India

Underweight *(no change)*

Highlighted Companies

Aarti Industries

REDUCE, TP Rs435, Rs655 close

Aarti Industries has been relying heavily on MMA, as it has higher gross spreads compared to other molecules. However, other molecules' declining spreads are not helping. We retain our REDUCE rating on the stock.

Atul Ltd

REDUCE, TP Rs5955, Rs6014 close

The slowdown in India's textile exports and the global agrochemicals market is hitting Atul very hard. The company's expansion project may result in its balance sheet getting leveraged upwards for the first time in many years. Consensus EPS estimates are still too high. We expect a cut in consensus EPS estimates. We retain our REDUCE rating on the stock with a lower target price of Rs5,955.

Summary Valuation Metrics

P/E (x)	Mar24-F	Mar25-F	Mar26-F
Aarti Industries	54.19	45.21	37.69
Atul Ltd	39.52	34.09	27.25

P/BV (x)	Mar24-F	Mar25-F	Mar26-F
Aarti Industries	4.51	4.16	3.8
Atul Ltd	3.53	3.24	2.94

Dividend Yield	Mar24-F	Mar25-F	Mar26-F
Aarti Industries	0.38%	0.38%	0.38%
Atul Ltd	0.3%	0.35%	0.44%

Chemicals - Others

Plasticizers & phthalic anhydride near bottom

- Phthalic anhydride prices are close to the bottom of the cycle. Capacities are being shut & rising naphthalene prices are leading to higher production costs.
- Naphthalene is slated to rise further because of China's crackdown on coal tar production and the destruction of Ukraine's key production capacity.
- India, which is a dumping ground for naphthalene-based PA, stands to benefit as the alternate method of making it via ortho xylene turns cost-competitive.

Phthalic anhydride is close to the bottom of the cycle

Phthalic anhydride (PA) shows the classic bottom cycle pattern as: 1) the spreads of the commodity over raw material are close to an all-time low, 2) capacities are being shut down, and 3) prices have started to recover a bit. Added to the above factors is the fact that the alternate method of producing phthalic anhydride (through the naphthalene route) is costlier. Indian, being one of the main dumping grounds for naphthalene-based PA from Taiwan, stands to benefit from this development.

China's crackdown on coal tar production – less naphthalene exports

Naphthalene can be produced from coal tar or petroleum. The most common production process is to distill and fractionate coal tar. The middle fraction, which contains most of the naphthalene, is cooled and crystallized. To manufacture 95% naphthalene, coal tar is first distilled. The oil from the distillate, which contains a large amount of naphthalene, is then further refined, and distilled. In China, there are three sizes of furnaces which are used to produce coal tar: 4.3-, 5.6- and 7.65-metre-high furnaces. The 7.65-metre-high furnace is the least pollutant. Hence, the government's crackdown on the production from lower height furnaces has led to lower coal tar production and thereby, naphthalene availability.

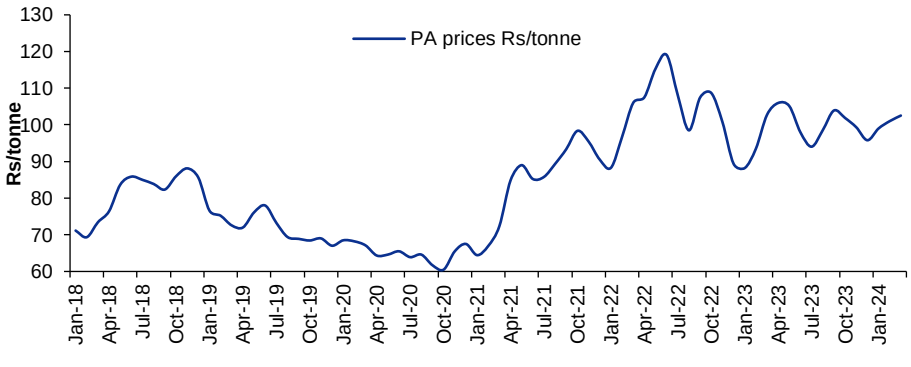
The alternate method of PA output via ortho xylene stands to benefit

