India

Underweight *(no change)*

Chemicals - Overall

Export chemicals- I

- In this weekly series, we will cover five-to-six major chemicals each time with their global balance, regulations and Indian export potential.
- In this edition, it covers PTFE, vanillin, HFC-125, HFC-134A, HFC-410A and LiPF6. Apart from vanillin and $LiPF_6$, others are meant for export market only.
- PTFE & HFC demand will tend to zero. For 30GW capacity, $LiPF_6$ demand will be ~5.6kt & hence, all other production must be exported at -ve gross margin.

Indian exports of HFCs & PTFE to US and Europe will tend to zero

The incremental demand for PTFE (the largest PFAS) is declining each year. 12 US states have either restricted or banned PFAS usage in certain categories, although it's still unclear whether PTFE, a type of PFAS, will face similar restrictions or a complete ban. However, the collapse in imports suggests that consumer companies are exercising great caution. The publicity around 3M halting all PFAS production, combined with the growing awareness of PFAS's harmful effects, seems to have influenced consumers, as evidenced by the rise in advertisements for PFAS-free products. Europe is also moving toward stricter regulations on PFAS usage. It's important to note that the US and Europe are the largest markets for Indian PFAS exports, including PTFE. In the case of HFCs like HFC-124, HFC-134A, and HFC-410A, their Global Warming Potential (GWP) is very high. With the US reducing HFC consumption by 33% in terms of GWP, imports of these chemicals are collapsing and could drop to zero in the coming years.

RoCE of new $LiPF_6$ capacities will be negative

A 1kWh battery could contain roughly 150–225gms of $LiPF_6$, depending on the electrolyte volume and concentration used in the specific battery design. This means that for an estimated peak Indian demand of 30GWh battery manufacturing (around 2030-32F), the demand for $LiPF_6$ would be approximately 5.6kt. Given this fact, the large capacities that are being announced in India need to rely on export markets. However, China, as usual, has a significant overcapacity, and currently the gross profit on $LiPF_6$ is negative. Additionally, $LiPF_6$ is being gradually replaced by a newer chemical, LiFSi.

Vanillin can do well if one gets 99.5% purity

Global demand for vanillin is around 40,000t, with Solvay being the market leader. However, as are typical, Chinese companies are producing lower-grade, cheaper materials. India imports around 3,000t of vanillin, primarily from China, while the US imports 3,000–3,500t annually from China. Recently, China has been dumping vanillin in the US and Europe, which forced Solvay to shut its US facility. As a result, an anti-dumping duty (ADD) investigation is underway, and it's likely that a 100% duty will be imposed on Chinese imports. The reason is that Solvay's cost of production is around US$15-16/kg, while China is dumping material at US$8/kg. This will create opportunities for non-Chinese producers to enter the US market, potentially selling at US$14-15/kg. Notably, the cost of producing vanillin in India is likely to be not higher than US$8/kg.

Figure 1: Videos, like this one, are prevalent in the US, leading to lower demand for PFAS (please click the picture to see the advertisement)

SOURCE: INCRED RESEARCH, COMPANY REPORTS

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Export chemicals- I

While chemical stocks are significantly underperforming, as always, there are pockets of outperformance even in the worst sectors, and vice versa. In this weekly series, we will cover five-to-six major chemicals each time with their global balance, regulations and Indian export potential.

PFAS—more importantly, PTFE exports—are expected to trend towards zero in coming years

PFAS is broad category of compounds with around 10,000 individual chemicals. There is a lot of activism against the same in key markets such as the US and Europe. While the US Food and Drug Administration or US FDA has already partially banned the usage of PTFE, ECHA is contemplating a total ban on PFAS usage.

PTFE is the first on the list of chemicals whose exports will become zero in coming years ➤

Europe is moving towards potentially banning PTFE (polytetrafluoroethylene), as a part of broader regulations targeting PFAS (per- and polyfluoroalkyl substances), often referred to as 'forever chemicals'. The European Chemicals Agency (ECHA) has been advancing proposals for a wide-reaching ban on all PFAS compounds due to concerns about their environmental persistence and potential health risks.

A key step in this process came in Feb 2023 when five European countries (Germany, the Netherlands, Norway, Denmark, and Sweden) formally submitted a proposal to ECHA to restrict the production and use of all PFAS, including PTFE. The proposal suggests a near-total ban on the production and use of PFAS in various industries across the European Union, with limited exceptions where alternatives are not feasible.

Key aspects of the potential ban on PTFE

Scope: The ban could cover both the production and use of PTFE, which is widely used in applications like non-stick cookware, industrial coatings, gaskets, seals, and electronics. The regulatory proposal specifically targets the environmental persistence of PTFE and other PFAS.

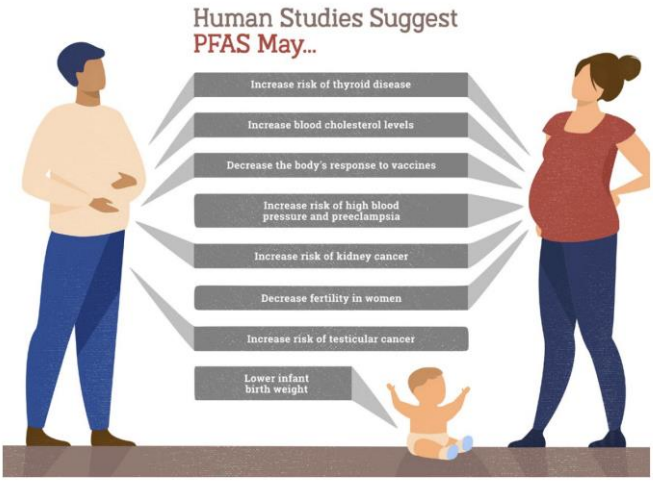
Timeline: If approved, the regulation would not take immediate effect, but could phase in over several years, allowing industries time to adapt and find alternatives. The decision-making process includes stakeholder consultations and regulatory impact assessments, with a final decision likely by 2025F.

Exemptions: Certain applications of PTFE may be granted temporary exemptions where no viable alternatives exist, particularly in critical sectors such as aerospace, medical devices, and certain industrial processes. However, these exemptions would likely be subject to strict controls and time limits.

Implications for industry: The potential ban would impact various sectors that rely on PTFE for its non-stick, heat-resistant, and chemically inert properties. Industries may need to explore alternative materials or reformulate products to comply with new regulations.

The European Commission's final stance on this issue will depend on the outcomes of ongoing consultations and scientific evaluations, but the regulatory momentum strongly suggests a phased-out approach to PTFE as a part of broader efforts to eliminate PFAS use in Europe.

Figure 2: PFAS is the well-known pollutant and carcinogenic compound



SOURCE: HTTPS://IPEN.ORG/SITES/DEFAULT/FILES/DOCUMENTS/IPEN-PACKAGING-REPORT-FIN-OPR-25012024.PDF, INCRED RESEARCH

Figure 3: The PFAS-free tag is becoming a selling strategy

SOURCE: HTTPS://BSIBIO.COM/ALL-YOU-NEED-TO-KNOW-ABOUT-PFAS-AND-HOW-TO-AVOID-THEM/, INCRED RESEARCH

Certain companies, like 3M, have already pledged to stop production of PTFE by 2025 ➤

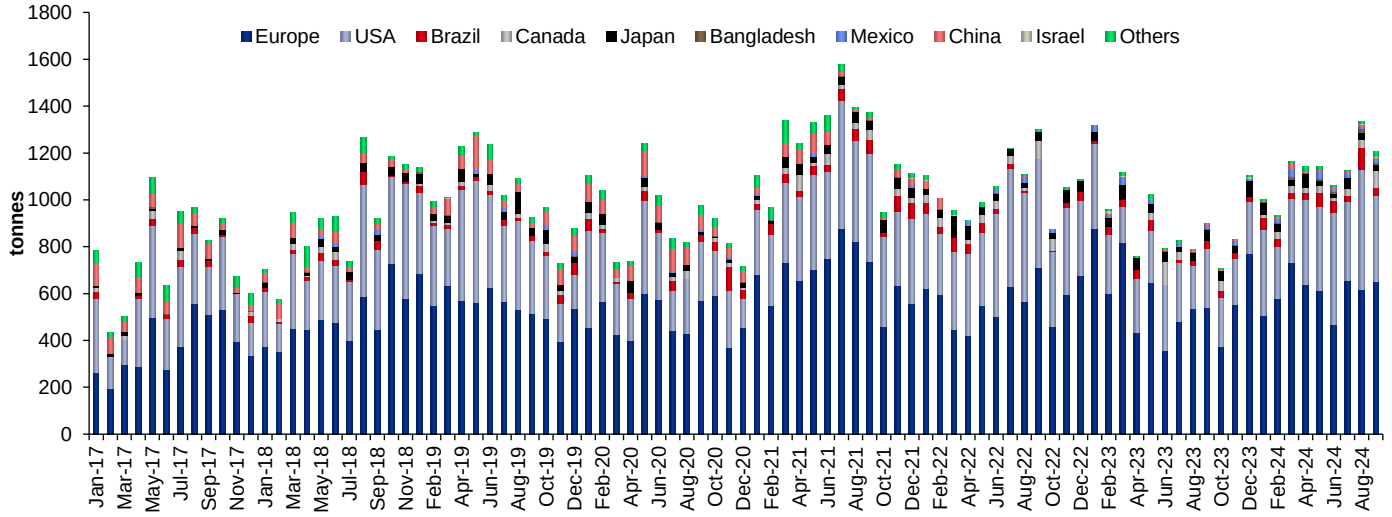
3M announced in Dec 2022 that it would cease the production of PFAS (per- and polyfluoroalkyl substances), including PTFE (polytetrafluoroethylene), by the end of 2025. This decision was driven by mounting regulatory pressure and environmental concerns related to PFAS chemicals, which are often called ‘forever chemicals’ due to their persistence in the environment. 3M's exit from PFAS production is part of a broader trend in the industry to address health and environmental risks associated with these chemicals.

