



## Chemicals - Others

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AUGUST 2022

Caustic industry records robust margins



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*Caustic soda prices have risen in South-east Asia amid the rise in energy costs and elevated freight rates. ICRA expects performance of caustic soda players to remain healthy in FY2023 amid higher production and elevated caustic soda realisations*



- Caustic soda production has been declining in the developed markets owing to high energy prices, phasing out of mercury process and shift of chlorine consuming industries to India and China.



- Next 5-6 years are forecast to have the lowest global capacity addition in the last 25 years. Accordingly, the demand growth is expected to outstrip incremental supply.



- The chloro-alkali Industry in India has 35 operating units with a combined capacity of 4.8 million tonne per annum of caustic soda as of FY2022 – at the end of which the top four players accounted for a sizeable portion of the total installed capacity



- Capacity enhancements in India are aided by increasing the size of the domestic specialty chemicals industry. The industry has been growing owing to the China+1 strategy adopted by several global companies following the Covid-19 pandemic.



- Caustic soda prices have risen to \$750-800/MT in South-East Asia amid the rise in energy costs and elevated freight rates



- ICRA expects performance of caustic soda players to remain healthy in FY2023 amid higher production and elevated caustic soda prices, particularly in H1 FY2023, although the gains will be limited by higher energy costs. Further, 1 MMT of capacity addition in the next 12-18 months may impact capacity utilisation and domestic prices

## Exhibit: Processes for manufacture of caustic soda\*

	Mercury	Diaphragm	Membrane
Caustic soda strength (weight %) produced	50	12	33-35
Energy consumption (KWh/MT of chlorine)	3360	2720	2650
Steam consumption (kWh/MT of chlorine) for concentration to 50% NaOH	0	610	180

Source: ICRA Research; \*Production of 1 MT of caustic soda also produces 0.88 MT of chlorine and 25 kg of hydrogen gas

- Caustic soda and chlorine are manufactured through either the membrane or the diaphragm process
- 'Membrane-grade' caustic soda is sold at a higher rate than 'diaphragm-grade' because of its purity and lower levels of salt and iron present as impurities which makes the latter unfit for use in certain end-user industries
- The membrane process for manufacturing caustic soda is considered as environmentally-safer than the diaphragm process due to use of asbestos in the latter leading to ESG concerns

# Comparison of Diaphragm, Mercury and Membrane processes

Process	Advantages	Disadvantages
<b>Diaphragm</b>	<ul style="list-style-type: none"> <li>▪ Low electricity consumption</li> <li>▪ Can run on dilute impure brine</li> <li>▪ Compact in size</li> </ul>	<ul style="list-style-type: none"> <li>▪ Salt and Iron impurities in product (~15-20% by weight)</li> <li>▪ Purification cost is very high</li> <li>▪ Low concentration of product</li> <li>▪ Uses asbestos as membrane leading to ESG concerns</li> </ul>
<b>Mercury</b>	<ul style="list-style-type: none"> <li>▪ High purity chlorine and hydrogen</li> <li>▪ Higher concentration of caustic produced (~50%)</li> <li>▪ Impurities in caustic are very low</li> </ul>	<ul style="list-style-type: none"> <li>▪ High electricity consumption so operation is expensive</li> <li>▪ Chlorine and sodium hydroxide produced are contaminated with trace amounts of mercury</li> <li>▪ Uses mercury leading to ESG concerns</li> </ul>
<b>Membrane</b>	<ul style="list-style-type: none"> <li>▪ Intermediate concentration of caustic so less water to be evaporated (~33-35%)</li> <li>▪ Low investment</li> <li>▪ High purity of caustic</li> </ul>	<ul style="list-style-type: none"> <li>▪ High investment cost</li> <li>▪ Large space compared to diaphragm cell</li> <li>▪ High quality requirements for brine raw materials</li> </ul>

Has  
been  
phased  
out  
globally

# Reasons for shutdown of plants in the West



High energy cost leading to unremunerative cost of production in Europe



EU phased out Mercury process by December 2017. Many plants shut down permanently owing to high cost of conversion