It's interesting to note that approximately 0.9kg of naphthalene as well as ortho xylene is needed to produce 1kg of PA. Hence, falling prices of ortho xylene and rising prices of naphthalene will render naphthalene-based PA producers uncompetitive. Please note that the naphthalene-based process to produce PA requires higher heat as compared to the ortho xylene-based process. Xylene spreads over naphtha are at a multi-month high while naphtha is very stable. With the production response of xylene, its prices are already falling, and we expect the decline to gain momentum in the coming period. Hence, we believe that the ortho xylene method of PA production via will take precedence.

Capture of Ukraine's coke plant by Russia leads to further tightening

The Ukranian city of Adviika houses a major coke plant, which consumes 6.4mt of coal per day to produce coke and its various derivatives including naphthalene. On 17 Feb 2024, Russian armed forces captured the plant after the withdrawal by Ukrainian forces. Metinvest CEO Mr. Yuriy Ryzhenkov stated that the plant cannot be restored. Moreover, a lot of PA plants are on the verge of closure (Aekyung Pharma, Mitsubishi Chem), which will also lead to tightening of the PA market, resulting in further price support.

Figure 1: PA prices show signs of a recovery in India



SOURCE: INCRED RESEARCH, COMPANY REPORTS

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Plasticizers & phthalic anhydride near bottom

Plasticizers and phthalic anhydride are close to the bottom of the cycle. Capacities are being shut down and the rising prices of naphthalene are making the cost of production of Taiwanese producers higher. Please note that Taiwan has approximately 1.2mt of naphthalene-based phthalic anhydride capacity. The rising prices of naphthalene are due to China's crackdown on coal tar production due to rising concerns over pollution in the country. Please note that coal tar distillation is the primary method of naphthalene production.

Phthalic anhydride is close to the bottom of the cycle

Phthalic anhydride (PA) is showing the classic bottom cycle pattern as 1) the spreads of the commodity over raw material are near an all-time low, 2) capacities are being shut, and 2) the prices have started to recover a bit. Adding to the above factors is the fact that the alternate method of producing phthalic anhydride (through the naphthalene route) is costlier. India, being one of the main dumping grounds for naphthalene-based PA from Taiwan, stands to benefit from this development.

Phthalic anhydride can be produced by two routes - napthalene and ortho xylene

Naphthalene - based production method

Vaporization: Naphthalene is heated to convert it into a vapour state.

Mixing: The vapourized naphthalene is mixed with compressed air to create a reactant feed.

Reaction: The reactant feed is introduced into a reactor vessel containing the vanadium pentoxide catalyst. At elevated temperatures (around 400-500°C), naphthalene reacts with oxygen in the air to produce phthalic anhydride, according to the following chemical equation:

$2C_{10}H_8 + 12O_2 \rightarrow 8C_6H_4O_3 + 4CO_2 + 4H_2O$

Product separation: The reactor effluent, a hot gas mixture containing phthalic anhydride vapour, unreacted naphthalene, various byproducts, and entrained catalyst particles, exits the reactor. The gas stream is then cooled down, causing the phthalic anhydride to condense from the vapour phase into a liquid form.

Purification: The condensed phthalic anhydride may require further purification steps to remove impurities and obtain the desired product quality.

Ortho xylene-based production method

Unlike naphthalene, ortho xylene isn't used as a direct raw material for phthalic anhydride production. However, it is the most sought-after isomer among the three xylenes (ortho, meta, and para) for this purpose. Here's why:

Phthalic anhydride production and xylene

Commercially, phthalic anhydride is primarily produced using a specific xylene isomer - paraxylene (p-xylene). This is because paraxylene readily undergoes catalytic oxidation to form phthalic anhydride with high yield and purity.

Ortho-xylene's role

While ortho xylene (o-xylene) isn't directly used, it can be an intermediate source for para-xylene production. Here is the process flow:

Reforming: Reforming of a suitable hydrocarbon stream, typically naphtha, in a catalytic reforming unit produces a mixture of aromatic hydrocarbons including xylenes (ortho, meta, and para).