Figure 4: PFAS-free product advertisement (much like paraben-free cosmetic ad)

SOURCES: INCRED RESEARCH, COMPANY REPORTS

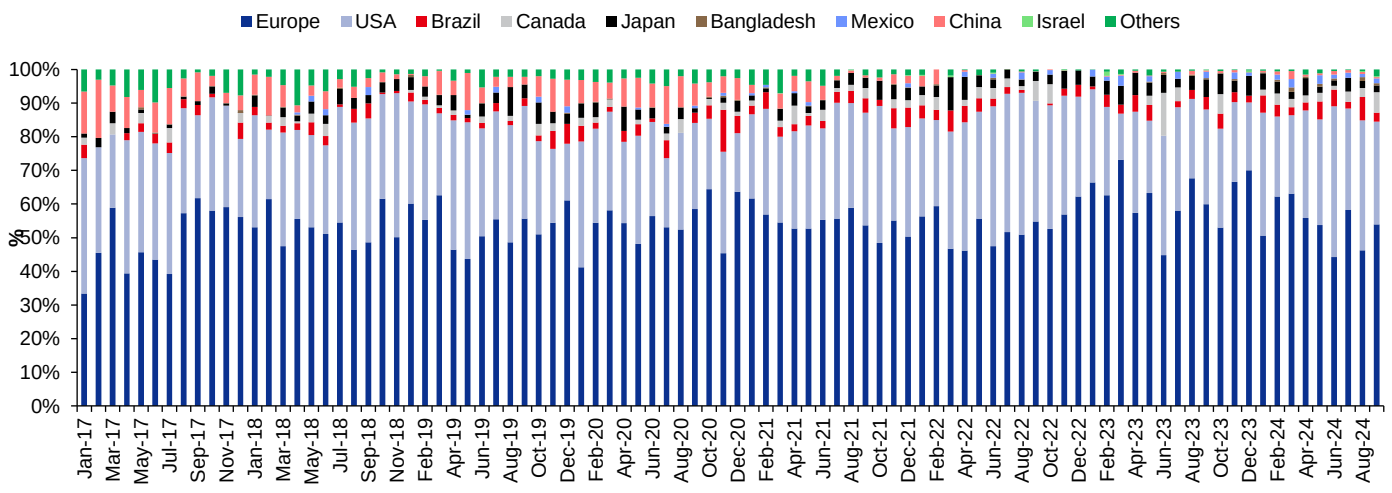
A major portion of Indian PTFE is exported to the US and Europe ➤

Figure 5: India's overall PTFE exports peaked in FY22, and since then the trajectory is down



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 6: Most of the Indian PTFE is exported to the US and Europe; please note that at both the places PFAS (PTFE is a part of PFAS) is getting banned or its usage is discouraged

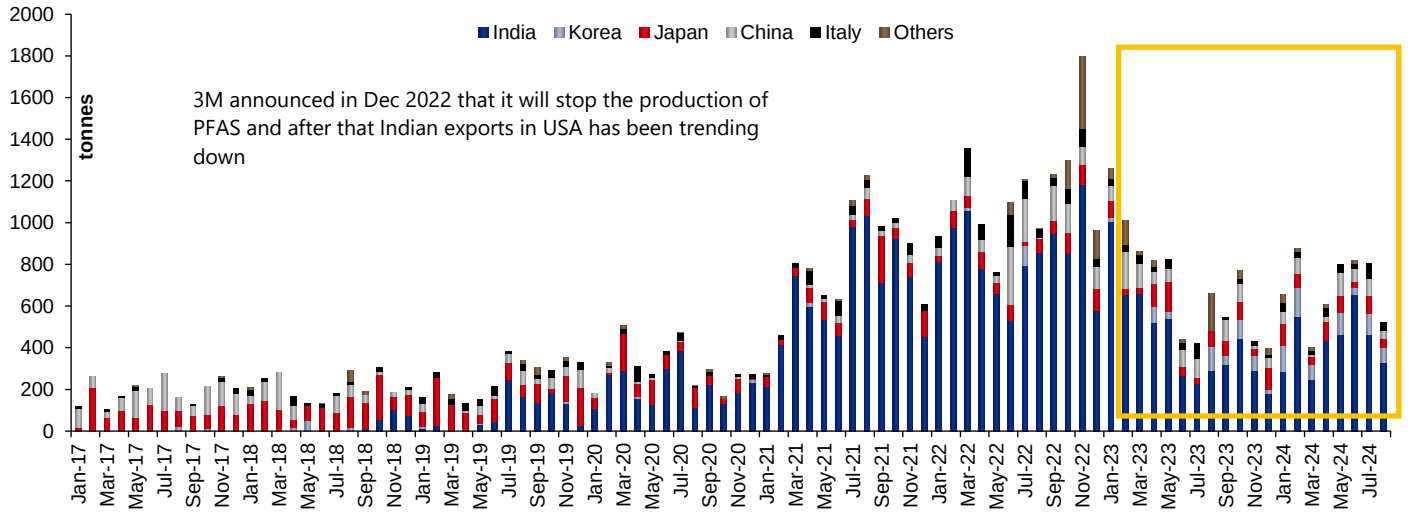


SOURCE: INCRED RESEARCH, COMPANY REPORTS

American PTFE imports are trending downwards, especially after 3M's proclamation that it will cease PTFE production ➤

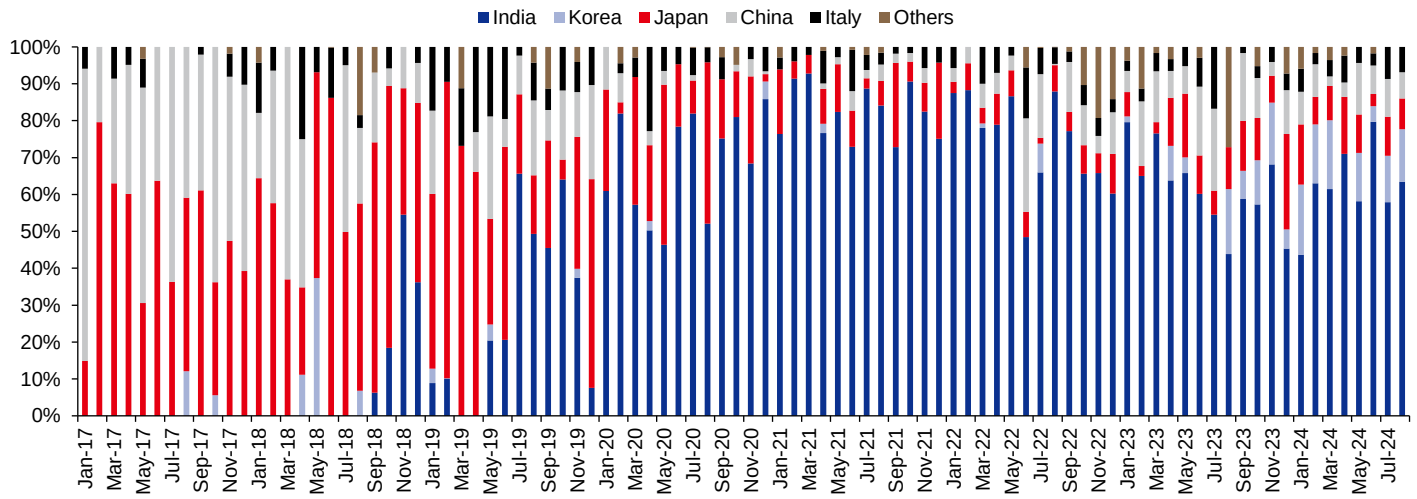
The US Food and Drug Administration has announced (on 28 Feb 2024) that grease-proofing materials containing per- and polyfluoroalkyl substances (PFAS) are no longer being sold for use in food packaging in the US. This means the major source of dietary exposure to PFAS from food packaging like fast-food wrappers, microwave popcorn bags, take-out paperboard containers and pet food bags is being eliminated.