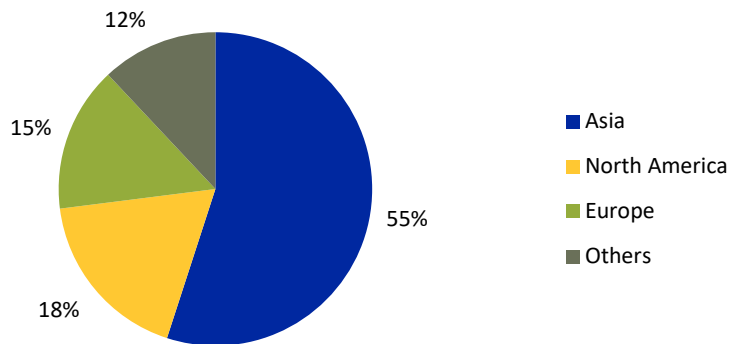
Weak economics of Diaphragm process compared to Membrane process is leading to shutdown of former



Shift of chlorine consuming industries such as specialty chemicals to India and China

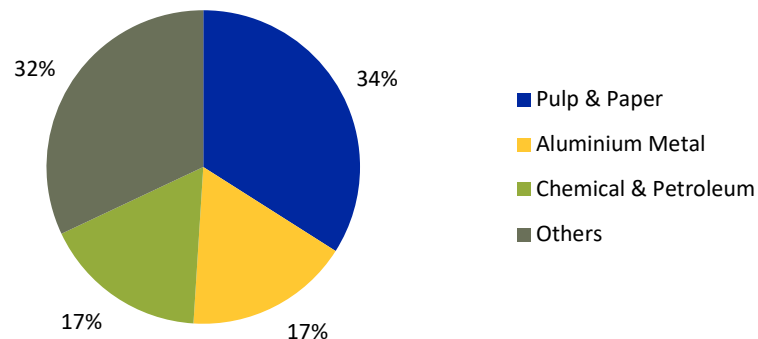


Exhibit: Caustic soda market by region



Source: Industry, ICRA Research

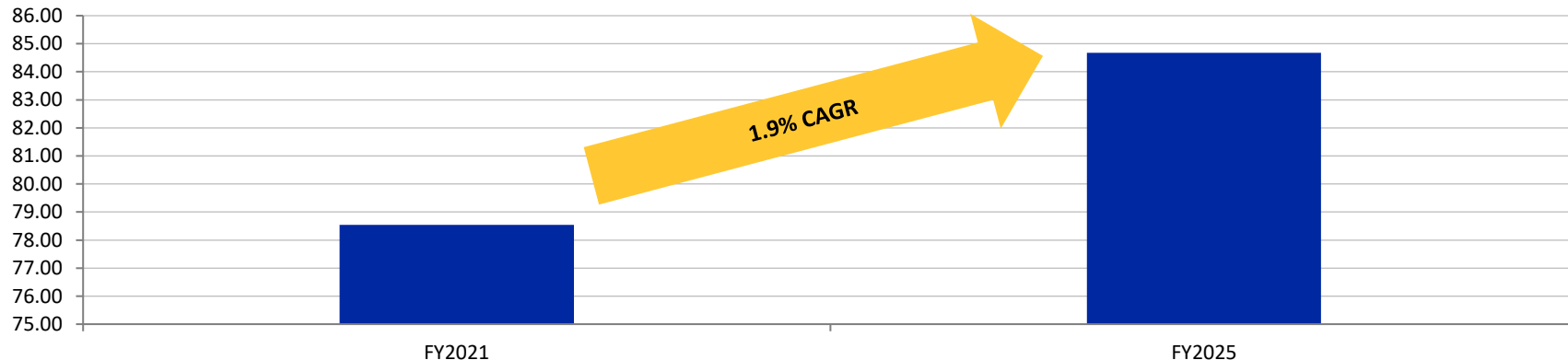
Exhibit: Caustic soda use by industry



Source: Industry, ICRA Research

- Asia is the largest market for caustic soda in terms of total revenue share and accounts for 55% of the total global revenue
- North America and Europe holds 2<sup>nd</sup> and 3<sup>rd</sup> position with revenue share of 18% and 15% respectively
- Caustic soda is primarily used in the production of pulp & paper which accounts for 34% of the total consumption globally followed by aluminium production at 17%
- Chlorine is mainly used in the production of epoxy products, vinyls, chlorinated organics and disinfectants. Globally about 38% of the chlorine is consumed for vinyl (ethylene di-chloride, vinyl chloride and poly-vinyl chloride) as against just 8% in India. PVC is the single biggest consumer of chlorine globally.