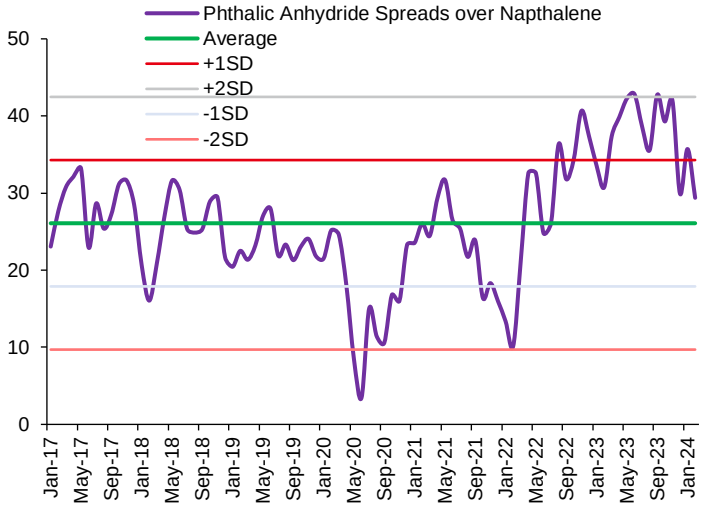
Separation: The xylene mixture obtained from reforming undergoes a distillation process to separate the three isomers. Ortho xylene has a slightly higher boiling point compared to para xylene.

Isomerization (optional): Depending on the xylene isomer distribution from reforming, an isomerization process might be employed. This process converts some of the meta and ortho xylene into the more desirable para xylene using catalysts under specific conditions.

Phthalic anhydride production: The purified para xylene stream then undergoes catalytic vapour phase oxidation with air to produce phthalic anhydride.

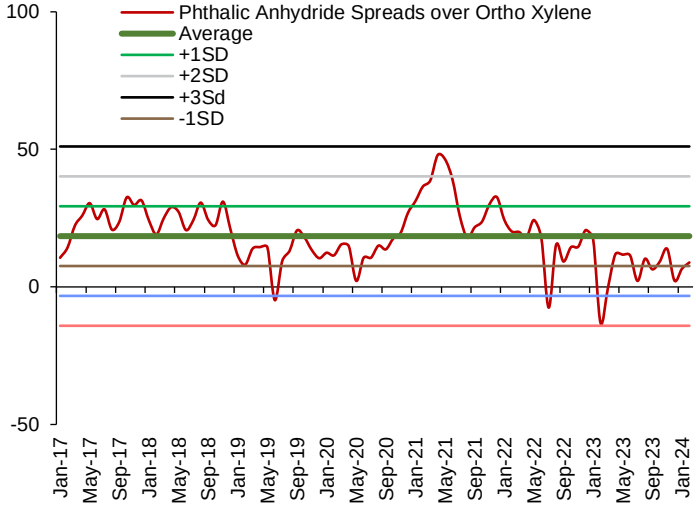
The spreads of PA over ortho xyxlene and napthalene have moved in the opposite direction ➤

