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# MELT GRANULATION IN THE CHEMICAL INDUSTRY

Melt solidification can be carried out in many different ways but one of the most efficient processes involves the melt being cooled on a steel belt-based processing conveyor

**M**odern-day life is built around chemicals and often in ways that may not be immediately obvious. From the moment we wake up, processed chemicals are at the heart of virtually everything we do. The toothpaste that cleans our teeth, the oil that fries our meals, the polish that shines our shoes, the pills that keep us healthy, the fuel that powers our buses and cars ... all need chemical ingredients to do their job.

Some chemicals are desirable, others less so. In materials like crude oil, chemicals have to be removed and added and both tasks present their challenges. For example, H<sub>2</sub>S is an undesirable gas that needs to be extracted and the sulphur content separated, cooled and solidified.

## The chemical industry in India

All this is extremely important to India's economy. In terms of output, India is Asia's third-largest chemical producer and currently ranks sixth in the world after the USA, China, Germany, Japan and South Korea. This growth is expected to continue in a post-COVID-19 world, with India being

seen as the preferred location for world-leading companies planning to invest in new manufacturing facilities.

The Indian speciality chemical industry is already one of the fastest-growing industries in the world. Over the five years up to 2019, it experienced a CAGR (Compound Annual Growth Rate) of around 11 per cent, a figure that is expected to increase further over the next couple of years. In just a decade, India has risen from eighth to sixth place in world rankings, a clear indication of the significant potential for further market growth and innovation in this field. Achieving this is likely to involve either some new plants or expansions or even relocations.

One of the major challenges faced by this sector is the large number of unorganized producers catering to the needs of smaller, similarly unorganized customers in their respective sub-segments. In some sub-segments like base ingredients, the market share of the unorganized market is more – substantially more – than that of the organized market. If this unorganized sector can be backed by systematic process interventions and R&D support, there is a huge potential to grow at a faster rate. This will require good government policies and support.

## India's advantages in a global market Low cost of manufacturing with skilled labour:

India has the competitive advantage of being a country with low-cost manufacturing capabilities, a skilled workforce and an abundance of human resources. This leads to lower operating expenses and other costs in comparison to other nations, making India one of the preferred manufacturing destinations for companies across the globe.

# 6.4%

"Globally, the speciality chemicals industry is predicted to grow at 6.4 per cent over the next five years and reach US \$1.2 trillion in value by 2025"

## The growth potential of the domestic market:

India still lags behind the major



developed nations in terms of chemical consumption on a per capita basis, but increasing urbanization is leading to growth in end-user segments like paint, personal care, home care, textiles and adhesives. This has been one of the significant contributors to the top-line growth of speciality chemicals in India.

**Potential for improvement in R&D:** Many major players in India spend less than 3 per cent of their revenues on R&D activities, significantly less than the 6-10 per cent typically invested by their global

like mandating BIS-like certification for imported chemicals to prevent the dumping of cheap and substandard chemicals into India. Furthermore, the government has allowed 100% FDI under the automatic route in the chemicals sectors, excluding hazardous chemicals. The Indian government has proposed a draft National Chemical Policy where it aims to increase the share of the chemical sector to 6 per cent of the GDP within the next 10 years.

**Demolishing the strong entry barrier:**

of new players to enter the competitive market, resulting in the creation of a good value chain in the field of speciality chemicals, which in turn is boosting our export economy.

#### The China effect

Globally, the speciality chemicals industry is predicted to grow at 6.4 per cent over the next five years and reach US \$1.2 trillion in value by 2025. The past couple of decades have seen a significant shift in the manufacture of chemicals from Europe and North America to Asia, in particular China and India.

One of the most prominent trends in the global chemicals industry has been the emergence of China as a dominant player. This is reflected in the increase in China's share of the global chemicals industry from 6 per cent in 2000 to around 25 per cent in 2020. However, with China's shift from basic chemicals, India is likely to emerge as a prominent player in this space in the foreseeable future.

China's government implemented stringent laws for the protection of the environment in January 2015. They have made it compulsory to build effluent treatment plants and have levied a green tax on them to keep pollution under a certain level. This has hit their bottom line and the chemical companies now need Capex to scale up their production and build such plants.