Figure 7: After the 3M announcement that it will stop production of forever chemicals, US demand has been going down, which is manifested in declining Indian exports to the US



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 8: Please note that over the past few quarters, India has been a major exporter of PTFE to the US



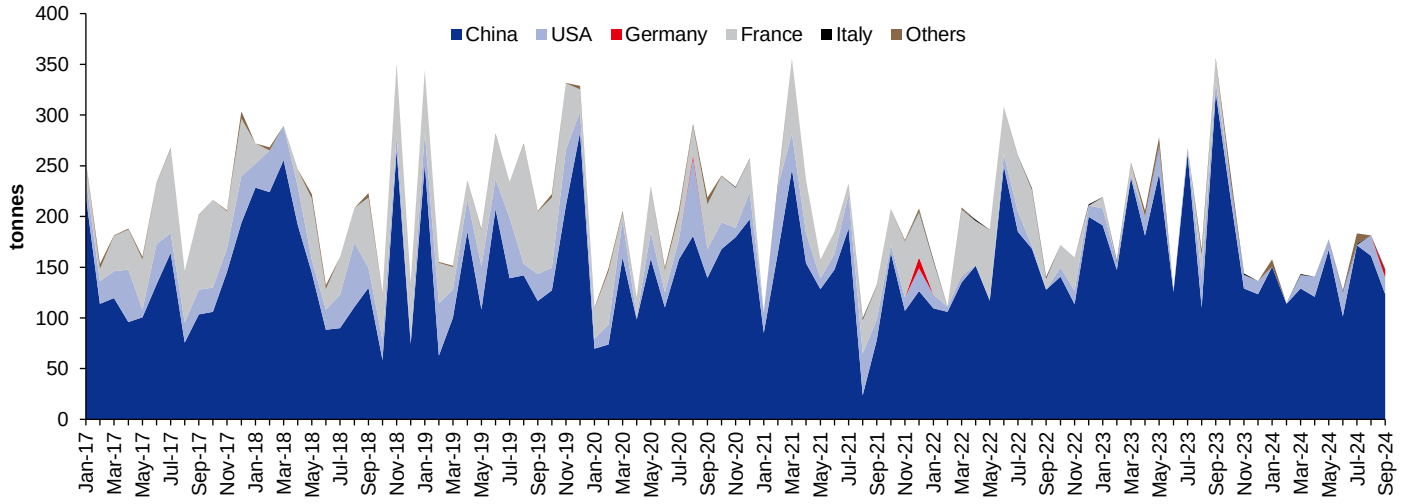
SOURCE: INCRED RESEARCH, COMPANY REPORTS

Vanillin—domestic manufacturing will replace imports and capture international markets

With Camlin Fine Sciences (UNRATED) successfully manufacturing high-quality vanillin (with more than 99.5% purity), there is a strong case for both import substitution and export opportunities in this small but niche commodity. India's export prospects will be further bolstered by the imposition of anti-dumping duties (ADD) and countervailing duties (CVD) on Chinese vanillin in Europe and the US.

India has been an importer of vanillin for the past several years ➤

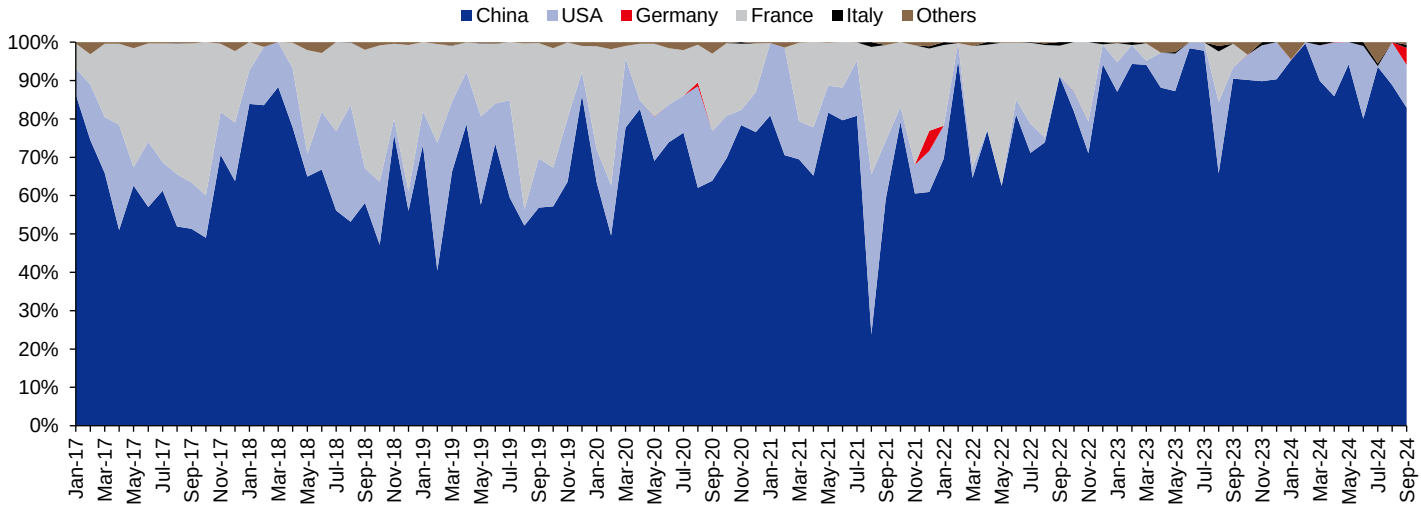
Figure 9: Indian imports of vanillin have been around 250t per month for the past several years



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Normally, food-grade vanillin sold by Solvay has a purity of 99.5%, whereas Chinese vanillin imported into India typically has a purity of not more than the mid-90s. This creates a strong case for import substitution of this product in India. Camlin Fine Sciences, with an overall capacity of 6,000tpa, has the potential to meet domestic demand and replace Chinese exports to the US.

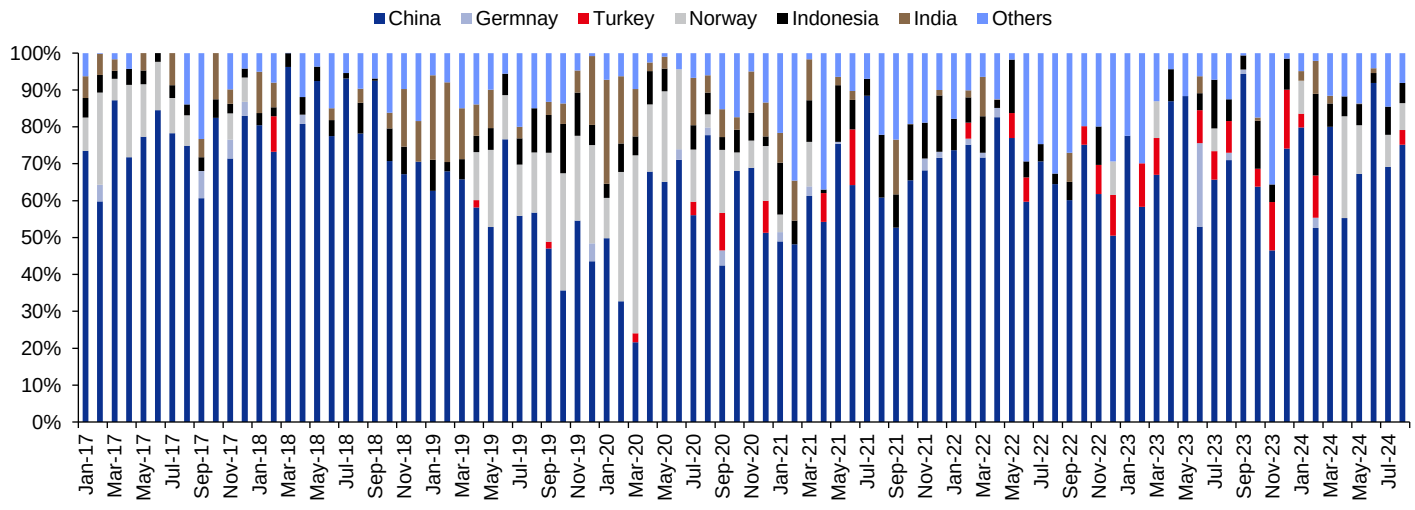
Figure 10: As always, lower quality Chinese vanillin is being imported in India