Figure 2: PA spreads over naphthalene are coming down…



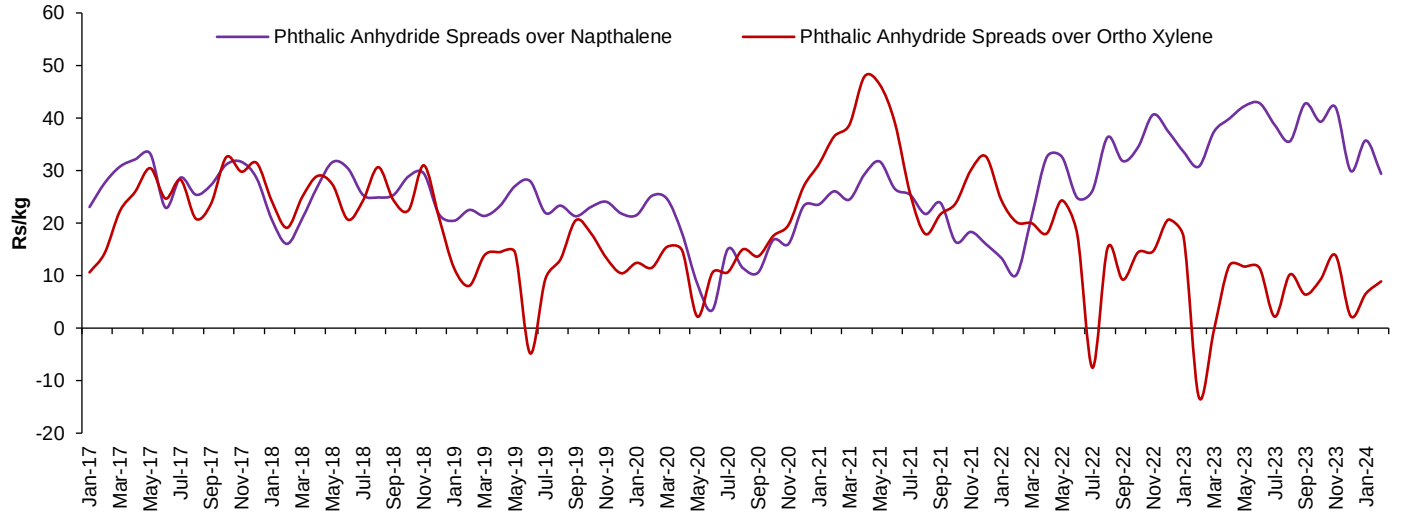
SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 3: …and its spreads over ortho xylene are improving



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 4: As the naphthalene route is becoming more costly, its supply is coming off from the market which is helping the ortho xylene route; the reverse correlation between the naphthalene route and the ortho xylene route is apparent in the graph below



SOURCE: INCRED RESEARCH, COMPANY REPORTS

The biggest producer of napthalene, China, is cracking down on coal tar production ➤

1. The global naphthalene market stands at 2.3mt. Approximately 35-40% of naphthalene is used to produce PA. Taiwan is the major producer of naphthalene-based PA.
2. China produces the largest volume of naphthalene, along with the US, Western Europe, and Japan. China's demand for refined naphthalene has been growing rapidly in the last decade and it is expected to continue in the next decade as well.
3. Naphthalene can be produced from coal tar or petroleum. The most common production process is to distil and fractionate coal tar. The middle fraction,

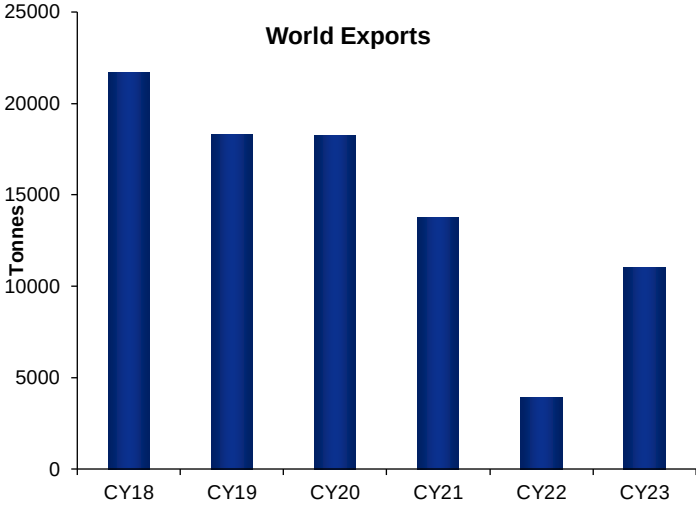
which contains most of the naphthalene, is cooled and crystallized. To manufacture 95% naphthalene, coal tar is first distilled. The oil from the distillate, which contains a large amount of naphthalene, is then further refined and distilled.