- The chlor-alkali globally is driven by the demand for chlorine whereas in India it is driven by the demand for caustic soda

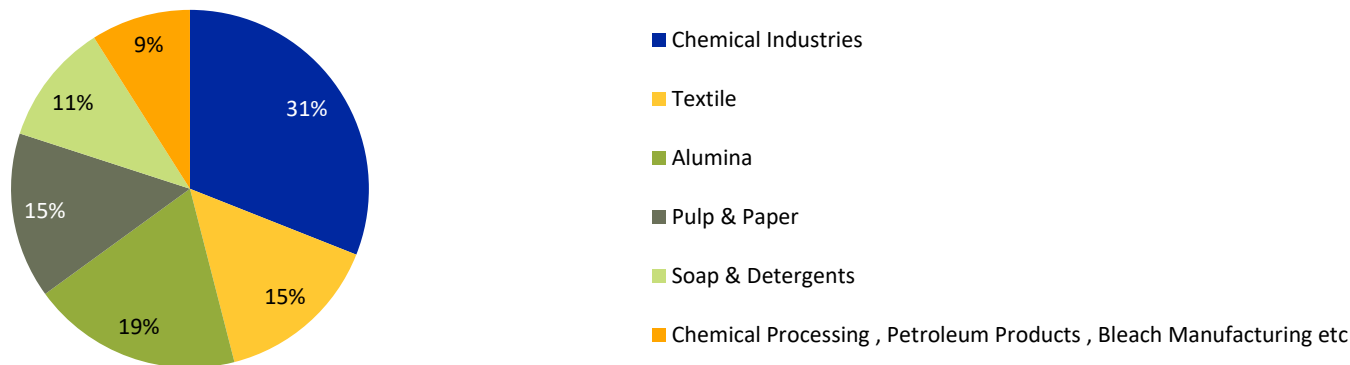
Exhibit: Global Caustic Soda Market Size ( million tons)



Source: ICRA Research

- The global caustic soda market size is estimated to reach 84.68 million tonnes in FY2025
- The growth is driven by various industries like pulp and paper industry, soap and detergent market, alumina market. There is increasing demand for PVC globally and the expanding use of caustic soda in mining, metal processing, glass production, food and textile industry
- Next 5-6 years are forecast to have the lowest global capacity addition in the last 25 years. Most of the capacity growth is expected to come up in India and China. Accordingly, the demand growth is expected to outstrip incremental supply
- Shutdowns are also expected in other parts of the world including the US to achieve ESG goals