SOURCE: INCRED RESEARCH, COMPANY REPORTS

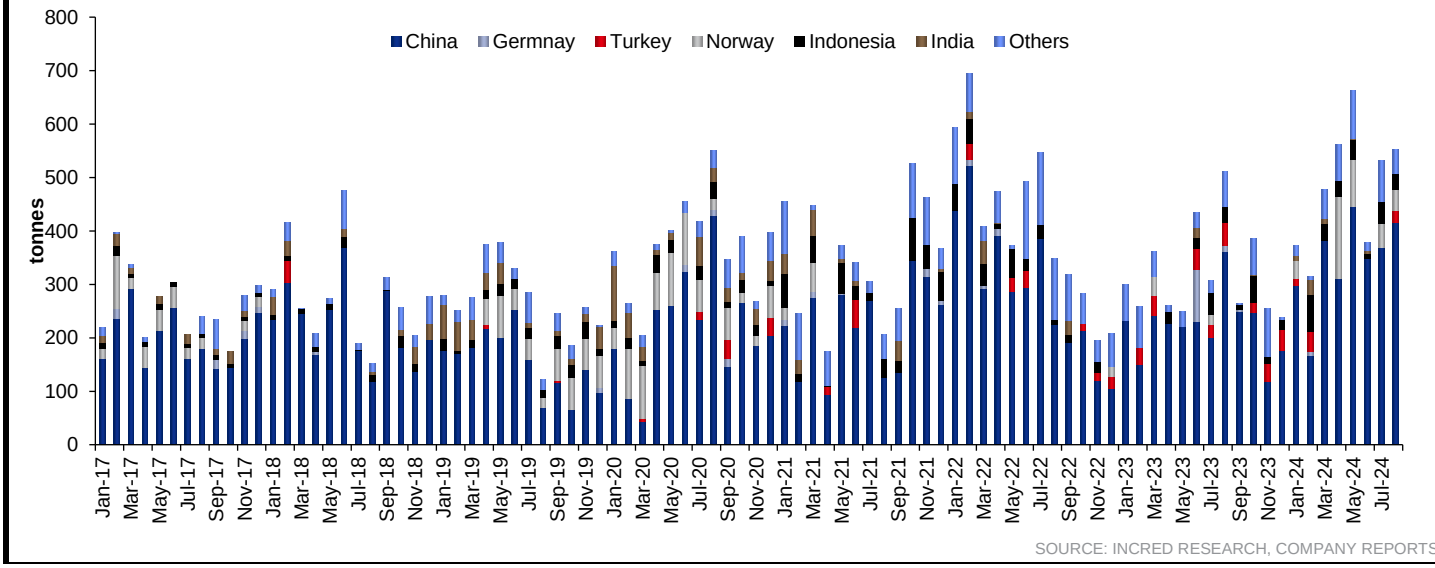
The US is one of the largest importers of vanillin, with Chinese vanillin accounting for 60% of its total imports ➤

Figure 11: Chinese vanillin accounts for approximately 60% of US imports



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 12: Overall, US vanillin imports have increased significantly, with China being one of the main exporters



SOURCE: INCRED RESEARCH, COMPANY REPORTS

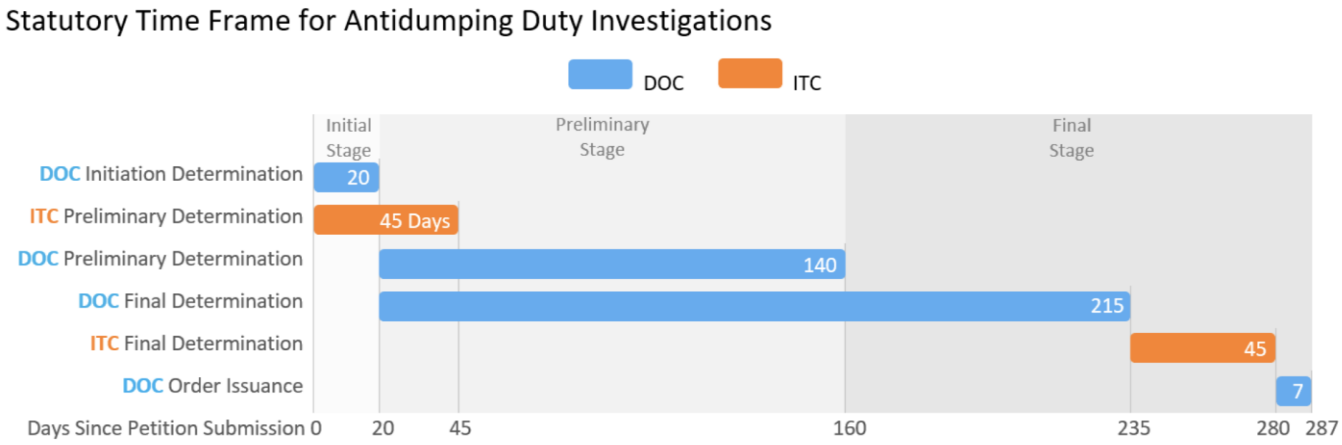
As a result, the US has initiated an anti-dumping (AD) investigation into vanillin exports from China, led by the International Trade Commission (ITC) ➤

Please see the link https://www.trade.gov/initiation-ad-and-cvd-investigations-vanillin-china. The US International Trade Commission has found a prima facie case of dumping of vanillin by Chinese producers in the US. Please see the link https://www.usitc.gov/publications/701_731/pub5527.pdf

Unlike India, the US decides CVD (countervailing duty) and AD decision in a time-bound manner ➤

Figure 13: While the Department of Commerce (DoC) will take a final decision on imposing anti-dumping duty, the DoC and the International Trade Commission (ITC) work very closely; it is highly unlikely that the DoC would not approve the decision once the ITC has made its determination; notably, the ITC has already concluded that there is a case of vanillin dumping in the US

Permalink



*The DOC determination dates may be extended under certain circumstances. Note that if at any point a DOC or ITC determination (excluding the DOC Preliminary Determination) is negative, the investigation will terminate. When the DOC and ITC's final determinations are affirmative, the DOC will issue an AD order within approximately seven days after the ITC's final determination.

SOURCE: INCRED RESEARCH, COMPANY REPORTS

Imposition of AD on Chinese vanillin will open the market for Indian producers ➤

The imposition of anti-dumping duty on Chinese vanillin will open the market for Indian producers. Additionally, the imposition of countervailing duties will be a positive development for Indian vanillin manufacturers. Camlin Fine Sciences (UNRATED) is one such producer of vanillin.

Indian producers will gain volume at a slightly higher realization as catechol prices rise, while Chinese companies will struggle to cover even raw material costs at US prices of US$12-13/kg ➤

1. The US is one the biggest vanillin markets and if indications come out to be true, then Chinese vanillin will attract high anti-dumping duty, which will make it very costly.
2. At the same time, as Indian vanillin production ramps up, global oversupply of catechol will come down, thus raising its prices.
3. Solvay, and a few others, who have the filed the anti-dumping petition can make money only at a price of US$15/ kg or more and hence, it's possible that AD on Chinese vanillin will be higher than 100%.
4. Assuming the price settles somewhere around US$12-13/kg (currently at US$9/kg vs. US$15-16/kg before Chinese dumping), China will have to supply vanillin at US$5-6/kg to remain competitive. As global catechol prices rise, it will become impossible for China to cover even the base raw material costs at US$5-6/kg.

Refrigerants—EPA directives will lead to lower exports of R-134A, HFC-125, HFC-32. HFO-1234ZE to gain market share in the US

The US Environmental Protection Agency (EPA) has been gradually reducing the consumption of hydrofluorocarbons (HFCs), potent greenhouse gases used primarily in refrigeration, air-conditioning, and other industrial applications. This effort is a part of the global initiative under the Kigali Amendment to the Montreal Protocol, which aims to phase down HFCs due to their high global warming potential (GWP).

In Oct 2021, the EPA introduced a rule to reduce HFC production and consumption in the US by 85% by 2036. This phasedown started with a 10% reduction in 2022, followed by more significant cuts over the years. The reductions are based on a quota system, where each company involved in HFC production or import is allocated a limited quota, pushing the industry toward adopting lower-GWP alternatives, such as hydrofluoroolefins (HFOs) and natural refrigerants (e.g., ammonia, CO2).

The EPA has been assigning consumption and production allowances annually to companies, setting limits on how much HFCs they can produce or import. This quota system ensures compliance with the overall phasedown targets, with stricter quotas coming into effect periodically to drive further reductions.