4. In China, there are three sizes of furnaces which are used to produce coal tar: 4.3-, 5.6- and 7.65-metre high furnaces. The 7.65-metre high furnace is the least pollutant. Hence, the government's crackdown on the production from lower height furnaces, which is leading to lower coal tar production and thereby, naphthalene availability.

Russian control over Avdiivka coke plant in Ukraine can lead to a tight napthalene market ➤

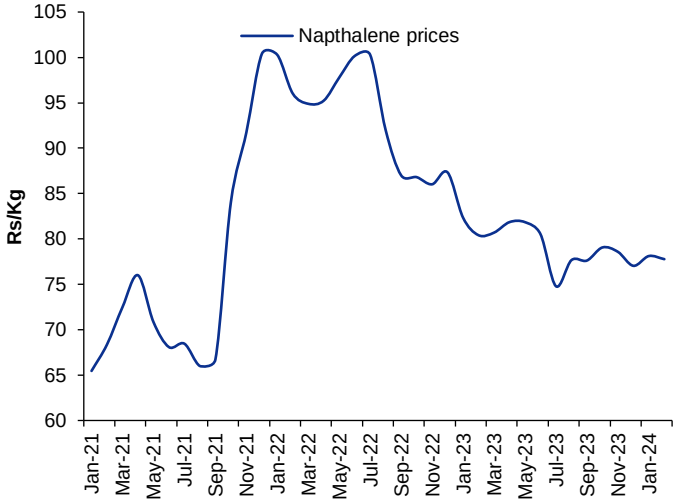
https://akhz.metinvestholding.com/en/activity/products lists the products made at the Avdiivka coke plant in Ukraine. As is apparent, Avdiivka produces a significant quantity of naphthalene as well. On 17 Feb 2024, Russian armed forces captured the plant after the withdrawal by Ukrainian forces. Metinvest CEO Mr. Yuriy Ryzhenkov stated that the plant cannot be restored.

Figure 5: After the supply chain stabilized in CY23, Ukraine's exports bounced back…



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 6: …which led to the fall in naphthalene prices but after the 17 Feb 2024 event, prices will rise again

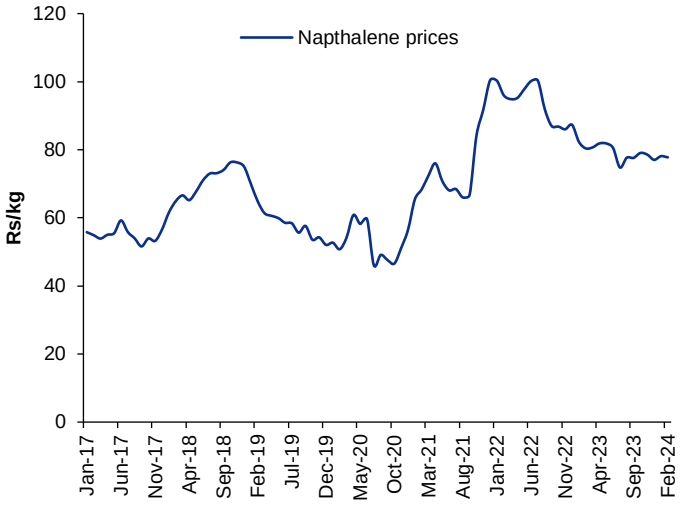


SOURCE: INCRED RESEARCH, COMPANY REPORTS

Napthalene prices have been highly stable compared to ortho xylene prices and after the closure of Avdiivka plant, prices may rise➤