Exhibit: Industry-wise use of caustic soda

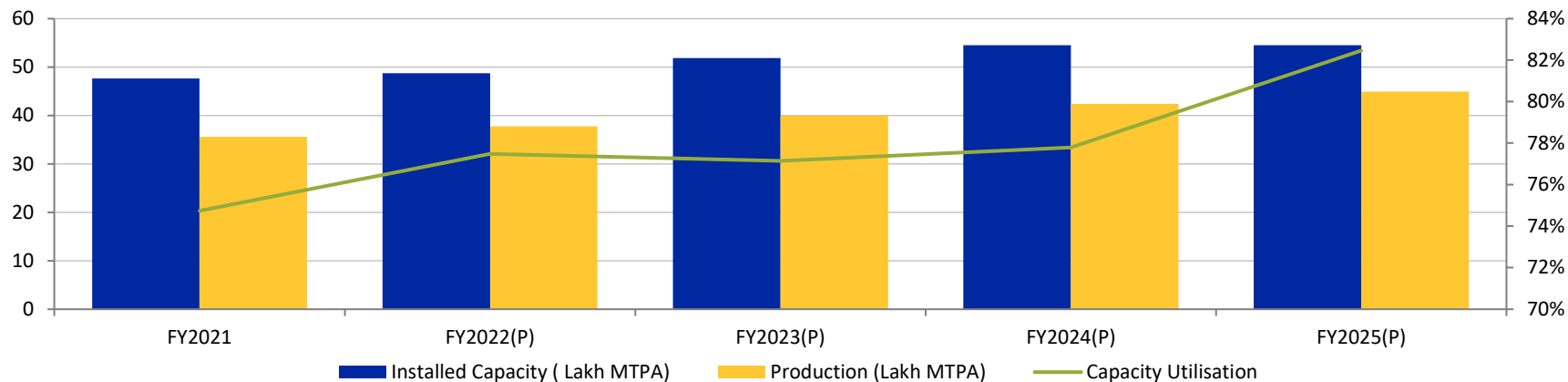


Source: Industry, ICRA Research

- In FY2021 around 65% of caustic soda was consumed by chemicals, textiles and alumina industries; pulp and paper industry accounted for 15% share in the consumption of caustic soda
- The key drivers for the growth of caustic soda demand in India are chemical, textile, alumina, pulp and paper and soap and detergents industries
- Apart from alumina and pulp and paper, the demand is fragmented and widely dispersed and is met through trade channels
- Going forward, the demand is expected to remain Stable with the soaps and detergents segment demand remaining stable, while the uptick in the paper and pulp and textile industries will support the offtake.

# Capacity and production of caustic soda

Exhibit: Caustic soda capacity and production trend



- The chloro-alkali Industry in India has 35 operating units in the country with a combined capacity of 4.8 million tons per annum of caustic soda of which the top four players account for 62% of the total installed capacity. Overall, Gujarat accounts for more than half of the total installed capacity for caustic soda owing to the chemical industry's presence
- Capacity utilisation in FY2021 was nearly 75% which is projected to increase to around 82% in FY2025
- Some of the key players expanding capacity include Gujarat Alkalies and Chemicals expanding its capacity from 520,000 MTPA to around 900,000 MTPA by the end of year CY2022, Tamil Nadu Petroproduct Limited increasing its capacity from 150 tonnes per day (TPD) to 250 TPD, Grasim increasing its capacity to 1530 KTPA by CY2024 from 1264 KTPA as of now and DCM Shriram increasing its caustic capacity at Bharuch by 850TPD and flakes capacity by 600TPD in CY2022

