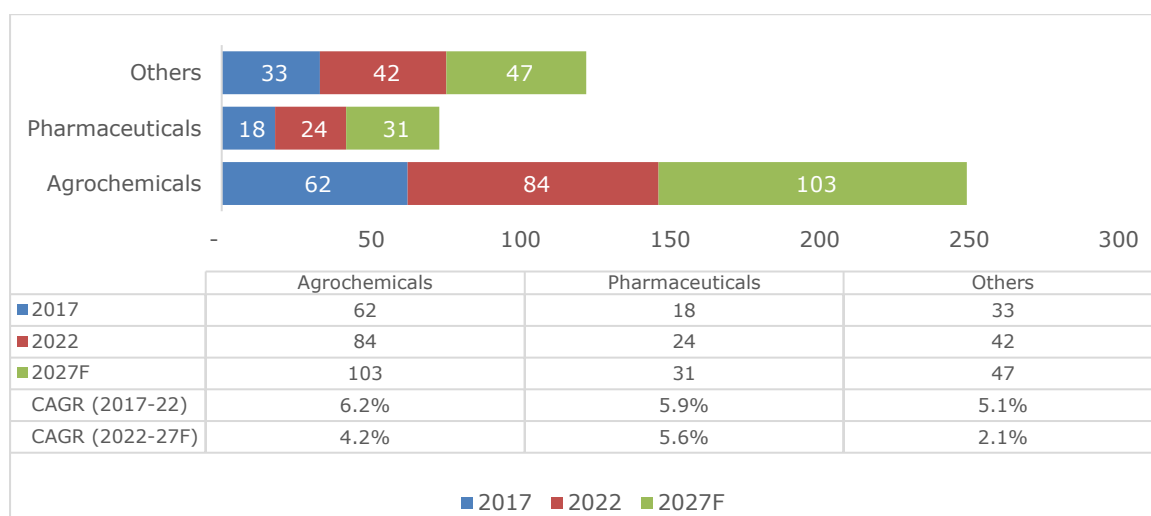


Sources: Annual reports and F&S estimation

5.7.5 Market size - Global and India – Based on Application

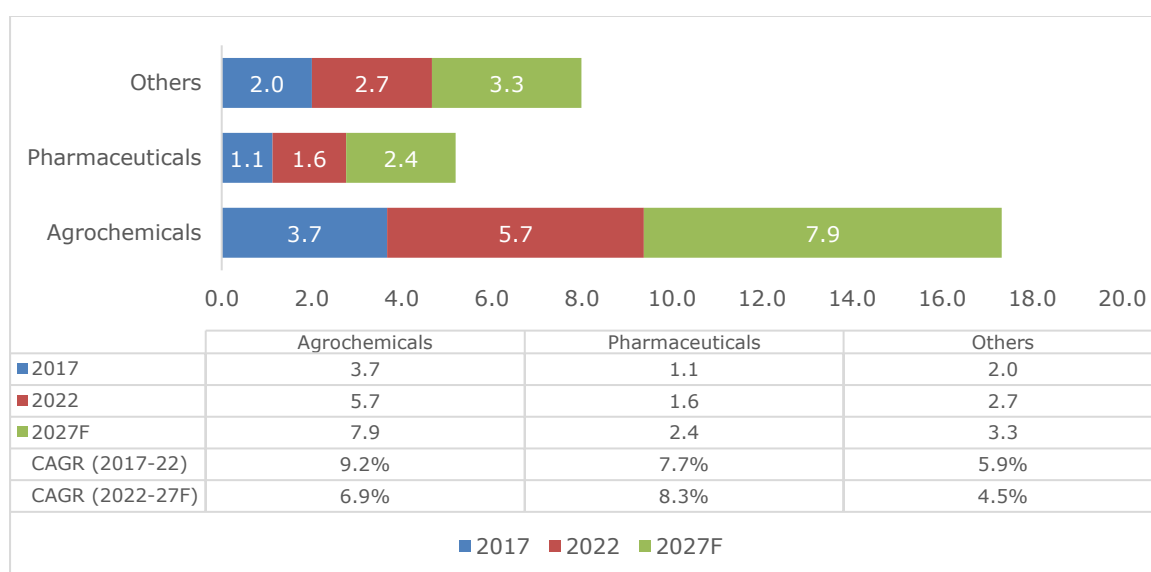
The growing usage in agrochemicals and pharmaceuticals sector is driving the demand of 2-Cyanophenol in the forecast period. The pharmaceuticals application captured a share of ~16% in 2022 and is expected to be the fastest growing segment in the forecast period. After the pandemic, the usage of disinfectants in various applications such as household, institutional and industrial cleaning has become more pronounced. 2-Cyanophenol is the key ingredient for manufacturing disinfectants which will further fuel the demand for the same.

Exhibit 55: Global Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

Exhibit 56: India Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

5.8 DCPI (3,4 and 3,5)

5.8.1 Overview

3,4-Dichlorophenyl isocyanate is used in the synthesis of 1,5-disubstituted-2-thiobiuret derivatives via reaction with thioureido-containing aromatic/heterocyclic sulfonamides. It is a solid, and ranges in colour from white to yellow. It is an irritant for tissues including eyes and mucous membrane with toxic fumes.

5.8.2 Established and Emerging Applications

This advanced intermediate chemical is majorly used in agrochemical market as it is mainly used in synthesizing herbicides such as diuron, and propanil. Other major applications of this chemical are chemical synthesis, manufacturing of dyestuffs, cosmetics, and polymer auxiliaries.

5.8.3 Key growth drivers

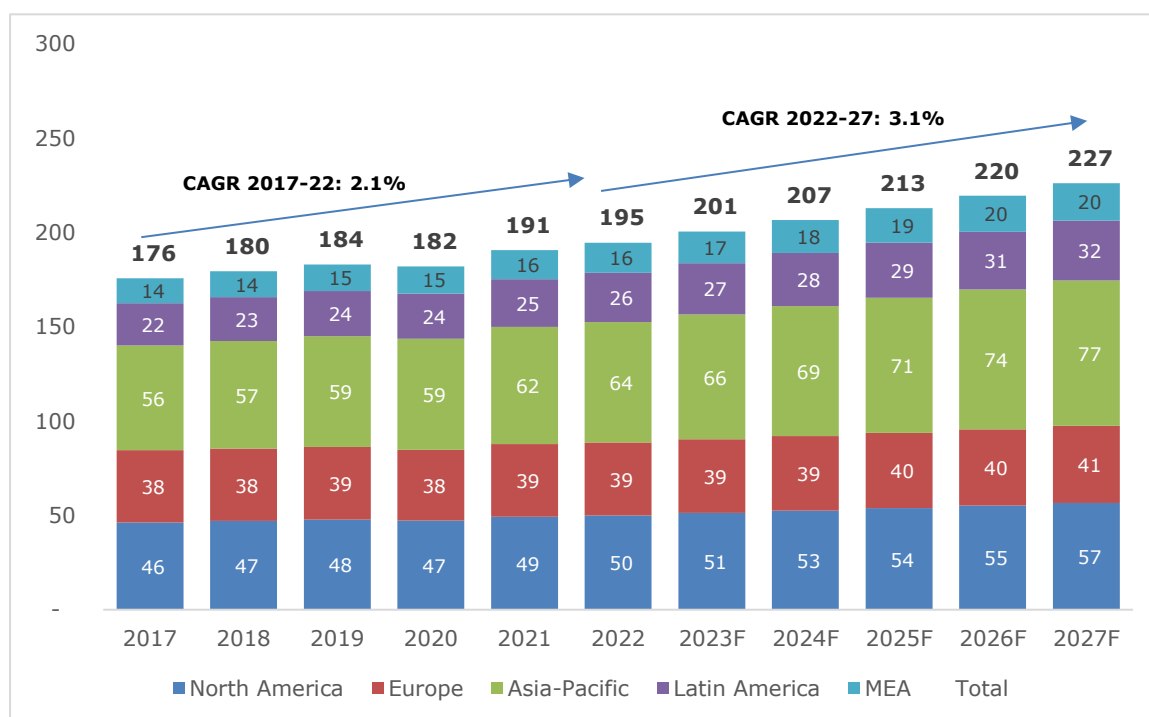
It is used as a hardener in the polymer market and is the prime reason to drive the 3,4-Dichlorophenyl isocyanate market in the forecast period. Also, the growing demand for cosmetics and agricultural chemicals, where 3,4-Dichlorophenyl isocyanate finds application is also expected to drive its market in the forecast period.

5.8.4 Market size - Global and India – Based on Region

The Global 3,4-Dichlorophenyl isocyanate market is expected to grow from USD 195 Mn in 2022 to USD 227 Mn in 2027 at a CAGR of ~3.1%.