The most recent reductions in the HFC consumption quota, enforced by the EPA, aim to accelerate the shift to environmentally friendly refrigerants, support innovation in alternatives, and help the US meet its climate goals. The phasedown is expected to significantly contribute to reducing the impact of HFCs on climate change by lowering overall greenhouse gas emissions.

After EPA guidelines, exports of HFCs to the US have decreased significantly »

Figure 14: The figure below shows the EPA HFC consumption quota for CY24-28 in the US

Table 2: HFC Phasedown Schedule and Consumption & Production Allowance Caps

Year	Consumption & Production Allowance Caps as a Percentage of Baseline	Consumption and Production Allowance Caps in MMTEVe*
Baseline	Consumption: 302.5 MMTEVe Production: 382.5 MMTEVe	
2020–2023	90 percent	Consumption: 273.5 Production: 344.3
2024–2028	60 percent	Consumption: 181.5 Production: 229.5
2029–2033	30 percent	Consumption: 90.8 Production: 114.8
2034–2035	20 percent	Consumption: 60.5 Production: 76.5
2036 & after	15 percent	Consumption: 45.4 Production: 57.4

SOURCE: INCRED RESEARCH, COMPANY REPORTS

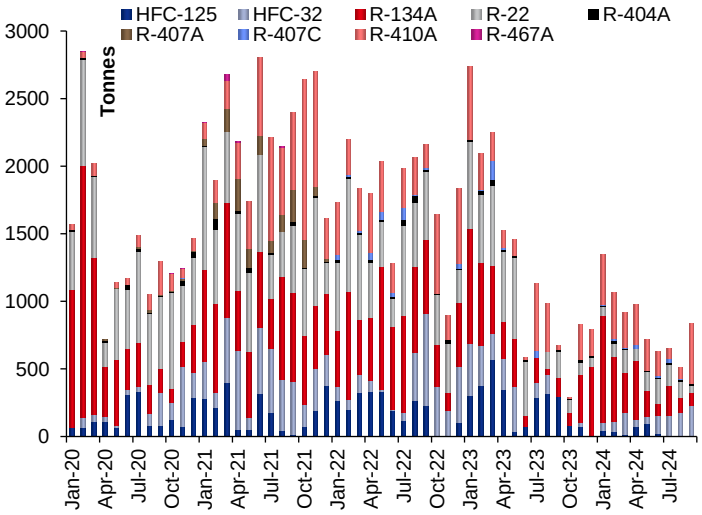
Figure 15: As is evident, the bulk of refrigerant exports by GFL and SRF (which generated substantial profits for them in FY23) have very high GWP and consequently, their exports started declining

Table 1: 18 Individual HFCs Listed in the AIM Act

Chemical Name	Common Name	Exchange Value*
CHF_2CHF_2	HFC–134	1,100
CH_2FCF_3	HFC–134a	1,430
CH_2FCHF_2	HFC–143	353
$CHF_2CH_2CF_3$	HFC–245fa	1,030
$CF_3CH_2CF_2CH_3$	HFC–365mfc	794
CF_3CHFCF_3	HFC–227ea	3,220
$CH_2FCF_2CF_3$	HFC–236cb	1,340
CHF_2CHFCF_3	HFC–236ea	1,370
$CF_3CH_2CF_3$	HFC–236fa	9,810
$CH_2FCF_2CHF_2$	HFC–245ca	693
$CF_3CHFCHFCF_2CF_3$	HFC–43–10mee	1,640
CH_2F_2	HFC–32	675
CHF_2CF_3	HFC–125	3,500
CH_3CF_3	HFC–143a	4,470
CH_3F	HFC–41	92
CH_2FCH_2F	HFC–152	53
CH_3CHF_2	HFC–152a	124
CHF_3	HFC–23	14,800

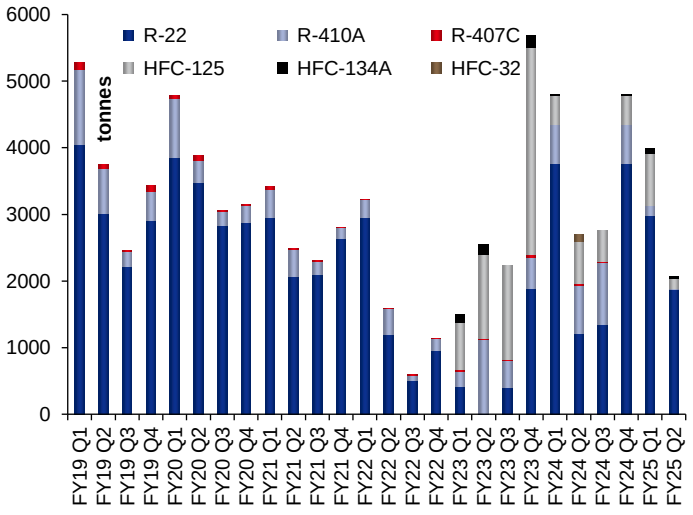
SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 16: SRF's HFC exports are falling…



SOURCE: INCRED RESEARCH, COMPANY REPORTS

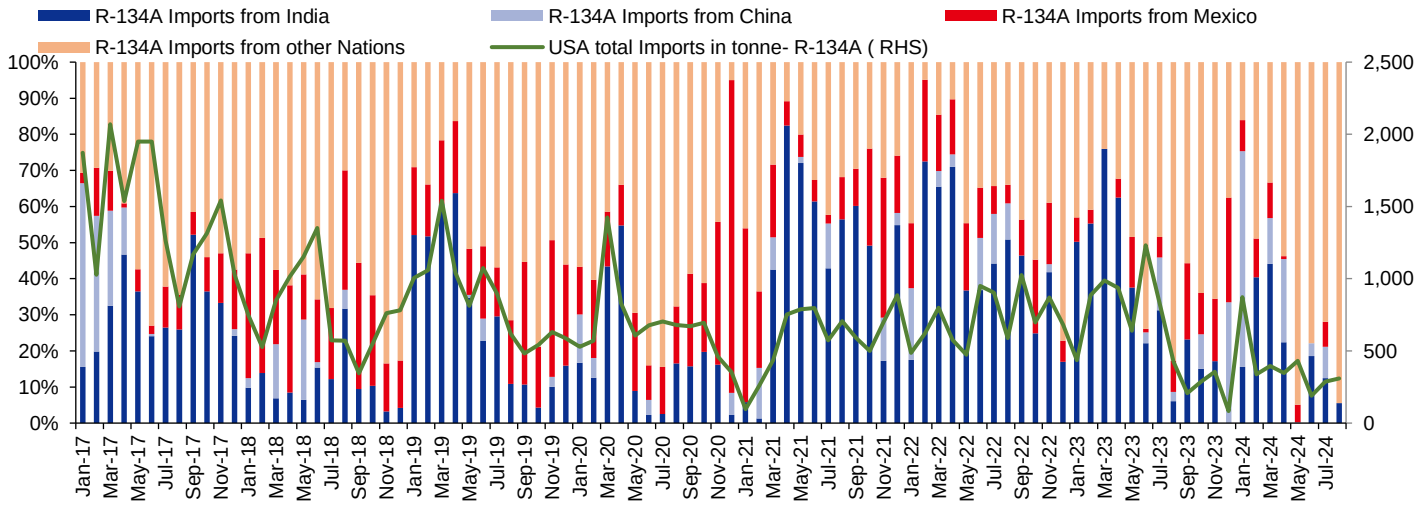
Figure 17: …and so is the case with GFL's exports of refrigerants