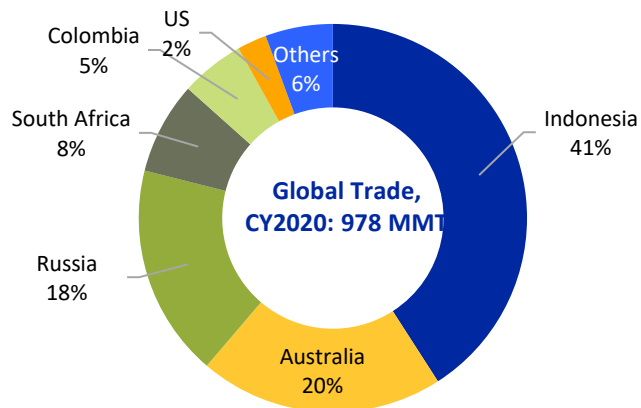
Source: Industry, ICRA Research

# Capacity of key players

Key Players	Capacity as on March 31, 2022 (MTPA)	Expansion planned over next 2 years (MTPA)	Estimated capacity as on March 31, 2024 (MTPA)	ICRA Ratings outstanding
Grasim Industries Ltd.	1,290,000	240,000	1,530,000	[ICRA]AAA (Stable)/ [ICRA]A1+
Gujarat Alkalies & Chemicals Ltd.	520,000	380,000	900,000	Not rated
DCM Shriram	445,500	280,500	726,000	[ICRA]AA+ (Stable)/ [ICRA]A1+
Nirma limited	188,100	-	188,100	[ICRA]AA (Stable)/ [ICRA]A1+
The Andhra Sugars Ltd.	165,000	33,000	198,000	[ICRA]A+ (Stable)/ [ICRA]A1+
Gujarat Fluorochemicals Limited	138,450	-	138,450	Not rated
Punjab Alkalies & Chemicals Ltd.	99,000	66,000	165,000	Not rated
Lords Chloro Alkali Ltd.	70,620	28,380	99,000	[ICRA]BBB (Stable)
The Travancore-Cochin Chemicals Ltd.	60,450	13,800	74,250	[ICRA]BB+ (Stable)/ [ICRA]A4+
Tamil Nadu Petroproducts Limited	49,500	33,000	82,500	Not rated

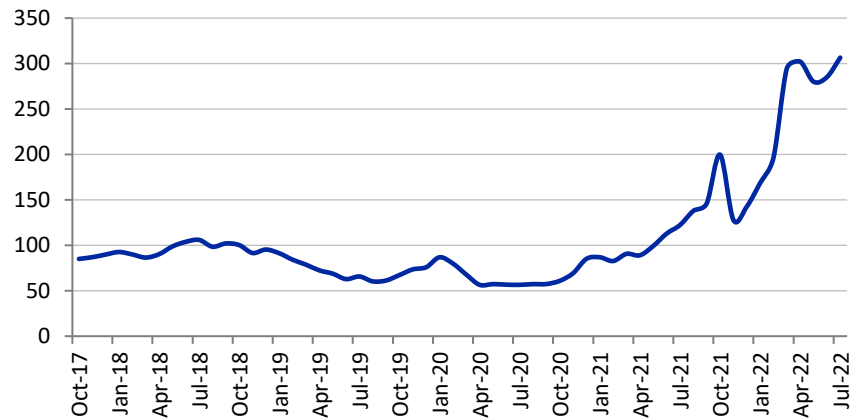
# Russia a major exporter of coal; prices spike amid geo-political tensions

Exhibit: Share of Russia in global coal trade



Source : EIA, ICRA Research

Exhibit: Trend in India's Coal Imports price (South African Coal – USD/tonne)



Source : CMIE, ICRA Research

- Russia is the third-largest exporter of coal, accounting for ~18% of global trade, with China, South Korea and Japan being the major trade partners
- With major Russian banks being excluded from the Society for Worldwide Interbank Financial Telecommunications (SWIFT) system, coal sales have come to a halt
- Prices have spiked sharply since the start of Russia's invasion of Ukraine; unless alternative payment channels are set up for payment in local currencies, coal prices may remain firm
- India's dependence on Russian coal was low at around 3% of India's total coal imports. The imports of Russian coal to India have increased significantly in Q1 FY2023 with traders offering significant discounts and accepting rupee payments.

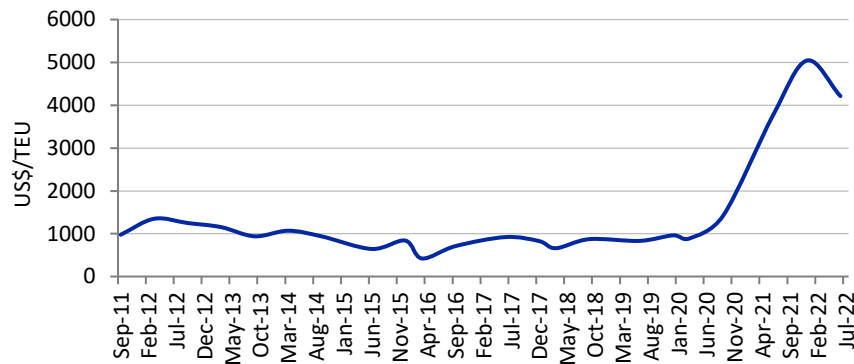
- Chlorine is mainly used in the production of epoxy products, vinyls, chlorinated organics and disinfectants.
- Globally about 38% of the chlorine is consumed for vinyl (ethylene dichloride, vinyl chloride and poly-vinyl chloride) against just 8% in India. PVC is the single biggest consumer of chlorine globally.
- Uses such as chlorinated paraffin wax, organic & inorganic chemicals, and chloromethanes account for bulk of the demand in India.
- The domestic industry converts a significant portion of its chlorine to low value hydrochloric acid
- Some of the new uses of chlorine are in electric vehicles (Polyurethane seating & parts, battery casings, printed circuit board systems), new generation refrigerants, renewable energy and battery storage (resins, silicone, polysilicon, performance coatings)
- Indian companies are adding capacities of products that use chlorine such as epichlorohydrin, aluminum chloride etc. while expanding caustic soda capacities
- Capacity enhancements in India are also aided by increasing the size of the domestic specialty chemicals industry (dyes and pigments, agrochemicals etc).
- The specialty chemicals industry has been growing owing to the China+1 strategy adopted by several global companies following the outbreak of Covid-19