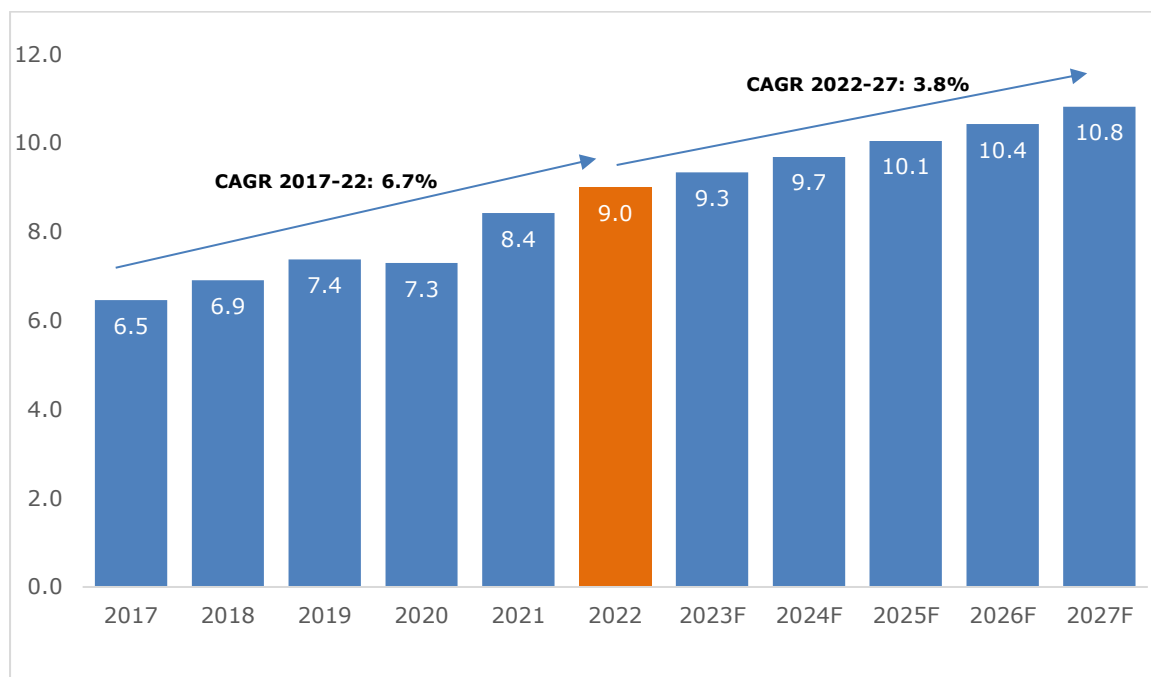
The Indian 3,4-Dichlorophenyl isocyanate market is expected to grow from USD 9 Mn in 2022 to USD 11 Mn in 2027 at a CAGR of ~3.8%.

Exhibit 57: Global DCPI (3,4 and 3,5) Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 58: Indian DCPI (3,4 and 3,5) Chemicals Market (USD Million) CY 2017-2027F

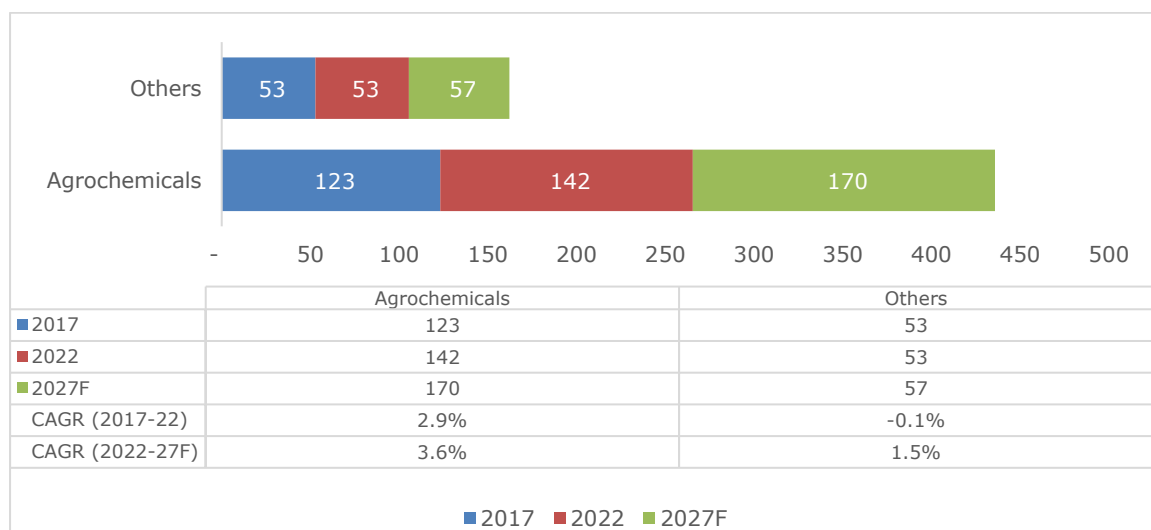


Sources: Annual reports and F&S estimation

5.8.5 Market size - Global and India – Based on Application

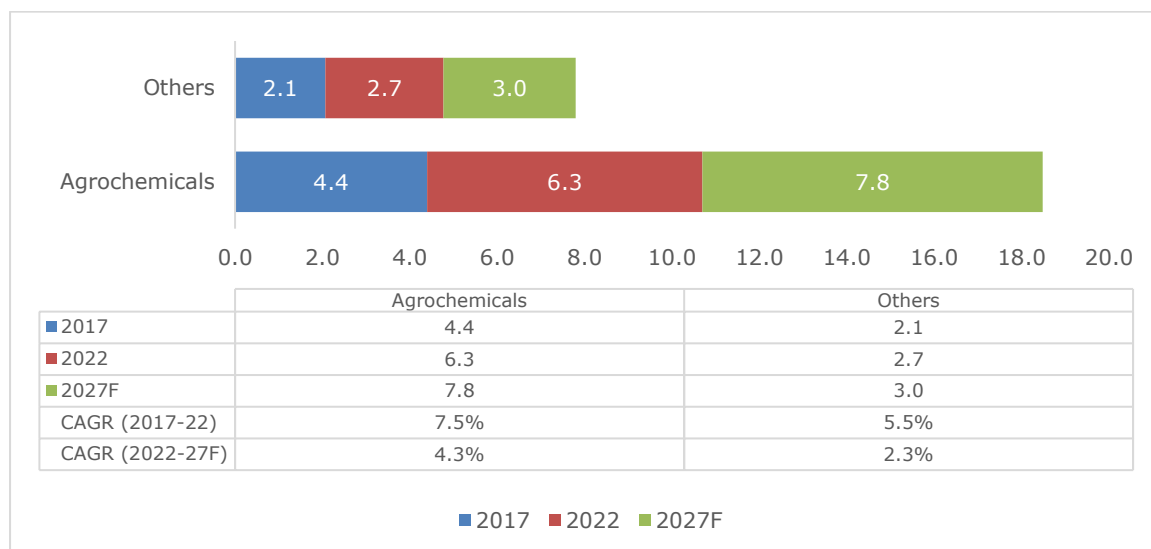
3,4-Dichlorophenyl isocyanate is used in plastic and polyrubbers, textile dyestuff, polymer auxiliaries, manufacturing of skin cosmetic products. The diversified application of this advanced intermediate is driving the demand in the forecast period. In 2022, agrochemicals application captured a share of ~73% of the Indian 3,4-Dichlorophenyl isocyanate market. This was due to huge demand of herbicides from countries like Brazil, United States, Japan and China. The key ingredient of herbicides is 3,4-Dichlorophenyl isocyanate. This is a key reason why the agrochemicals application is expected to hold the largest share in the forecast period.

Exhibit 59: Global Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

Exhibit 60: Historic and Projected growth of select End-user segments in India, in USD million



Sources: Annual reports and F&S estimation

5.9 Para Chloro Meta Xynelol

5.9.1 Overview

Para Chloro Meta Xynelol (PCMX) is a bactericide and preservative with a long established and proven use in controlling mildew, bacterial and fungal growth in a wide range of applications.

5.9.2 Established and Emerging Applications

This chemical has a preservative property, which has further increased its usage in personal care and pharmaceutical market. It is used as an antiseptic and disinfectant agent that is used for skin treatment and surgical instruments. It is also found in antibacterial soaps, wound-cleansing applications, and household antiseptics.

5.9.3 Key growth drivers

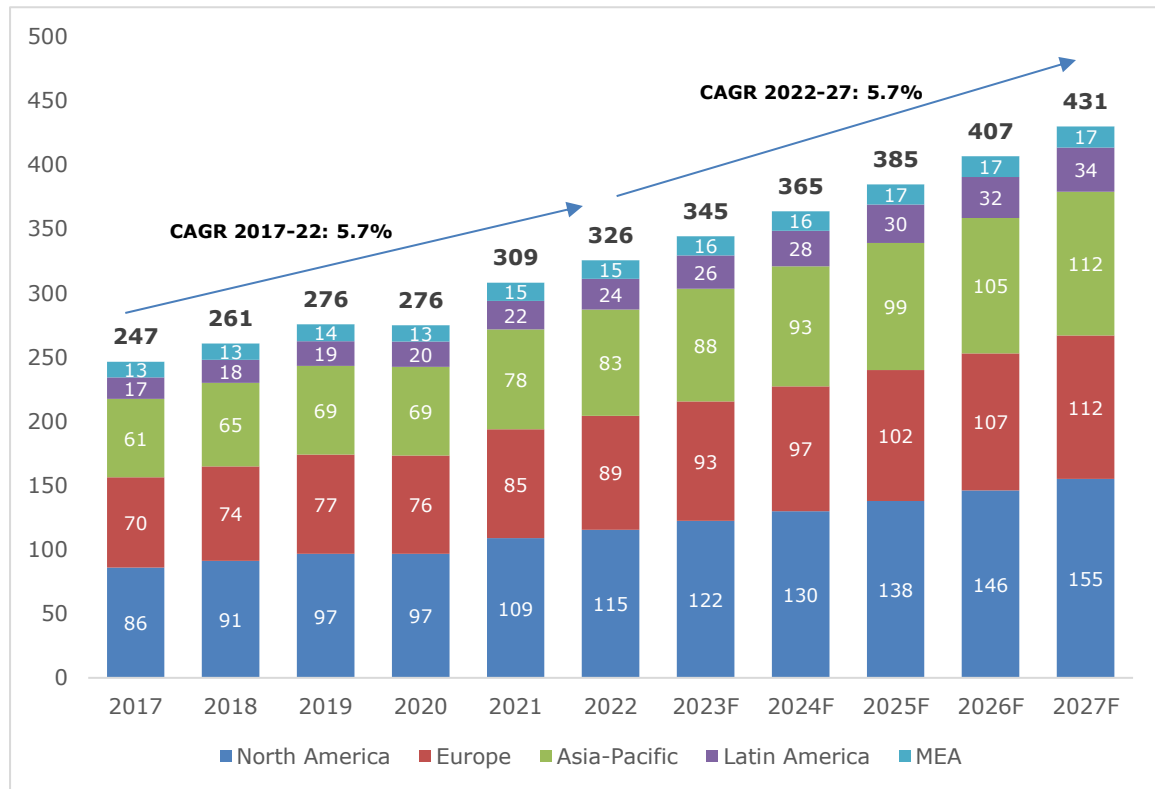
The predominant medical applications for which chloroxylenol is formally indicated for therapeutic use is as an application to the skin for use in cuts, stings, bites, abrasions, and for use as antiseptic hand cleaner. All these applications are expected to drive the Para Chloro Meta Xynelol market in the forecast period.