SOURCE: INCRED RESEARCH, COMPANY REPORTS

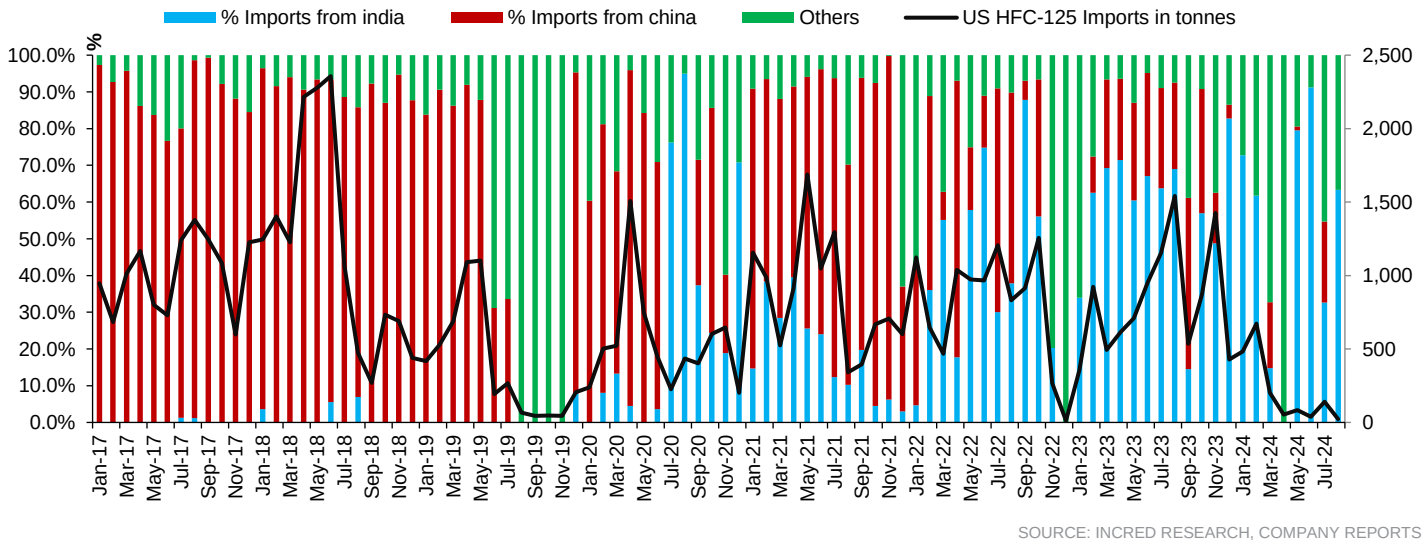
US imports of HFC-125, R-134A, R-410A are also collapsing ➤

Figure 18: R-134A imports in the US are collapsing and at the same time, Indian companies are losing massive market share



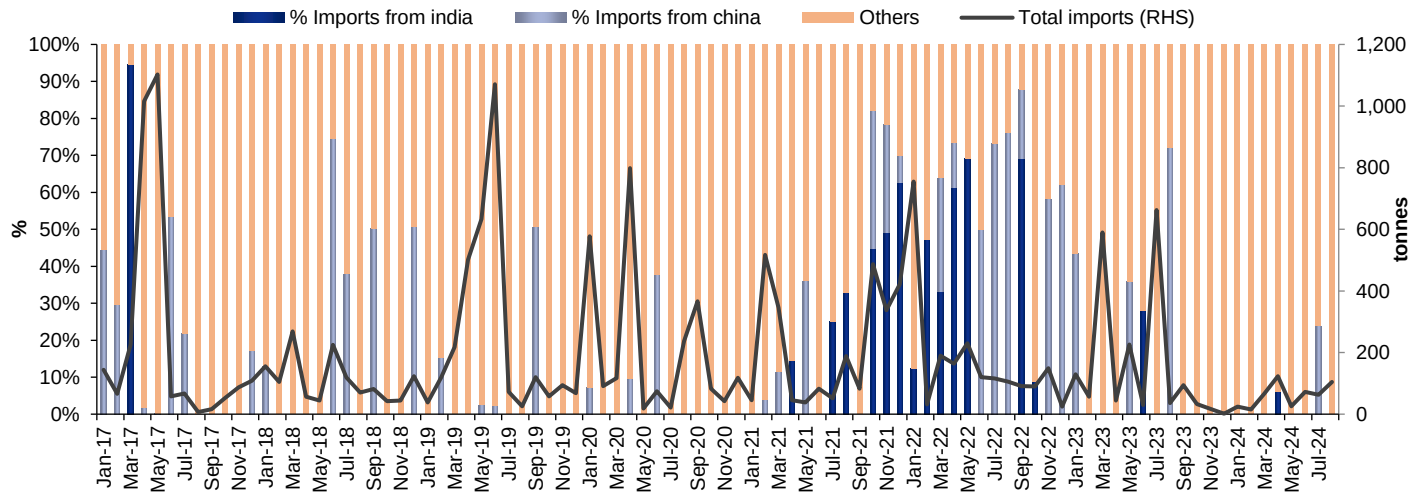
SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 19: HFC-125 imports in the US are close to zero



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 20: Similarly, R-410 A imports are trickling down



SOURCE: INCRED RESEARCH, COMPANY REPORTS

With large capacities in place and a collapse in demand in key markets, prices in India are at risk ➤

Indian companies like Gujarat Fluorochemicals or GFL and SRF have installed multiple capacities which will face the risk of underutilization and hence, prices can fall in the Indian market.

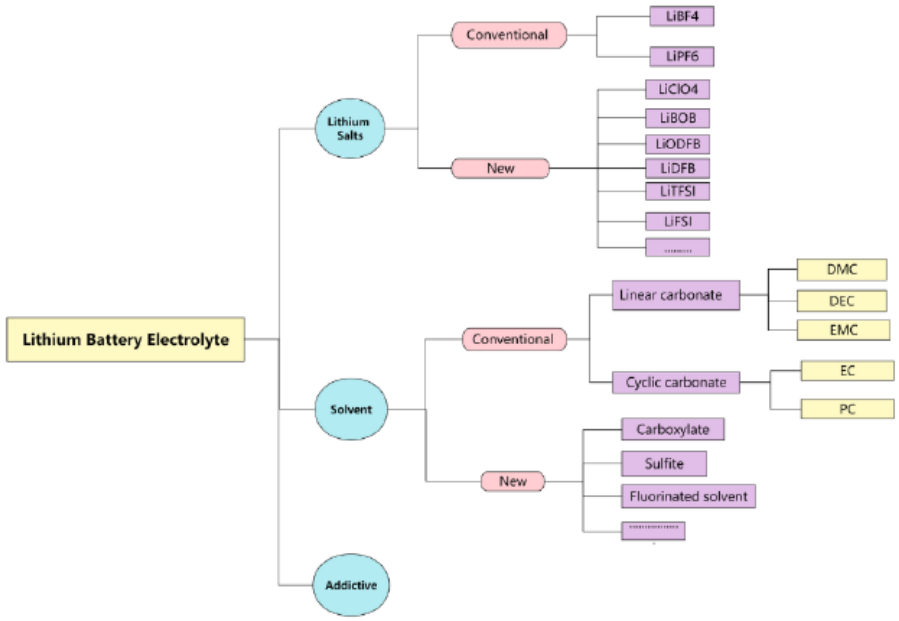
Electrolytes and solvents of lithium-ion batteries

There are seven kinds of lithium salts which are listed below:

1) LiBF4 - lithium tetrafluoroborate
2) LiPF6 - lithium hexafluoro phosphate
3) LiCIO4 - lithium perchlorate
4) LiBOB - lithium bis(oxalato)borate
5) LiODFB - lithium difluoro(oxalato)borate
6) LiDFB - lithium difluoro(oxalate)borate. LiDFB, also known as lithium difluoro(oxalato)borate, is the same compound as LiODFB (lithium difluoro(oxalate)borate). They both have the same chemical formula, Li (ODFB), and share the same properties and applications. The difference in notation (DFB vs. ODFB) likely arises from different ways of representing the same chemical structure.
7) LiFSi-: lithium bis(fluorosulfonyl)imide.

Out of these, LiPF6 is the most widely used salt commercially. BYD's Blade Battery also uses LiPF6 as an electrolyte**.** LiPF6 stands for lithium hexafluorophosphate, made up of a lithium cation and hexafluorophosphate anion. It accounts for 43% of the total electrolyte cost and is manufactured by reacting phosphorus pentachloride with hydrogen fluoride and lithium fluoride. In comparison to the older electrolyte salts like LiBF4, LiAsF6 and LiClO4, LiPF6 has a better performance with respect to solubility, conductivity, safety, and environmental friendliness in organic solvents. Hence, it became widely popular among battery electrolytes even though some of the newer salts like LiFSi have better properties.