- Close to 40% of the hydrogen produced is captively used as a fuel in boilers and about 30% is converted to hydrochloric acid
- Higher value is obtained for only the remaining 30% by production of chemicals such as hydrogen peroxide or by sale to third parties for use in hydrogenation plants

# Caustic soda prices firm up with rise in energy costs and elevated freight rates

Exhibit: Trend in containerized cargo freight rates



Source : Bloomberg, ICRA Research

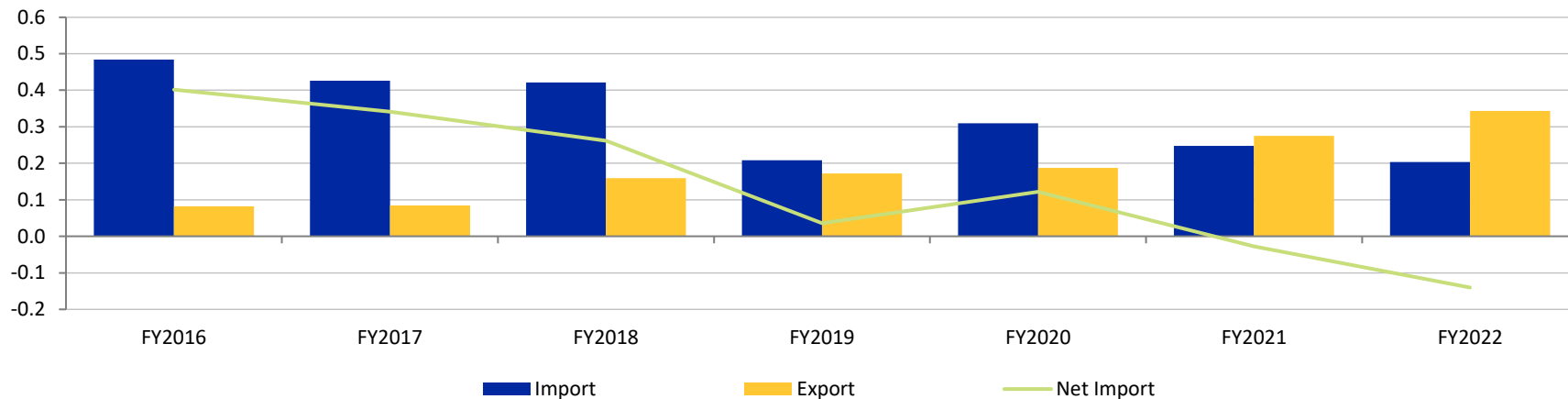
Exhibit: Trend in international caustic soda prices (South-East Asia)



Source : Bloomberg, ICRA Research

- Containerised freight rates have remained elevated amid a strong demand, while dry bulk cargo freight rates have dropped sharply due to lower iron ore demand from China
- Caustic soda prices have risen to around \$770-800/MT in South-East Asia amid the rise in energy costs and elevated freight rates
- Freight rates are expected to remain elevated amid supply management by liners and a steep rise in crude oil prices which may provide tailwinds to the ECU realisation of domestic manufacturers