5.9.4 Market size - Global and India - Based on Region

The Global Para Chloro Meta Xynelol market is expected to grow from USD 326 Mn in 2022 to USD 431 Mn in 2027 at a CAGR of 5.7%.

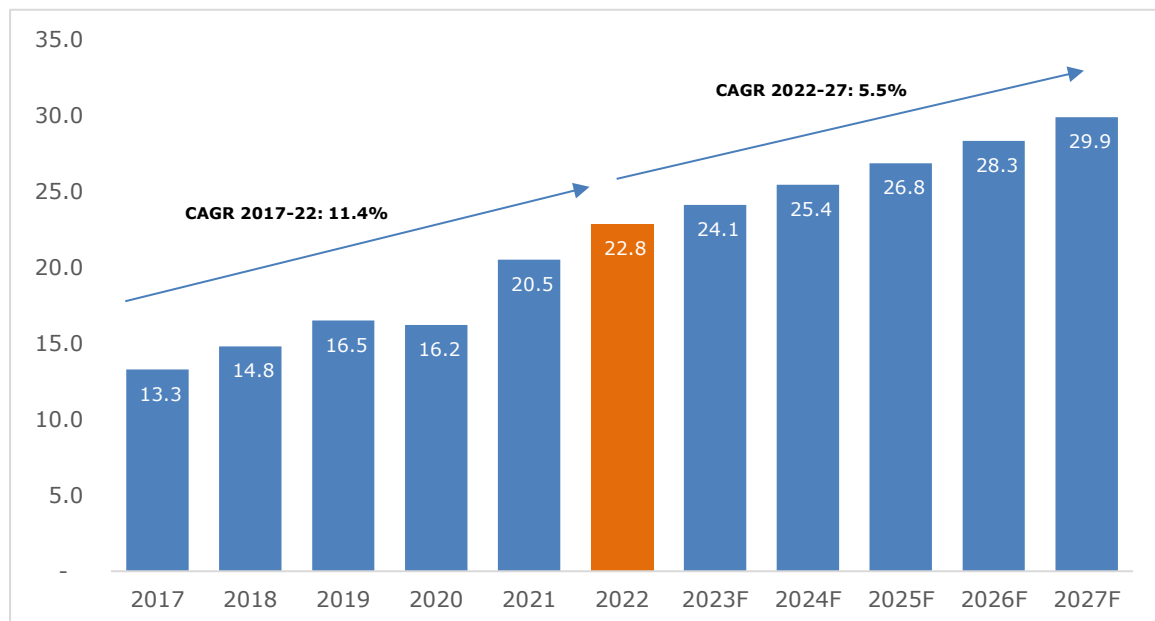
The Indian Para Chloro Meta Xynelol market is expected to grow from USD 23 Mn in 2022 to USD 30 Mn in 2027 at a CAGR of 5.5%.

Exhibit 61: Global Para Chloro Meta Xynelol Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 62: Indian Para Chloro Meta Xynelol Chemicals Market (USD Million) CY 2017-2027F

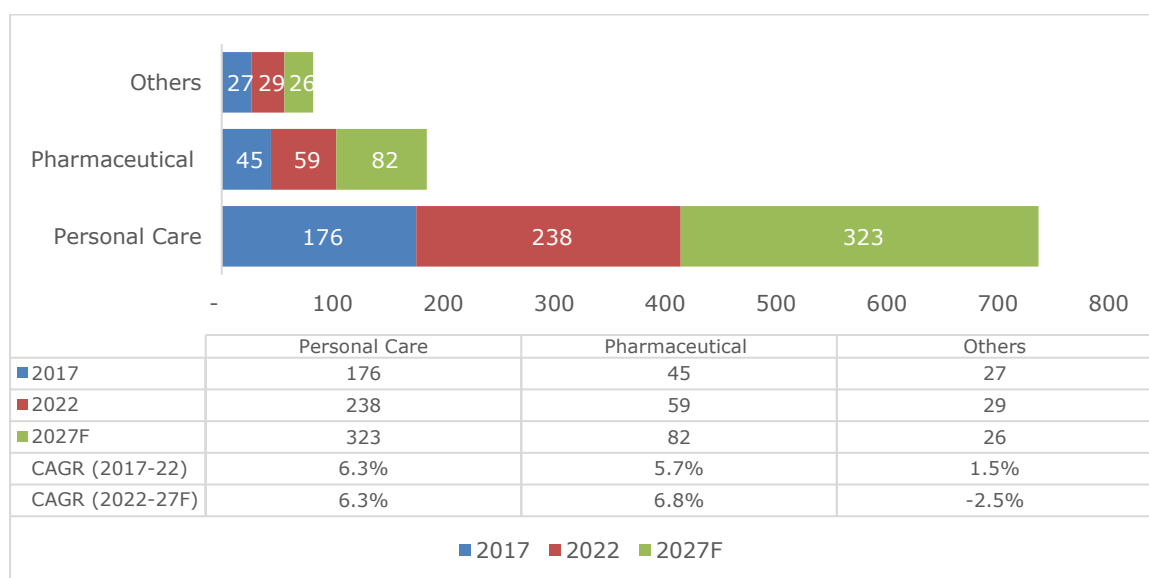


Sources: Annual reports and F&S estimation

5.9.5 Market size - Global and India – Based on Application

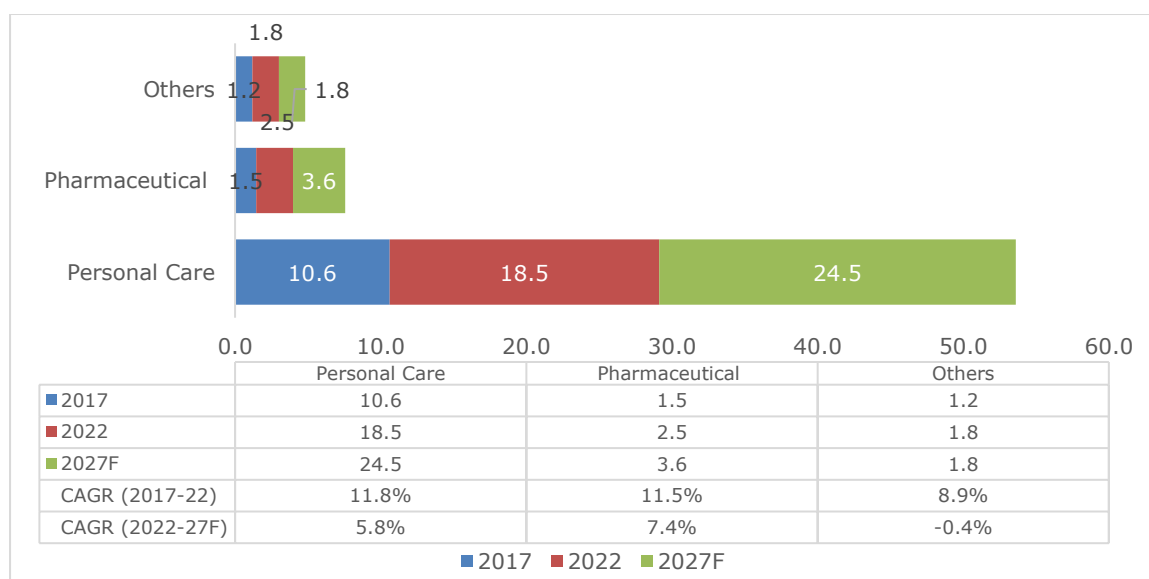
Para Chloro Meta Xylenol is used in many applications such as personal care and pharmaceutical for skin disinfection and surgical instruments. These applications are driving the demand of para chloro meta xylenol's demand in the forecast period. Amongst applications, personal care application captured the largest share of ~73% for the year 2022 in India as there is a growing awareness of skin care, changing lifestyle and easier access to personal care products. Many of these personal care products have para chloro meta xylenol as their ingredient. Pharmaceuticals supplication is expected to grow at the highest CAGR of 7-8% in the forecast period in India and this is primarily because of increasing usage of disinfectants and cleaners that require para chloro meta xylenol.

Exhibit 63: Global Historic and Projected growth of select End-user segments, in USD million



Sources: Annual reports and F&S estimation

Exhibit 64: India Historic and Projected growth of select End-user segments in India, in USD million



Sources: Annual reports and F&S estimation

5.10 Diuron

5.10.1 Overview

Diuron, also known as DCMU (3-(3,4-dichlorophenyl)-1,1-dimethylurea), is a herbicide in the urea chemical family that inhibits photosynthesis.