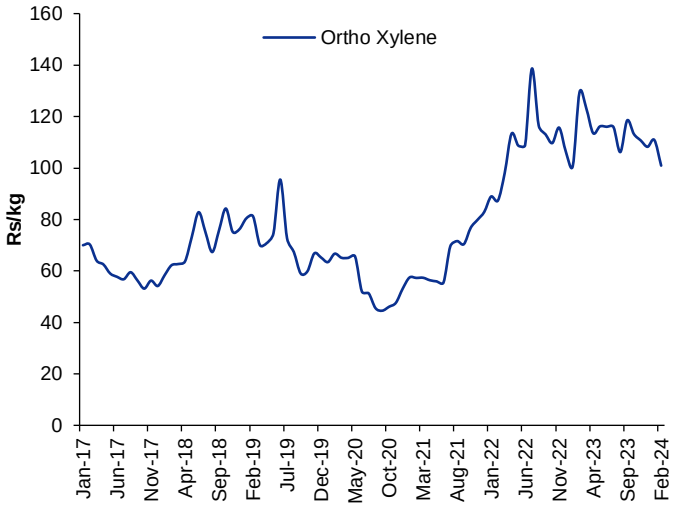
It's interesting to note that approximately 0.9kg of naphthalene as well as ortho xylene is needed to produce 1kg of PA. Hence, the falling prices of ortho xylene and rising prices of naphthalene will render naphthalene-based PA producers uncompetitive. Please note that the naphthalene-based process to produce PA requires higher heat compared to the ortho xylene-based process.

Figure 7: Naphthalene prices are steady and after China's crack down on coke furnaces and Russia's capture of Avdiivka plant, it is likely that prices will go up



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 8: On the other hand, ortho xylene prices are falling, which makes ortho xylene-based PA producers much more competitive



SOURCE: INCRED RESEARCH, COMPANY REPORTS

At the same time, some of the PA capacities are shut/on the verge of getting shut ➤

1. Aekyung Petrochemical is set to cease phthalic anhydride or PA production in Apr 2024F. This plant produces approximately 0.45mt of PA.
2. Mitsubishi Gas Chemical plans to halt the production of phthalic anhydride in Mizushima. This plant has the capacity to produce approximately 70kt.
3. Some more capacities in Germany and USA are also at the risk of closure if the prices don't recover fast.

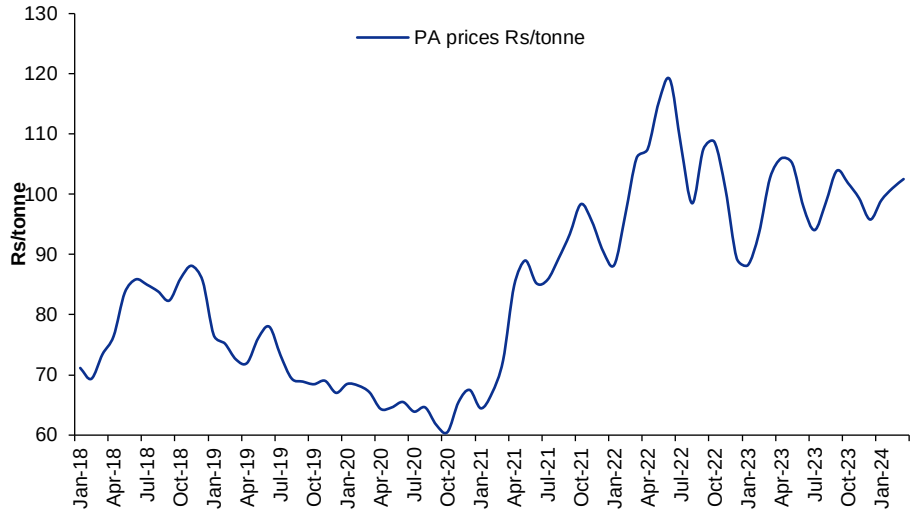
However, we see some recovery in downstream demand for PA ➤

Phthalic anhydride is a versatile industrial chemical with a wide range of applications. Here are some of its most important uses:

1. **Plasticizers:** The primary use of phthalic anhydride is as a precursor to phthalate esters, which are used as plasticizers in polyvinyl chloride (PVC). Plasticizers make PVC more flexible and easier to process. They are found in a variety of products, including building materials, flooring, hoses, wires, and cables.
2. **Unsaturated polyester resins:** Phthalic anhydride is also a key component in the production of unsaturated polyester resins (UPRs). UPRs are a type of thermosetting resins that are used in a variety of applications, including reinforced plastics for boats, bathtubs, countertops, and car parts.
3. **Alkyd resins:** Phthalic anhydride is used in the production of alkyd resins, which are a type of polyester resins used in paints, varnishes, and lacquers. Alkyd resins provide good durability and adhesion, making them a popular choice for a variety of coating applications.
4. **Dyes and pigments:** Phthalic anhydride is a precursor to a number of dyes and pigments. These dyes and pigments are used in a wide variety of products, including textiles, paints, and plastics.
5. **Other uses:** Phthalic anhydride has a number of other minor uses, including as a fungicide, a flame retardant, and a chemical intermediate in the production of other chemicals.