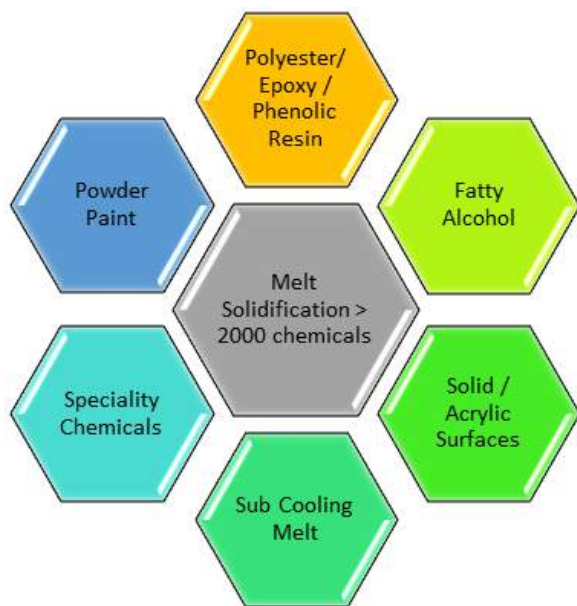
The Chinese government had also made it compulsory for small to mid-size

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counterparts. The domestic speciality chemical industry is basic in operation and has considerable scope for improvement as there are only a handful of companies developing innovative and unique products.

**Indian Government's initiatives for growth:** The GOI has initiated actions

Earlier government policies were extremely complicated in terms of company registration, product registration/approval, statutory clearances etc. More recently, the Ministry of Corporate Affairs (MoCA) has introduced a single-window clearance system for company establishment and statutory compliances. This has encouraged a large number



chemical companies to relocate to dedicated chemical parks far away from protected habitat by the end of 2020. These factors have led to the slowdown in the growth of China's chemical industry.

Further, COVID-19 has contributed to the cause of international players seeking India as their alternative destination for the manufacture of speciality chemicals.

### The growing market for speciality chemicals

A combination of a growing population and greater disposable income is driving increasing demand in India for products that make use of speciality chemicals.

The tyre industry is one example. While car ownership in the USA is at a level of 850 per 1000 people, here in the emerging Indian market, vehicle ownership is just a fraction of this figure – 50 cars per 1000 people – and this represents tremendous potential for growth. The tyre industry is expected to grow by 9-10 per cent over the next five years, including an 8 per cent increase in the heavy commercial vehicle segment and 14 per cent in Light Commercial Vehicles (LCV). How does this impact the speciality chemical market? Tyres are made of rubber, a natural product that requires the addition of chemicals to provide the necessary durability and wear resistance.

The chemical additives required for this present a particular challenge in terms of processing in that they are 'subcooling' melts. This means that they remain liquid even when cooled below their melting point and have to be processed on a specially designed supercooling system.

Another common speciality chemical product is fatty alcohol, widely used – along with microcrystalline wax – in soaps, shampoos, detergents and cosmetic products. These too are processed in the form of a melt.

India's growing population, economic growth and changing lifestyles are also driving demand for products used across the construction and real estate industry, such as decorative products, modular furniture, solid/acrylic surfaces, LVT tiles and paints. And, whether directly or indirectly, these products all make use of speciality chemicals such as polyester, phenolic and epoxy resins.

### Continuous melt solidification

All these chemicals have one thing in common: they need to be transformed from their melt state into a solid form for easier downstream storage, handling and subsequent reprocessing. Melt solidification can be carried out in several ways but one of the most efficient processes involves the melt being cooled on a steel belt-based processing conveyor.

This technique uses indirect cooling methods in single or multiple temperature zones carefully controlled to meet specific process parameters. Successful solidification depends on a range of factors including the properties of the chemical itself (e.g. its amorphous or crystalline nature), ambient temperatures and associated dew points, and the process needs precision control of every aspect, including timings. These conditions can best be guaranteed through

the use of state-of-the-art continuous steel belt-based cooling technology that has been designed, manufactured and installed.

Once the melt has been solidified, it then needs to be stored, bagged and/or bulk transported. As with the solidification process, this requires specific expertise and the integration of storage and handling systems to enable automated bulk production. Some of these melts are extremely expensive, others less so. Depending on the product type, throughput levels can range from around 500 to 15,000 kg/hour per single unit.

The costs of storage, packing and transportation all have a bearing on the overall cost of the speciality chemical so factors such as the type and size of the packaging, feed rates and storage capacity are all parameters that need a long-term view. Similarly, it is important to consider the need for production flexibility and potential for future growth, again requiring a long-term perspective. The entire system from receipt of the melt, through solidification, to downstream storage and handling must therefore be designed to achieve the desired capacity.

With so many different factors at play, there is no such thing as a standard solution. Every project is different and the answer will depend on everything from product type and throughput rates to the needs of downstream re-processors and even the ultimate customer – the consumer.

One other important consideration is the environmental impact of the solidification process and this is another area where the steel belt cooler can deliver significant benefits. The efficiency of this indirect cooling process results in short processing times, no risk of cross-contamination with the cooling water, extremely low emissions and a virtually dust-free environment. This, combined with the integration of peripheral equipment, enables the production of high-quality products without risk of contamination to the environment either through the air, water or soil. ■