5.10.2 Established and Emerging Applications

Diuron is the trade name for DCMU, an algaecide and herbicide active ingredient used for controlling annual and perennial broadleaf and grassy weeds in agricultural settings as well as for industrial and commercial areas. It is a white crystalline odorless solid, and it exhibits slow acute toxicity. It is also used as a preservative in paper products, such as cardboard, paper towels, and napkins. It helps to prevent the growth of mold and mildew, which can make the paper products otherwise unsightly and unusable. It is also used to control weeds and algae in and around water bodies and is a component of marine antifouling paints.

5.10.3 Key growth drivers

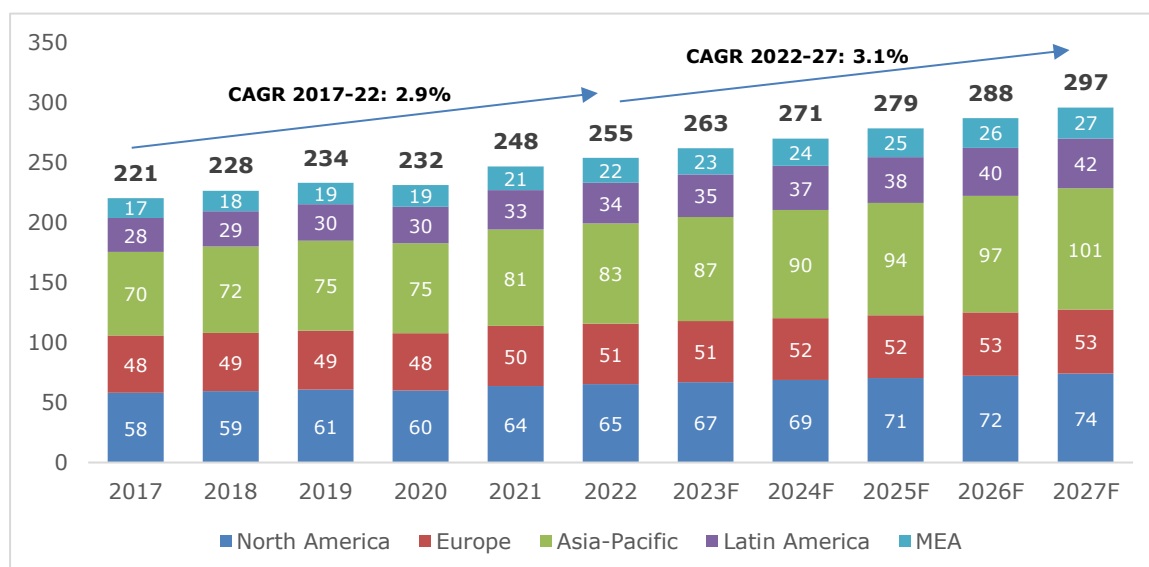
Diuron is a widely used herbicide in agriculture, and the increasing demand for agricultural products is expected to drive the growth of the diuron market. It is used in agricultural settings to control invasive weeds around forage crops, field crops, fruits, vegetables, nuts, and ornamental crops. There are ongoing developments in diuron formulations, which are expected to improve the efficacy and safety of diuron. This is expected to drive the demand for diuron in the coming years. Based on type, the Diuron market is segmented into crystals and liquids. The crystal segment dominates the global Diuron market, being widely used in farming.

5.10.4 Market size - Global and India – Based on Region

The Global Diuron market is expected to grow from USD 255 Mn in 2022 to USD 297 Mn in 2027 at a CAGR of 3.1%.

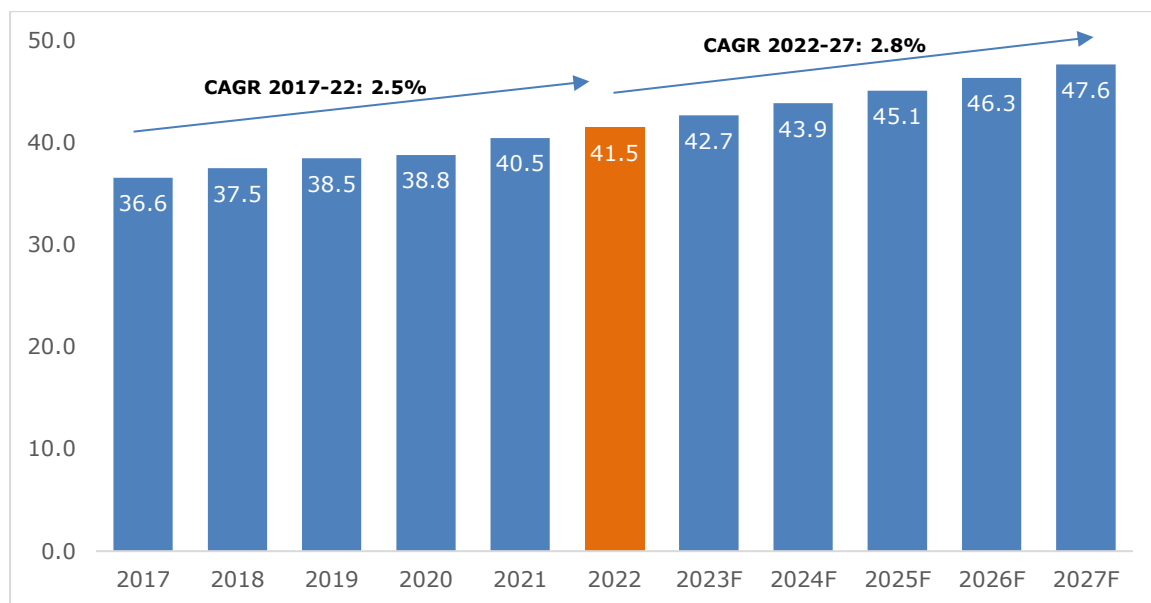
The Indian Diuron market is expected to grow from USD ~42 Mn in 2022 to USD ~48 Mn in 2027 at a CAGR of 2.8%.

Exhibit 65: Global Diuron Chemicals Market (USD Million) CY 2017-2027F



Sources: Annual reports and F&S estimation

Exhibit 66: India Diuron Chemicals Market (USD Million) CY 2017-2027F

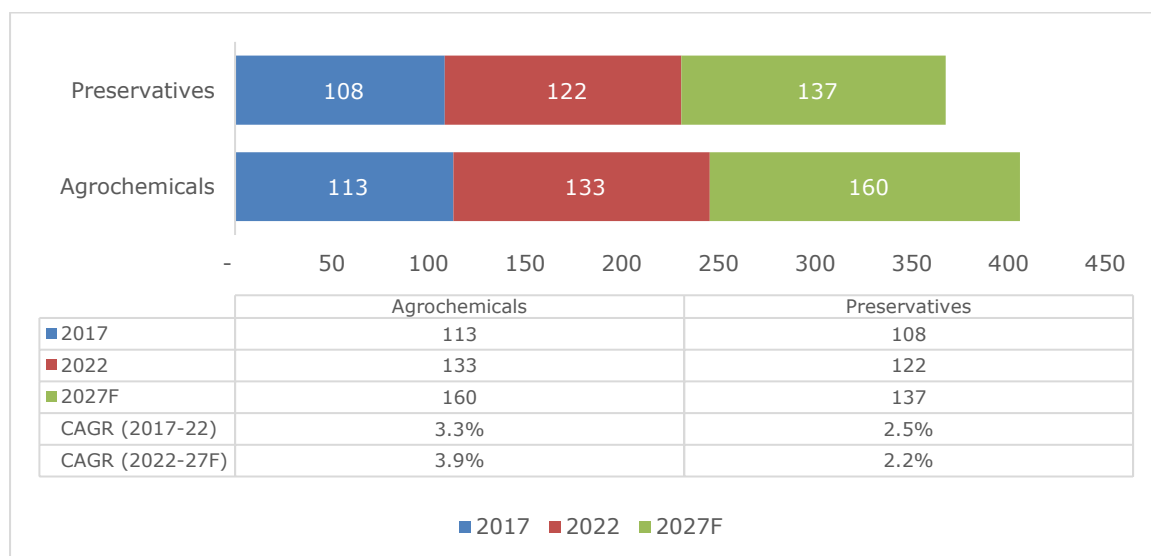


Sources: Annual reports and F&S estimation

5.10.5 Market size - Global and India – Based on Application

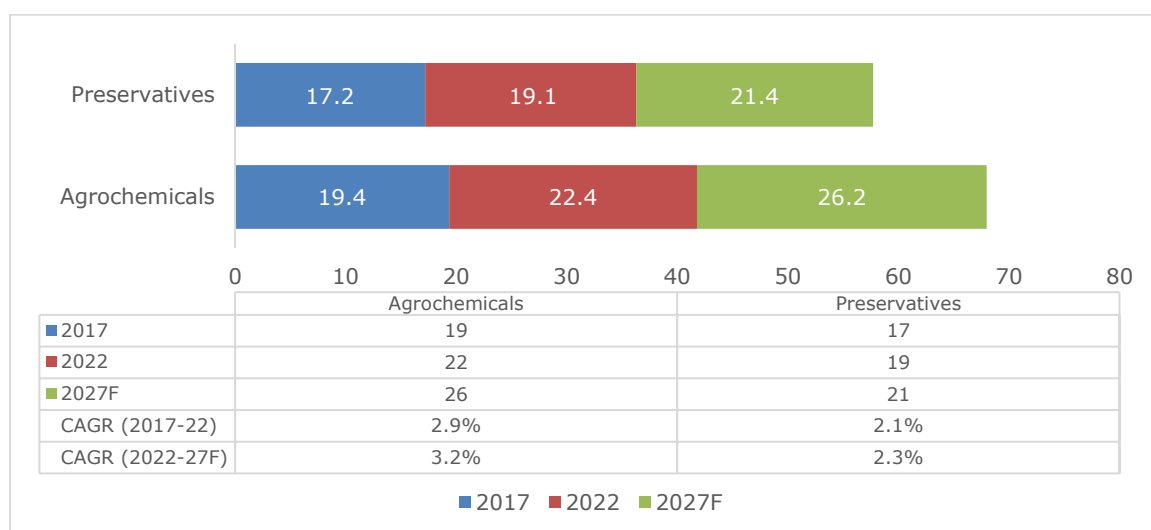
It is used in the production of herbicides, which protects crops from pests. This is the primary reason that drives Diuron’s increasing usage in the agrochemicals market for the forecast period.