PA prices are showing initial signs of a recovery

Figure 9: PA prices are showing some signs of a recovery in the domestic market



SOURCE: COMPANY REPORTS, INCRED RESEARCH

Diethyl phthalate is also showing signs of improvement

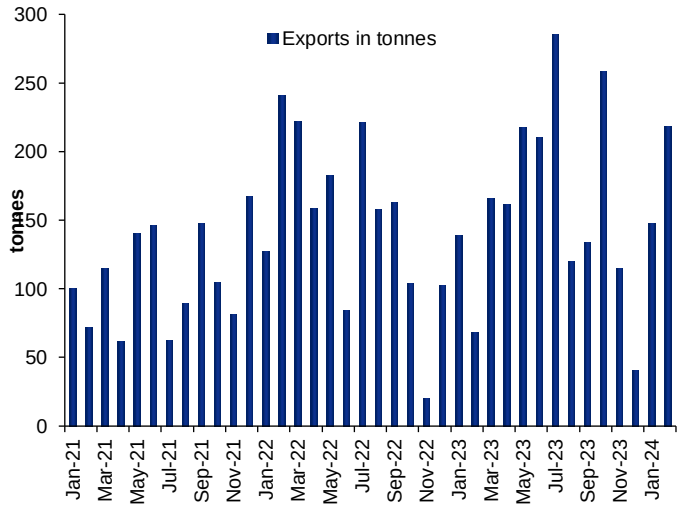
Diethyl phthalate (DEP) has multiple usage

Diethyl phthalate (DEP) is a colourless, oily liquid that is commonly used as a plasticizer. Plasticizers are substances that are added to plastics to make them more flexible and less brittle. DEP is found in a wide variety of consumer goods, including:

1. Plastic packaging films.
2. Cosmetics.
3. Solvents for fragrances.
4. Surface lubricant in food and pharmaceutical packaging.
5. Tubing used for medical purpose.

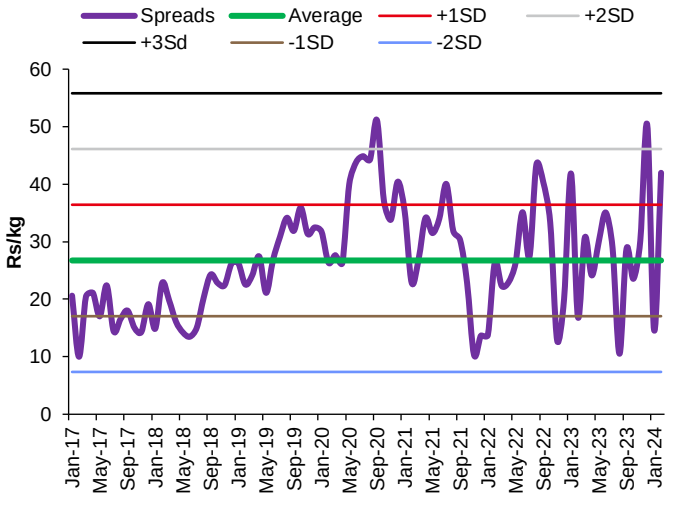
Normalizing scenario in the developed world is a first sign of improvement, as exports from India are rising and the spreads are increasing

Figure 10: Exports of dimethyl phthalate from India are rising…



SOURCE: INCRED RESEARCH, COMPANY REPORTS

Figure 11: …and its spreads over raw material are also improving



SOURCE: INCRED RESEARCH, COMPANY REPORTS

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