Figure 21: Different lithium salts used as an electrolyte



SOURCE: INCRED RESEARCH, COMPANY REPORTS

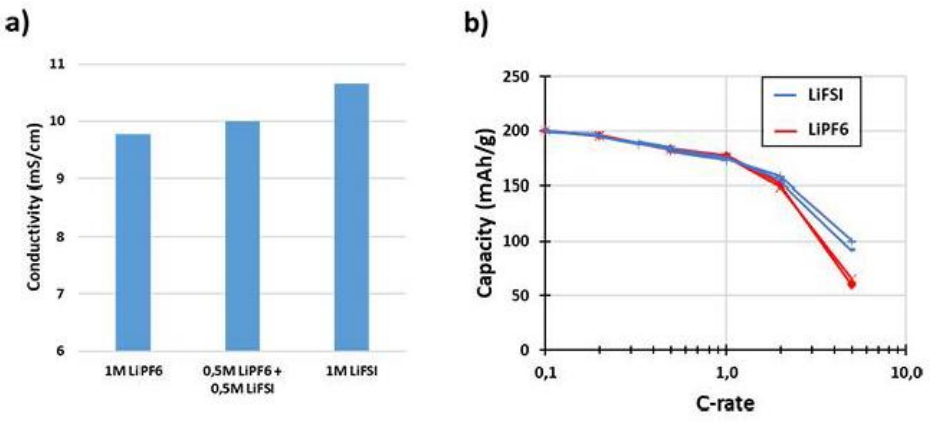
Electrolytes for lithium-ion batteries: LiFSi vs. LiPF6 - LiFSi is a better salt but the world is still taking baby steps in its adoption ➤

1. LiPF6 still dominates the market because standardized processes exist for it, enabling the refinement of the manufacturing process, thus lowering the cost. However, the trend is likely to change in the future.
2. Currently, the global demand for LiPF6 stands at 67kt and Chinese capacity now is 2x of this, with another 100kt capacity in the pipeline.
3. Meanwhile, a new contender for LiPF6 is around the block: lithium bis(fluorosulfonyl)imide (LiFSI).
4. LiPF6 has limitations such as poor performance in both low & high temperatures, a harsh preparation process, and inadequate thermal stability.
5. LiFSI has the potential to address most of these bottlenecks, not just due to its better physical & chemical properties but also due to the continuous investments from Chinese companies in its research & development.
6. Currently, LiFSI is mainly used in small quantity as an electrolyte additive mixed with LiPF6.
7. Several major Chinese players are investing in new supply of LiFSI besides LiPF6 plants. The primary hindrance to widespread adoption of LiFSI is its high application cost.
8. The price disparity between the two is gradually narrowing. Notably, EV giant Tesla is already deploying LiFSI salt into its 4680 batteries. Companies like Contemporary Amperex Technology (CATL), Panasonic, and LG Chem are actively involved in the production of these batteries, having inked sourcing agreements with domestic LiFSI manufacturers in China.
9. LiPF6 decomposes easily in heat, has hydrolysis resistance, and crystalizes easily at low temperatures.
10. LiPF6 electrolyte's performance is not optimal at high and low temperatures, and humidity because it is unstable and sensitive to humidity and temperature. It is susceptible to decomposition when the temperature and humidity are high. Hydrogen fluoride is produced under these conditions, and it severely affects battery life.
11. LiPF6 also crystalizes under low temperature, thereby decreasing the electrical conductivity of the electrolyte.

12. As a result, LiFSI could potentially be the answer. It is a hydrophyphic lithium salt that is used to make electrolytes for lithium-ion batteries as a safer alternative to the conventionally used LiPF6. It is made up of one li cation and a bistriflimide anion. The fluorine atom in LiFSi has strong electron absorption ability, because of which it has high conductivity. FSI- anion in LiFSi has better hydrolysis resistance. LiFSi has a lower crystallization point than LiPF6 and hence, it is more stable at lower temperatures.

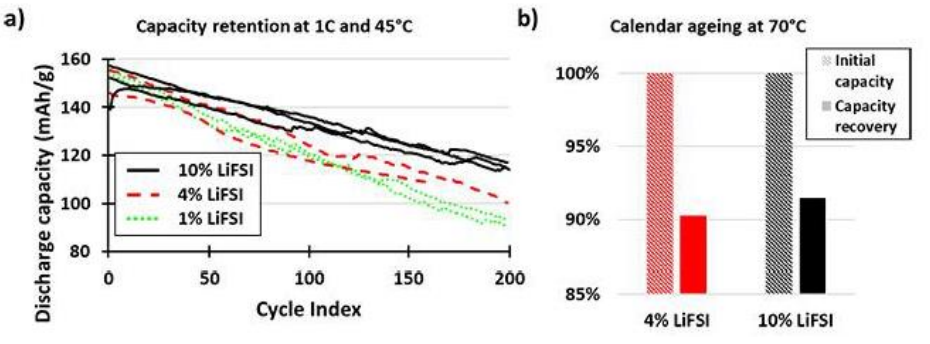
Overall, in comparison to LiPF6, LiFSi has the plus side of better thermal stability, strong hydrolysis resistance, and high conductivity. Owing to its superior properties, LiFSi can significantly improve a battery's life, its range, and charge & discharge power in the summer and winter seasons. Due to these reasons, it is expected to become the next-generation mainstream lithium salt. China is rapidly expanding its LiFSi capacity. A lot of downstream players like LG, Tesla, Volkswagen, etc. are beginning to use LiFSi. Even though LiPF6 dominates the market now, with the mass production of 4680 batteries and Qilin batteries, the trend is likely to change.

Figure 22: a) LiFSI batteries have improved fast charging and high-power delivery; b) batteries with LiFSI have higher capacity compared to LiPF6



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 23: Capacity retention of NMC532/graphite cells cycled at 1C (charge & discharge) at 45°C; b) initial capacity and capacity recovery at C/10 after two weeks of calendar ageing at 100% SOC at 70°C



SOURCE: INCRED RESEARCH, COMPANY REPORTS

LiPF6 venture may not be able to recover even the cost of debt ➤

1. Multiple Indian companies are incurring capex to make LiPF6 electrolyte and its additive, cinylene carbonate. They hope that India will become a big powerhouse of lithium-ion battery manufacturing and hence, there will be huge demand for electrolytes.
2. GFL is incurring a capex of Rs10bn to make LiPF6 while Neogene has also committed capex for the same. Even a small company like Ami Organics is incurring a capex of Rs2bn to make vinylene carbonate (an additive for LiPF6). Please note that current global demand for LiPF6 is ~67,000t against which the top 10 Chinese companies' capacity alone is 1,00,000t and 1,50,000t capacity is in the pipeline.
3. As of now, the spreads of $LiPF_6$ over the raw material is -Rs100/kg. Normally, 12 units of electricity are needed to make 1kg of $LiPF_6$, which means that the present EBITDA/kg will be nearly -Rs300 or **overall EBITDA loss for a 1,800t plant will be ~Rs540m**. Given the capex of Rs10bn for a 1,800t plant, at present even the interest costs (assuming 2:1 debt-equity ratio) won't be recovered.
4. Assuming the last 36 months' average spreads, EBITDA/kg is around Rs500 (removing the abnormally high spreads of the post-Covid supply chain crisis period between Sep 2021 to Mar 2022), EBITDA for a 1,800t plant should be ~Rs900m. Adjusting for working capital requirement and necessary sustenance capex, it will be barely sufficient to recover 9-10% interest costs on debt taken for capex.

LiPF6 is the most hyped electrolyte in Indian equity markets ➤

Investors are assigning a premium valuation to any company that makes $LiPF_6$ (none are making it on a commercial scale though) or has an intention to make it or is in the process of installing a pilot plant. Contrary to market hype, 1) $LiPF_6$ is being replaced by a better electrolyte known as LiFSi, 2) $LiPF_6$ margins have collapsed, is hugely oversupplied and, in fact, the current and upcoming capacity in China alone can keep the product oversupplied beyond 2030F, and 3) a slew of $LiPF_6$ manufacturing capacities and little investment in Li (lithium) mining have resulted in skyrocketing lithium carbonate (LiC) prices. $LiPF_6$ margins have collapsed by 75% in the last six months and are expected to decline further in the coming months. Even $LiPF_6$ prices have collapsed by 60%. In this context, we are unable to understand as to why investors are assigning a premium valuation to Indian companies who have no indigenous source of LiC and are coming into oversupplied $LiPF_6$.

Leading electric vehicle or EV makers are replacing $LiPF_6$ with LiFSi ➤

The trend is quite certain that LiFSi is becoming one of the mainstream lithium salts for next-generation electrolytes. However, it is also true that due to severe technical problems in mass production and high costs, LiFSi has not been directly used as a solute lithium salt but as an additive mixed with lithium hexafluorophosphate ($LiPF_6$) for use in electrolytes of lithium-ion-powered batteries especially. To cite an example, LG Chem has been using LiFSi as an additive in its electrolytes for quite some time. Tesla's '4680' battery has commenced mass production, and the upgrade of the new battery technology has enabled LiFSi to be rapidly introduced into the industry chain.