Exhibit 67: Global Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

Exhibit 68: India Historic and Projected growth of select End-user segments in USD million



Sources: Annual reports and F&S estimation

Table 3 : Key players and their capacities as of CY 2022 (Indian)

Chemicals	Key Indian Players (capacity in MT/month)							
	Bharat Rasayan	Shiva Pharma chem Ltd./SPL Europe**	Transpek Industries	Kumar Organics	Atul Ltd.	Paushak	FMC (Cheminova)	NS Chemicals
Octanoyl Chloride	NA	210-220	220-240	NA	NA	NA	NA	NA
Cloquintocet Mexyl	50-60	80-100	NA	NA	NA	NA	20-30	NA
Isophthaloyl Chloride	NA	200-300	950-1,000	NA	NA	NA	NA	NA
Pivaloyl Chloride	NA	160-200	NA	NA	NA	NA	NA	NA
DCPI (3,4 and 3,5)	NA	240-250**	NA	NA	NA	750-800	NA	NA
Para Chloro Meta Xynelol	NA	180-200	NA	2-5	NA	NA	NA	10-20
Terephthaloyl Chloride	NA	400-500	2,200-2,300	NA	NA	NA	NA	NA
2-Cyano-phenol	NA	200-220**	NA	NA	NA	NA	90-100	NA
Diuron	NA	150-200	NA	NA	300-320	NA	NA	NA

Source: Company websites, Annual reports, F&S

** Capacities of SPL Europe (European subsidiary of Shiva Pharmachem Ltd. India)

Table 4: Global Prices of advanced intermediate chemicals

Advanced Intermediate	Price in USD/kg (2021)	Price in USD/kg (2022)
Terephthaloyl Chloride	~3.2	~3.4
Isophthaloyl Chloride	~3.4	~4.1
Pivaloyl Chloride	~4.5	~5.1
Octanoyl Chloride	~7.6	~8.2
Cloquintocet Mexyl	~21.7	~22.4
2 Cyano Phenol	~13.3	~13.2
DCPI (3,4 and 3,5)	~5.2	~5.8
Para Chloro Meta Xynelol	~9.5	~9.7
Diuron	~6.3	~6.9

Source: Company websites, Annual reports, F&S

5.11 Pricing Outlook in the Forecast period

India's advanced intermediate chemicals market is playing a vital role in the development of its chemical market and GDP growth. These advanced intermediates are used in various applications such as polymer, agrochemicals, personal care, adhesives and other applications. There is a rise of at least 3-11% between the prices in 2021 as compared to the prices in 2022. This is due to two important reasons that are mentioned below:

Volatile Input Prices: The raw materials prices have been volatile in the past few years. The major raw material required in advanced chemicals is crude oil, as the price of crude oil is highly volatile, it affects a large range of advanced intermediate products. The demand of advanced intermediate chemicals has been rising rapidly due to their increased applications in industries such as polymer, personal care, and adhesives. The rising demand coupled with supply shortage are further increasing the prices of the raw materials that are required to manufacture these intermediate chemicals.

Logistics Challenges: Apart from the rising input cost, domestic players are also plagued by the resurging issue of container shortage. Shipping rates across routes have increased by 3-5x over the past year. It is further indicated by Baltic Dry Index, which surged up to 1,949 in March 2023 from 1,500 in March 2021. These challenges along with rising input costs have added short-term margin pressure on advanced intermediate players. The market expects these issues to persist over the next 4-6 quarters.

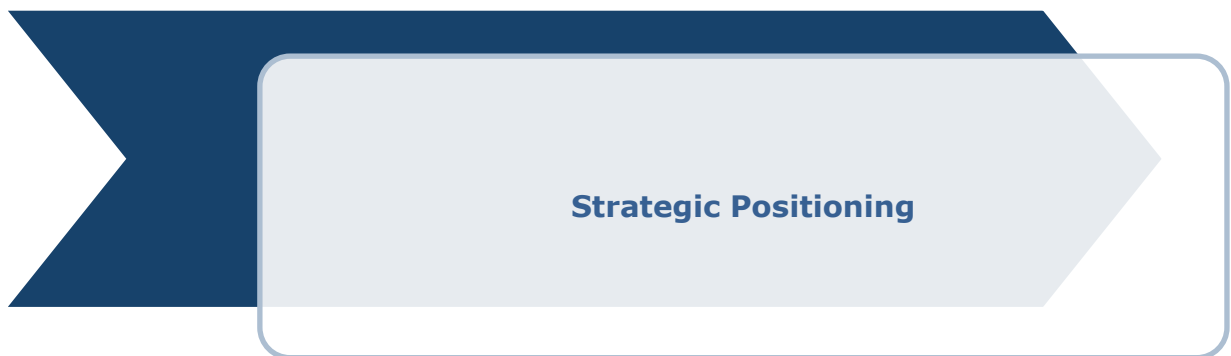
5.12 Established and emerging applications for advanced intermediates

Agrochemical: Agrochemical intermediates are extensively used to produce pesticides such as fungicides, herbicides, and insecticides. The rise in need for agricultural products and food requirements due to increasing population globally is the primary factor impacting the upsurge in agricultural activities. Agrochemicals sector is witnessing a massive uptick in demand due to augmented factors like rising demand for innovative but organic compost, upsurge in commercial value of agrochemical advance intermediates, increasing favourable government policies and rising technological advancements.

Personal Care: The personal care market includes cosmetics, fashion, and FMCG that are growing rapidly as people are getting more aware about personal care. Consumers are increasingly preferring anti-microbial and anti-aging moisturizers, skin protection, UV filters and other cosmetic products for use in daily life. The increase in consumption of advanced intermediate chemicals in personal care market will further boost demand.

Adhesives: The market is witnessing increasing demand for various types of adhesives that are required in automotive, polymer and packaging market. Stringent regulations and a monumental shift towards sustainable products has provided significant opportunities for the adhesives and sealants segment. Such stringent regulations are leading manufacturers to opt for eco-friendly adhesives that would further require advanced intermediate chemicals which will further drive the market.

6 Strategic Positioning



6.1 Strategic Positioning

Shiva Pharmachem Ltd. is the largest manufacturer by volume of acid and alkyl chlorides in CY 2022 in India and a key player globally. The R&D efforts of Shiva Pharmachem Ltd. have been important to its success and a differentiating factor enabling it to attain leading market positions for certain products. In FY 2023, over 80% of Shiva Pharmachem's revenue from operations has been generated from Fortune 500 companies globally. Shiva Pharmachem's Indian facilities are located strategically in India's Chlor Alkali Belt in Gujarat which helps it secure an economic supply of chlorine from domestic suppliers. The lengthy qualification for products, particularly in the agrochemicals, performance chemicals and pharmaceutical industries acts as an entry barrier.

The complexity of the products manufactured by Shiva Pharmachem Ltd. relative to commodity chemicals and regular specialty chemicals is illustrated in the table below.

Table 5:

Parameter	Commodity Chemicals	Regular Speciality Chemicals	Shiva Pharmachem Speciality Chemicals
Blended Price	₹200-300 per kg	₹400-700 per kg	₹600 – 3,000 per kg
Steps in the manufacturing process	1-2	2-3	4-5
Number of stages remaining until active ingredients are produced	n-10 and upwards	n-6 till n-9	Active Ingredients till n-4

Note: n is the number of steps involved in the final formulation of the active ingredient or intermediate from the raw material.

Following are some of the strong and sustainable entry barriers for Company's specialty chemical products:

- **Technology:** The development of in-house technology for all of their products including bulk acid chlorides and specialty chemicals enables it to enjoy strong strategic positioning amongst reputed customers. It has both dedicated as well as multi-purpose, state-of-the-art plants involving multi step synthesis for various chemistries. In FY 2023, the company offered 100+ specialized products and advanced intermediates, all of which have been developed using their own in-house technology.
- **Complex Chemistry:** Shiva Pharmachem Ltd. has established operations and has a rich experience in handling hazardous chemistries like chlorination and vapour phase reactions at high temperatures of 400 °C and above. The company has over 15 complex chemistry capabilities for manufacturing different types of product groups.
- **Integration:** Shiva Pharmachem Ltd. enjoys the distinct advantage of being backward integrated for most of their products owing to their strategic location in the Chlor-alkali belt of Gujarat. They have own thionyl chloride plant with a by-

product reuse facility to ensure sustainability. The company uses chlorine gas as a raw material and receives it via a pipeline for supply to its operations, a highly safe process.

- **Transportation and Storage** They have dedicated storage tank farms for bulk storage of raw materials and finished goods, which helps them to provide a competitive offering. Shiva Pharmachem Ltd. owns a fleet of 189 ISO tanks, which are dedicated to individual products to ensure that quality product is delivered to customers.
- **Client Base:** They have a diverse worldwide customer base with reputed clients based in North America and Europe. Their customer base included more than 181 multinational, regional and local companies in FY 2023.
- **Scale of Operations:** The large scale of their operations enable them with economies and poses a commercial and operation barrier to new entrants.
- **Seasonality of products/Industry:** The industry exhibits a certain degree of seasonality. However, Shiva Pharmachem Ltd. has a diversified product portfolio and caters to different end segments. Additionally, with multi product plant capability, seasonality impact on revenue for Shiva Pharmachem Ltd. and SPL Europe is minimised.

Shivapharma chem Ltd.'s international operations: Shiva Pharmachem Ltd. has two integrated manufacturing facilities in India (Luna, Vadodara and Dahej SEZ, Bharuch) and another facility in Hungary, which together have a manufacturing capacity of ~60,000 MT/Annum. The company has been successful in increasing its penetration in the European market by setting this third production facility in Hungary. Shiva Pharmachem Ltd. has multiproduct facility and is aiming to mitigate its geographical risk of operations by expanding into other regions of the world. Shiva Pharmachem is backward integrated for Nitriles, Amides & Amines from basic raw material, thus offering cost effective and sustainable products to customers.

Shiva Pharmachem Ltd's facility in Hungary is spread over 2,00,000 sq. mt with state-of-the-art phosgenation capabilities. The Hungary plant with 10 KTPA phosgene capacity specializes in manufacturing of phosgene-based intermediates. The plant is well equipped in handling complex and hazardous phosgenation chemistries which itself poses a huge entry barrier to new players and existing competition. The R&D centre in Hungary is intensively engaged in product innovation and optimisation of various process techniques. Apart from phosgene-based intermediates, the Hungary plant also has an additional capacity of 8 KTPA for agrochemicals for producing agrochemical technical/formulations.

Shiva Pharmachem Ltd. has created storage and distribution hubs in Europe and USA to strengthen their relationship and serve their customers better. This has helped them to reduce lead time substantially from six weeks to two weeks. The company aims to further strengthen their export performance by enhancing the customer base worldwide and also by continuously increasing their product basket. Their warehouses have a storage capacity of more than 1,000 MT for raw materials and finished goods each.

Shiva Pharmachem's manufacturing in India and Hungary coupled with its international storage network offers cost and speed of delivery benefits to its customers.

Shiva Pharmachem currently holds international registrations in REACH (registration, evaluation, authorisation and restriction of chemicals) for countries including highly

regulated regions like North America and Europe with stringent requirements on safety, security and quality on chemical products and processes.

6.2 Market share / position of key players

6.2.1 Terephthaloyl Chlorides (TPCL)

Terephthaloyl Chloride is an acid chloride of terephthalic acid that is primarily used in the manufacturing of synthetic fibers, one of which is Kevlar. Terephthaloyl Chloride is a key raw material of aramid fibers.

The terephthaloyl chloride market in India is consolidated. There are two major players in this market, namely Shiva Pharmachem Ltd., Transpek Industry and some other smaller players. Shiva Pharmachem Ltd. has a capacity of manufacturing 500 MT/month terephthaloyl chloride while Transpek has a capacity of around 2,200 – 2,300 MT/month. Together, Shiva Pharmachem and Transpek Industry hold nearly ~20% share for the year CY 2022 of the terephthaloyl chloride global market. Shiva Pharmachem Ltd. is both backward and forward integrated for Terephthaloyl Chloride. The company has its own Thionyl Chloride plant with by-product reuse facility ensuring sustainability.

Terephthaloyl Chloride is a highly regulated chemical. There are strict rules to be followed w.r.t. clear declaration of the hazardous nature of this chemical on the label along with manufacturing details, storage and disposal instructions and environmental impact (e.g., import of hazardous chemical (Amendment) Rules, 1989, 1994, and 2000).

Table 6: Global Market Share of key companies - Terephthaloyl Chloride

Key Companies	Global Market Share (CY 2022)
Shiva Pharmachem Ltd.	2 - 4%
Transpek Industry	15 - 17%
Chinese players	52 - 54%
Others	29 - 32%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.2.2 Isophthaloyl Chloride

Isophthaloyl Chloride is an advanced intermediate chemical that is primarily used in a wide variety of polymers. This chemical is also widely used as a water scavenger.

The market in India for Isophthaloyl Chloride is consolidated. There are majorly two players in the isophthaloyl chloride market, namely Shiva Pharmachem Ltd. and Transpek Industry, along with some other smaller players in India. Shiva Pharmachem and Transpek Industry collectively hold around 12-15% share for the year CY 2022 of the global Isophthaloyl chloride market.

Shiva Pharmachem has a combined capacity of 18,000 MT for Acid Chlorides where they manufacture around 75 different types of products. In CY 2022, Shiva Pharmachem exported nearly ~520 MT of Isophthaloyl chloride.

Isophthaloyl Chlorides is a regulated chemical. It is a highly toxic and corrosive chemical and poisonous when ingested. It is unstable when it comes in contact with water, strong bases and alcohols (liberate toxic gases when comes in contact). It falls under the category of hazardous chemicals while transporting and handling.

Table 7: Global Market Share of key companies – Isophthaloyl Chloride

Key Companies	Global Market Share (CY 2022)
Shiva Pharmachem Ltd.	3 - 5%
Du Pont	14 - 16%
Transpek Industry	11 - 13%
Chinese Players	62 - 65%
Others	6 - 9%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms.

6.2.3 Pivaloyl Chloride

Pivaloyl chloride is used as an input for manufacturing some pharmaceuticals, insecticides, and herbicides. The market in India for Pivaloyl Chloride is reasonably consolidated. There is only one major player in the Indian market - Shiva Pharmachem Ltd. Globally, it holds around 3% share for the year CY 2022 of the Pivaloyl chloride market. Shiva Pharmachem Ltd. manufactures around 1,000-1,500 MT of pivaloyl chloride in a year. The company has various quality certificates and wider client base that helps them in distributing their chemicals in India as well as export them.

Shiva Pharmachem has developed in-house technologies to produce all the chemicals including specialties. Shiva pharmachem Ltd. operates dedicated as well as multipurpose plants with multi step synthesis. In FY 2023, over 80% of Shiva Pharmachem’s revenue from operations has been generated from Fortune 500 companies globally. These capabilities give it an edge over other peers.

Table 8: Global Market Share of key companies - Pivaloyl Chloride

Key Companies	Global Market Share (CY 2022)
Shiva Pharmachem Ltd.	2 - 4%
BASF	23 - 26%
CABB Chemicals	13 - 16%
VWR International	11 - 15%
Chinese players	49 - 53%
Others	2 - 4%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms.

6.2.4 Octanoyl Chloride

Octanoyl Chloride is used in polymer/adhesives, pharmaceuticals, and agrochemicals applications. The market in India for Octanoyl Chloride is reasonably consolidated. Shiva Pharmachem holds ~4% share for the year CY 2022 of the Octanoyl chloride global market and is the second largest player in India. The other prominent players are BASF, CABB Group, Altivia, Transpek, and others. Shiva Pharmachem Pvt Ltd. has a manufacturing capacity of around 210 MT/month. It has a strong client base and their products cater to a wider range of applications across industries.

Table 9: Global Market Share of key companies - Octanoyl Chlorides

Key Companies	Global Market Share (CY 2022)
Shiva Pharmachem Ltd.	3 - 5%
BASF	14 - 17%
CABB Group	13 - 16%
Altivia	11 - 14%
Transpek Industry	3 - 5%
Chinese Players	42 - 45%
Others	2 - 5%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms.

6.2.5 Cloquintocet Mexyl

Cloquintocet Mexyl is widely used in agrochemicals and pharmaceuticals.

The market in India is fragmented with many large and small players such as Shiva Pharmachem Ltd., Bharat Rasayan and others. Shiva Pharmachem Ltd. is the largest player in the world with almost 25% to 28% of the global market share of Cloquintocet Mexyl. Shiva Pharmachem Ltd. has a manufacturing capacity of 100 MT of Cloquintocet Mexyl per month, while Bharat Rasayan can manufacture around 50 MT of Cloquintocet Mexyl per month. Shivapharma chem Ltd. enjoys a strong customer base in agrochemicals sector and has grabbed organic and inorganic growth opportunities to enter new markets.

Table 10: Global Market Share of key companies - Cloquintocet-mexyl

Companies	Global Market Share (CY 2022)
Shiva Pharmachem Ltd.	25 - 28%
Dow Chemicals	10 - 12%
Syngenta	9 - 11%
Bharat Rasayan	2 - 4%

Bhagiradha Chemicals & Industries Limited	1 - 3%
FMC/ Cheminova	2 - 4%
Chinese Players	44 - 47%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.2.6 2-Cyano Phenol

The 2-Cyanophenol market in India is fragmented and majority of the demand is being serviced by Chinese imports. SPL Europe is the largest player in India and globally with 24% global market share and monthly capacity of 220 MT for 2-Cyanophenol. After SPL, several Chinese players collectively hold 70%-73% share in the global market.

Table 11: Global Market Share of 2-Cyano Phenol

Key Companies	Global Market Share (CY 2022)
SPL Europe LLC	24-27%
Cheminova India Limited	2-3%
Chinese players	69-72%
Other	5-7%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

*SPL Europe LLC (currently European subsidiary of Shiva Pharma chem Ltd.)

6.2.7 DCPI (3,4 and 3,5)

3,4-Dichlorophenyl isocyanate is used in the synthesis of 1,5-disubstituted-2-thiobiuret derivatives via reaction with thioureido-containing aromatic/heterocyclic sulfonamides.

3,4-Dichlorophenyl isocyanate market in India is consolidated with the only major manufacturer being Paushak Limited. Paushak holds around 7% of the global 3,4-Dichlorophenyl isocyanate market for the year CY 2022.