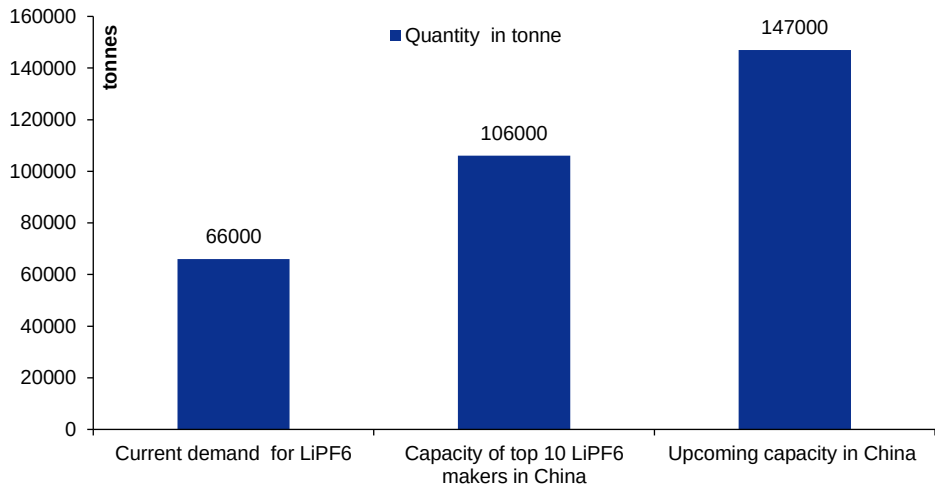
Indian companies' foray into LiPF6 and its additives is ill-timed ➤

We can say that Indian companies' foray into LiPF6 and its additives is ill-timed. Gujarat Fluorochemicals as well as Neogene are talking about putting up commercial plants for LiPF6, and Ami Organics is venturing into LiPF6 additives (vinylene carbonate or VC, and fluoroethylene carbonate or FEC). As we have

stated in our report, VC prices have fallen by 80% over the last eight months and a greater decline is on the cards till they reach the production cost of US$4/kg (current price of VC is US$12/kg). We retain our REDUCE rating on Gujarat Fluorochemicals. Ami Organics & Neogene are UNRATED stocks.

LiPF6 is hugely oversupplied in the global market ➤

Figure 24: $LiPF_6$ is hugely oversupplied, and it is being substituted by LiFSi



SOURCE: INCRED RESEARCH, COMPANY REPORTS

What is the use of solvent in batteries? Solvents play a critical role in the electrochemistry of electrolytes ➤

1. Solvents are used in batteries to dissolve lithium salt and other active materials. They also provide a medium for ion transport and can affect the diffusion coefficient of lithium ions and the dissociation of lithium salts. Small solvent molecules can enable a previously unknown ion-transport mechanism in battery electrolytes. This can speed up charging and increase the performance at low temperatures.
2. The choice of solvent and salt is the main descriptor of the electrolyte in lithium-ion batteries (LIBs). Different solvents and salts can have varying effects on the performance of LIBs. For example, the use of isoxazole as the main solvent in the electrolyte has been found to significantly increase the ionic conductivity at low temperatures.

Some commonly used solvents include: 1)N-methyl-2-pyrrolidone, 2) dimethyl carbonate , and 3) ethylene carbonate.

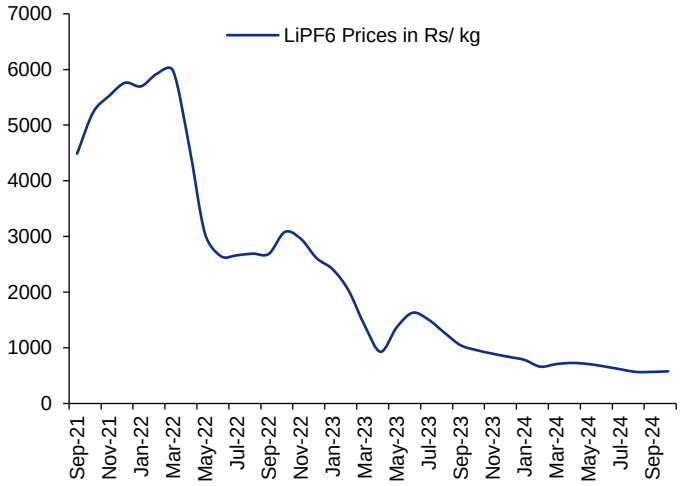
Solvent mixtures are used because a high relative permittivity and low viscosity commonly cannot be integrated into a single molecule.

Is making ethylene carbonate, N-methyl-2-pyrrolidone or dimethyl carbonate a specialized skill which cannot be mastered by all? The answer is an emphatic NO ➤

All these chemicals are manufactured by multiple companies in India. For example, N-methyl-2-pyrrolidone is exported by at least 150 different companies from India. Ethylene carbonate and di methyl carbonate are simple chemicals.

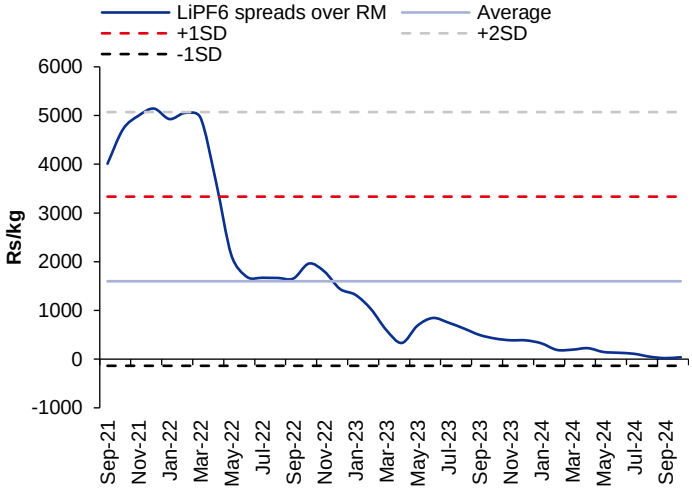
Is $LiPF_6$ making money now? No, it will be EBITDA negative »

Figure 25: Prices of $LiPF_6$ have collapsed by ~90%...



SOURCE: COMPANY REPORTS, INCRED RESEARCH

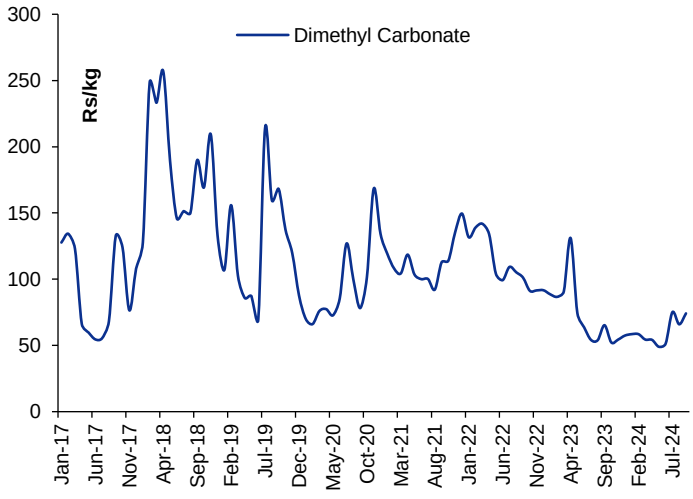
Figure 26: …and even the gross spread is zero



SOURCE: COMPANY REPORTS, INCRED RESEARCH

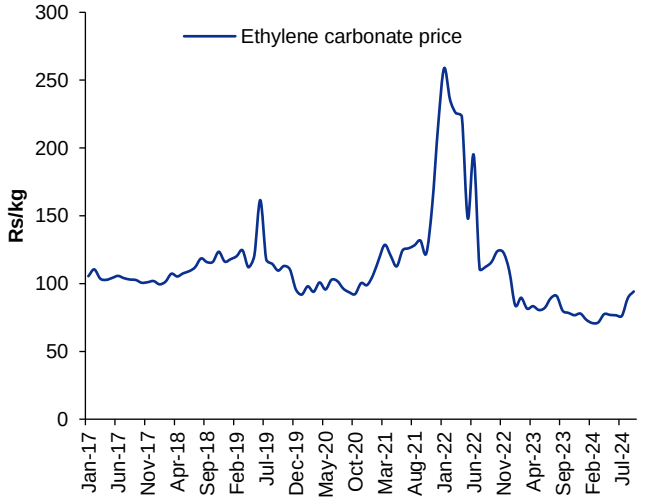
What about the prices of solvents? They too are falling rapidlyc»

Figure 27: Dimethyl carbonate prices have recovered a bit



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 28: Ethylene carbonate prices have fallen below their all-time low



SOURCE: INCRED RESEARCH, COMPANY REPORTS

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Add	The stock's total return is expected to exceed 10% over the next 12 months.
Hold	The stock's total return is expected to be between 0% and positive 10% over the next 12 months.
Reduce	The stock's total return is expected to fall below 0% or more over the next 12 months.

The total expected return of a stock is defined as the sum of the: (i) percentage difference between the target price and the current price and (ii) the forward net dividend yields of the stock. Stock price targets have an investment horizon of 12 months.

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Neutral	A Neutral rating means stocks in the sector have, on a market cap-weighted basis, a neutral absolute recommendation.
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Underweight	An Underweight rating means investors should be positioned with a below-market weight in this country relative to benchmark.