SPL Europe (Hungary)) has a capacity of around 250 MT per month for manufacturing aromatic isocyanates and enjoys 8-10% market share (third largest player) globally.

Table 12: Global Market Share of key companies - DCPI (3,4 and 3,5)

Key Companies	Global Market Share (CY 2022)
SPL Europe LLC*	8 -10%
Lanxess (Germany)	54-58%

UP Chem China Co Ltd. (China)	15-19%
Anhui Guangxin Agrochemical (China)	5-8%
Paushak	5 - 9%
Others	2-5%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms *SPL Europe LLC (currently European subsidiary of Shiva Pharma chem Ltd.)

6.2.8 Para Chloro Meta Xynelol

Para Chloro Meta Xynelol (PCM) is a bactericide and preservative with a long established and proven use in controlling mildew, bacterial and fungal growth in a wide range of applications.

The Para Chloro Meta Xynelol market is dominated by Shiva pharmachem who caters to a leading FMCG global giant for use in disinfectants. However, there are many medium and small-scale local manufacturers who sell a lower grade quality to farmers in the Indian market.

Table 13: Global Market Share of key companies - Para Chloro Meta Xynelol

Key Companies	Global Market Share (CY 2022)
Shiva Pharma chem Ltd.	40 - 42%
NS Chemicals	3 - 6%
Kumar Organics	13 - 16%
Chinese players	38 - 42%
Other	2 - 5%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.2.9 Diuron

Diuron is the trade name for DCMU, an algaecide and herbicide active ingredient used for controlling annual and perennial broadleaf and grassy weeds in agricultural settings as well as for industrial and commercial areas.

The Diuron market in India is fragmented. Many local manufacturers sell these to farmers at a cheaper rate and hence this market is fragmented. The large players in this market include Atul, Bharat Rasayan and others.

Table 14: Global Market Share of key companies - Diuron

Key Companies	Global Market Share (CY 2022)
SPL Europe LLC*	4 - 7%
Adama Agan Ltd.	11-15%
Atul Ltd.	8-10%
Bharat Rasayan	8-10%
Chinese players	39-44%
Others	25-28%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms *SPL Europe LLC (currently European subsidiary of Shiva Pharma chem Ltd.)

6.2.10 Acid Chlorides

Acid Chloride products find use in various end-use industries, such as pharmaceuticals, polymers, agrochemicals, and others. The market in India for Acid Chlorides is reasonably consolidated. Some of the players are Shiva Pharmachem Ltd., Transpek Industry, Shree Sulphurics Pvt. Ltd. and Bromchem Laboratories Private Limited.

Shiva Pharmachem Ltd. has a manufacturing capacity of around 18,000 MT of acid chlorides per annum. They have a wide range of acid chlorides that cater to various industrial needs. Shivapharma chem Ltd. has a large clientele all around the world and is among the top 3 players globally.

Table 15: Market Share of key companies (India) - Acid Chlorides

Key Companies	India Market Share (CY 2022)
Shiva Pharmachem Ltd.	49-52%
Transpek	24 - 26%
Shree Sulphurics Pvt. Ltd.	17-20%
Others	4-6%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.2.11 Aromatic Carbonyl Chloride

Aromatic carbonyl chloride is used in making organic chemicals, polycarbonate resins, dyestuffs, and isocyanates for making polyurethane resins. The market in India for aromatic carbonyl chloride is consolidated. Some major players are Shiva Pharmachem Ltd., Transpek Industry, Shree Sulphurics Pvt. Ltd. and others. Shiva Pharmachem and

Transpek Industry collectively hold around 47% for CY 2022 of the Indian aromatic carbonyl chloride market with Shiva being one of the top 3 players globally.

Shiva Pharmachem manufactures a wide range of aromatic carbonyl chlorides that have wide applications across industries. The company is extensively using strategies such as mergers & acquisitions and product portfolio expansion (wider array of downstream derivatives) to further penetrate in the market.

Table 16: Market Share of key companies (India) - Aromatic Carbonyl Chloride

Key Companies	India Market Share (CY 2022)
Shiva Pharmachem Ltd.	32-34%
Transpek	14-17%
Shree Sulphurics Pvt. Ltd.	3-5%
Others	47-50%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.2.12 Aliphatic Carbonyl Chloride

Aliphatic carbonyl chloride compounds are extensively used in household cosmetics and chemicals, pesticides, fuels, and essential oils.

Indian aliphatic carbonyl chloride market is fragmented. Some of the major players include Transpek Industry, Shiva Pharmachem Ltd., Shree Sulphurics Pvt. Ltd., and others. Shivapharma chem Ltd. is one of top 3 players in the world. Transpek Industry and Shiva Pharmachem Ltd., collectively hold around 50% for CY 2022 of the Indian aliphatic carbonyl chloride market. They have large capacities that can manufacture a wide range of aliphatic carbonyl chlorides across different applications.

Aliphatic carbonyl chloride is a regulated chemical. It is a highly toxic and corrosive chemical and poisonous when ingested. It reacts with water, strong bases and alcohols to liberate toxic gases. It falls under the category of hazardous chemicals while transporting and handling.

Table 17: Market Share of key companies (India) - Aliphatic Carbonyl Chloride

Key Companies	India Market Share (CY 2022)
Shiva Pharmachem Ltd.	32-34%
Transpek	17-21%
Shree Sulphurics Pvt. Ltd.	1-2%
Others	47-50%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.2.13 Aromatic and Fluoro Nitriles

India aromatic and fluoro aromatic nitriles market is fragmented with the presence of many large and small players. Some of the key players are Alkyl Amines, Balaji Amines, Otto Chemi, Shiva Pharmachem Limited among others. Balaji Amines, Alkyl Amines, Otto Chemi and Shiva Pharmachem collectively hold around 75% for CY 2022 of the Indian aromatic and fluoro aromatic nitriles market. Aromatic and fluoro aromatic nitriles are regulated chemicals.

Table 18: Market Share of key companies (India) - Aromatic and Fluoro Nitriles

Key Companies	India Market Share (CY 2022)
Shiva Pharmachem Ltd.	7-9%
Balaji Amines	34-36%
Alkyl Amines	13-17%
Otto Chemi	14-16%
Others	27-30%

Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.2.14 Fluoro Aromatic Amines

Fluoro aromatic amines find their use in various industries such as pharmaceuticals, polymers, and agrochemicals.

India fluoro aromatic amines market is fragmented with the presence of many large and small players. Some of the key players are Aarti Industries, Balaji Amines Shiva PharmaChem, Alkyl Amines, and others. Aarti Industries, Shivpharma chem Ltd. and Balaji Amines collectively hold around 65% for CY 2022 of the Indian fluoro aromatic amines market. Fluoro aromatic amines is a regulated chemical.

These companies including Shivapharma chem Ltd. have an extensive experience in manufacturing fluoro aromatic amines over the years. Their expertise in fluoro aromatic amines and wider product portfolio are the key reasons of them being market leaders.

Table 19: Market Share of key companies (India) - Fluoro Aromatic Amines

Key Companies	India Market Share (CY 2022)
Shiva Pharmachem Ltd.	7-10%
Aarti Industries	34-36%
Balaji Amines	18-22%
Alkyl Amines	3-5%

Others	32-25%
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Sources: Annual reports and F&S estimation

Note: Market share estimation has been done based on annual reports and primary validations. Market share is in volume terms

6.3 Strategic positioning of Shiva Pharmachem Ltd. w.r.t. competitors

Table 20: Strategic positioning of Shiva Pharmachem Ltd. w.r.t competitors (Product categories) CY 2022

Product category	Launch Year	Industry application	Global Market Size (Bn USD)	Quantity Manufactured/ Exported by the Company (KTPA)	Company's India Market Position	Market positioning (India)
Acid Chlorides	2001	Pharmaceuticals, polymers, agrochemicals	28	25 KTPA	Largest player in India	Shiva Pharmachem Ltd. :49-52% Transpek :24 - 26% Shree Sulphurics Pvt. Ltd.:17-20% Others :4-6%
Aromatic Carbonyl Chlorides	2008	Organic chemicals, polycarbonate resins, dyestuffs, and isocyanates PU resins	1.7	2-5 KTPA	Largest player in India	Shiva Pharmachem Ltd.:32-34% Transpek :14-17% Shree Sulphurics Pvt. Ltd.:3-5% Others :47-50%
Aliphatic Carbonyl Chloride	2001	Household cosmetics and chemicals, pesticides, fuels, and essential oils	26	2-5 KTPA	Largest player in India	Shiva Pharmachem Ltd. :32-34% Transpek :17-21% Shree Sulphurics Pvt. Ltd.:1-2% Others: 47-50%
Aromatic and Fluoro Nitriles	2021	Polymers, Pharmaceuticals, Agrochemicals, Personal care, Adhesives and Sealants	4.7	1-3 KTPA	-	Shiva Pharmachem Ltd. :7-9% Balaji Amines :34-36% Alkyl Amines: 13-17% Otto Chemi:14-16% Others:27-30%
Fluoro aromatic amines	2022	Polymers, Pharmaceuticals, Agrochemicals, Personal care	17.7	1-3 KTPA	-	Shiva Pharmachem Ltd. :7-10% Aarti Industries :34-36% Balaji Amines:18-22% Alkyl Amines: 3-5% Others:32-35%

Shiva Pharmachem Ltd. has developed in-house technology for all of its products including bulk acid chlorides and specialty chemicals. Shiva Pharmachem Ltd. has dedicated as well as multi-purpose plants with multi step synthesis.

Shiva Pharmachem Ltd. is experienced handling hazardous chemistries like chlorination and vapour phase reactions at high temperatures of 400 °C and above.

Table 21: Strategic positioning of Shiva Pharmachem Ltd. w.r.t competitors (Products) CY 2022

Product	Launch Year	Industry application	Global Market Size (KTPA)	Quantity Manufactured/ Exported by the Company (KTPA)	Company's Global Market Position	Company's India Market Position	Competitor's Market Positioning
2-Cyano Phenol	2008	Pesticide and disinfectant used in pharmaceuticals and agrochemicals	10	2.2	Overseas operations (MS:24-27%)	Not Present in India	Cheminova India: 2-3%; Chinese players: 69-72%; Other : 5-7%
DCPI (3,4 and 3,5)	2017	Advanced intermediate used in pharmaceuticals, cosmetics and agrochemicals	52	2.3	Overseas operations (MS: 8-10%)	Not present in India	Paushak : 5-9%; Lanxess: 54-58%; UP Chem China :15-19%; Anhui Guangxin : 5-8%; Others :2-5%
Para Chloro Meta Xynelol	2017	Healthcare, Personal Care & Cosmetics, Antiseptic and disinfectant	32	0.3	Largest manufacturer (MS: 40-42%)	Largest player in India	NS Chemicals: 3-6% Kumar Organics: 13-16% Chinese Players: 38-42%; Other: 2-5%
Terephthaloyl Chloride	2017	Synthetic fibers such as Kevlar. Also has automotive, aerospace and defense use.	102.5	2.2	2-4% market share globally	Second largest player in India	Transpek : 15 - 17% Chinese Players : 52-54% Other : 29-32%
Octanoyl Chloride	2015	Polymer, adhesives, pharmaceuticals, and agrochemicals	42.0	1.685	3-5% market share globally	Market Leadership	Transpek : 3-5% BASF : 14-17% CABB Group : 13-16% Altivia : 11-14% Chinese Players: 42-45% Others : 2 - 5%
Pivaloyl Chloride	2001	Pharmaceuticals, and agrochemicals	35.0	1.2	2-4% market share globally	Only manufacturer in India	BASF : 23 - 26% CABB Chemicals: 13-16% VWR Intl: 11-15% Chinese Players: 49-53%; Other : 2-4%
Cloquintocet Mexyl	2018	Herbicide safener used in agrochemicals and pharmaceuticals	2.3	0.6	Largest manufacturer (MS: 25-28%)	Largest player in India	Dow Chemicals: 10-12% Syngenta: 9-11% Bharat Rasayan: 2-4% Bhagiradha Chem: 1-3% FMC/Cheminova: 2-4% Chinese Players: 44-47%
Isophthaloyl Chloride	2010	Wide variety of polymers. pharmaceuticals and agrochemicals	63.75	0.2	3-5% market share globally	Second largest player in India	Du Pont - 14 - 16% Transpek -11-13% Chinese Players: 62-65% Others - 6-9%
Diuron	20010	Algaecide and herbicide	36.5	1.1	4-7% market share globally	-	Adama Aqan Ltd.:11-15% Atul Ltd.: 8-10% Bharat Rasayan: 8-10% Chinese Players: 39-44% Others: 25-28%

7 Competitive Landscape



7.1 Overview

Key financial parameters of relevant market participants in India have been considered herewith. Below are the key companies which hold prominence in one or multiple sub-segments of specialty chemicals. For instance, Navin Fluorine generates most of its revenue from fluorination (attributed to high demand in clinical pipeline molecules).

7.1.1 Benchmarking with Indian Specialty Chemical Peers – Financial

Table 22: Competition Landscape – Revenue from operations (INR million)

Companies	FY 2022-23	FY 2021-22	FY 2020-21
Shiva Pharmachem Ltd.	10,794.66	10,159.90	7,601.17
Navin Fluorine International Ltd.	20,774.00	14,533.60	11,793.90
Aether Industries Ltd.	6,510.74	5,900.47	4,498.16
Clean Science	9,357.99	6,848.86	5,124.28

Source: Annual reports

The illustration above presents a promising scenario for the specialty chemicals market in India. Most of the companies experienced significant growth in the last 3 years.

Table 23: Competition Landscape – Revenue Growth (%)

Companies	FY 2022-23	FY 2021-22	FY 2020-21
Shiva Pharmachem Ltd.	6.25%	33.66%	NA
Navin Fluorine International Ltd.	42.94%	23.23%	11.10%
Aether Industries Ltd.	10.34%	31.18%	49.01%
Clean Science	36.64%	33.66%	22.21%

Source: Annual reports

Revenue Growth (%) is calculated as a percentage of Revenue from Operations of the relevant year minus Revenue from Operations of the preceding year, divided by Revenue from Operations of the preceding year

Table 24: Competition Landscape –EBITDA (INR Million)

Companies	FY 2022-23	FY 2021-22	FY 2020-21
Shiva Pharmachem Ltd.	2,041.87	1,597.52	1,408.97
Navin Fluorine International Ltd.	5,503.10	3,548.10	3,092.90
Aether Industries Ltd.	1,862.49	1,681.07	1,121.59
Clean Science	4,020.95	2,998.88	2,589.54

Source: Annual reports

EBITDA is calculated as Profit before tax for the year, plus Finance Costs and Depreciation and Amortisation expenses less Other Income

Table 25: Competition Landscape – EBITDA Margin (%)

Companies	FY 2022-23	FY 2021-22	FY 2020-21
Shiva Pharmachem Ltd.	18.92%	15.72%	18.54%
Navin Fluorine International Ltd.	26.49%	24.41%	26.22%
Aether Industries Ltd.	28.61%	28.49%	24.93%
Clean Science	42.97%	43.79%	50.53%

EBITDA Margin (%) is calculated as EBITDA divided by Revenue from Operations

Source: Annual reports

However, if we look at the financials of the peers for Q1 FY 2024, there is a slowdown in the demand which is impacting the demand-supply trends in the entire sector. The key notable points are:

- Weaker demand registered in certain key international markets like Europe, North America; this demand impact has accelerated over the Q1 of FY 2024;
- Temporary over supply scenario has been caused due to inventory liquidation by China. China had a substantial build-up of inventory due to the extended COVID lockdowns and is currently dumping to liquidate their stock; and
- The impact of this market scenario has been widespread as witnessed by the deterioration in the performance of key players like Aether industries, Clean Science and Navin Fluorine, which have seen their quarter on quarter revenue reduce by 15-18% on an average in Q1 FY 2024.

However, we understand the current situation is temporary and is likely to improve towards H2 FY 2024 with demand being driven by end use industries.

7.2 Established technical expertise of players

Table 26: Company Technical expertise and reach

Company Name	Technical Expertise	Customer Base
Shiva Pharmachem Ltd.	The company provides large scale manufacturing and custom synthesis that helps their clients in developing and manufacturing of different APIs and agrochemical technicals by providing them with advanced intermediates, specialty chemicals and fine chemicals as per various customised requirement. The company offers services such as full time equivalent, fee for services, fixed quotation, synthesis from gram to kilogram quantities, process development for existing molecules, contract manufacturing and pilot scale manufacturing.	Shiva Pharmachem has diverse customer base which includes more than 181 multinational, regional and local companies. In its business, long lead times are required for building customer confidence and relationships due in part to customers' product approval systems with stringent specifications
Navin Fluorine	They provide custom chemical syntheses of fluorinated compounds for agro chemicals, pharmaceuticals, and speciality chemicals industries. They leverage their fluorine expertise to provide library syntheses, basic research, process development, scale up and small and large batch manufacturing. They offer contract research services	They produce over 60 fluorinated products for domestic and international customers. More than 40% of their products are exported to North America, Europe, Middle East and Asia Pacific regions

	through both Full Time Equivalent (FTE) and Fee For Service (FFS) arrangements.	
Aether Industries	The company offers large scale manufacturing and custom synthesis. Some of their installed equipment include fume hoods, lab scale, flow reactors and advanced separation equipment.	North America, LATAM, Middle East, Europe and APAC Export % - 50-60%
Clean science	The company has an in-house R&D and continuous innovation centre which enables them to offer a diversified product portfolio serving multiple end user industries. The company produces a wide variety of FMCG chemicals, performance chemicals and pharma & agro intermediates. They are among the leading companies in India to have commercialized use of environment-friendly processes to manufacture certain specialty chemicals.	They are currently present in 30 locations across the world with major presence in North America, LATAM, Europe, Middle East, Southeast Asia Export % - 40-50%

Sources: Annual reports

7.3 Comparison of Degree of backward and forward integration

Table 27: Comparison of players/peers based on "Degree of backward and forward integration"

Companies	High	Medium	Low
Shiva Pharmachem Ltd.	✓		
Navin Fluorine International	✓		
Aether Industries			✓
Clean Science		✓	

Source: Annual reports, Frost & Sullivan analysis

Shiva Pharmachem Ltd. is both forward and backward integrated company for almost all of its products. For instance, the company prefers to recover or reuse the by-products as an example of forward integration of the advanced chemistry. The company has its own Thionyl Chloride plant which allows them to reuse or recover their by-product which ensures sustainability of the environment. They also produce nitriles, amides and amines from basic raw materials that reduces the overall cost of the production.

Table 28: Established competency and EHS standards (Company Standards and Certifications) of players (as of CY 2022)

Company Name	Responsible Care	Ecovadis Audit	ISO 14001:2015	ISO 45001:2018
Shiva Pharmachem Ltd.	✓	✓	✓	✓
Aether Industries	X	✓	✓	✓
Clean Science	X	X	✓	✓
Navin Fluorine	✓	X	✓	✓

Sources: Annual reports and F&S research