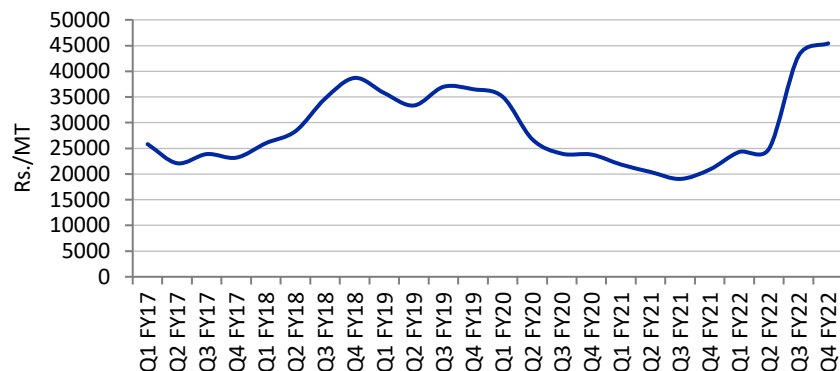
Exhibit : Trend in import and export of caustic soda in India (in MMT)



- Indian caustic soda players have started exporting caustic soda to the Middle East as well as European countries and the exports have surpassed imports, aiding the capacity utilisation of the Indian manufacturers. Permanent and temporary shutdown of plants in Europe and the US supported the export.
- Japan has been the dominant supplier of caustic soda to India, largely due to its FTA with India, which enables caustic soda to come in at concessional basic customs duty. Imports also met a large part of the demand of the alumina industry located on the East Coast of the country.
- ADD existed on imports from China and South Korea, which lapsed in November, 2020. The industry has been lobbying to impose ADDs on imports from Japan, the UAE, Iran and Qatar. Some non-tariff measures have also helped to reduce imports, which are now restricted to membrane-grade products. Additionally, certification by the Bureau of Indian Standards is needed for any importer who wishes to sell in the domestic market.

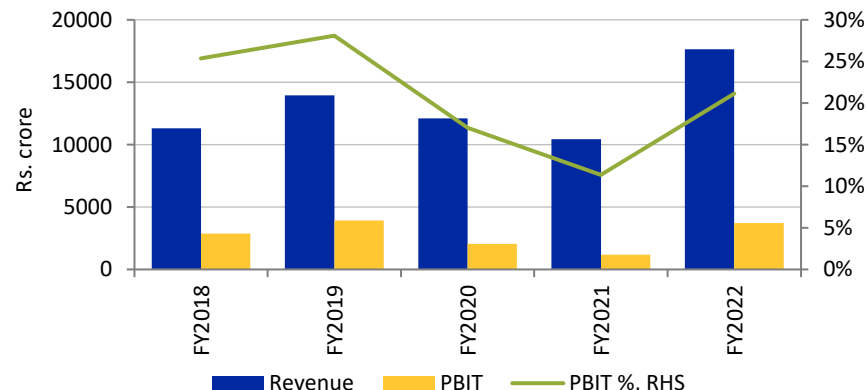
# ECU realisations to remain firm amid elevated caustic soda prices

Exhibit : Trend in ECU realisation for caustic soda players



Source: Industry, ICRA Research; Note: ECU realisation is the realisation earned is weighted average of caustic soda and all the by products i.e., Chlorine, Hydrogen. ECU=Ex-Factory Caustic soda price+0.88\*Ex Factor price of Chlorine

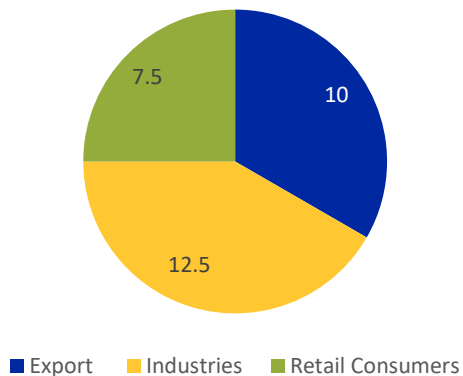
Exhibit : Trend in revenue and profitability for major CS players in India



Source: Company filings, ICRA Research

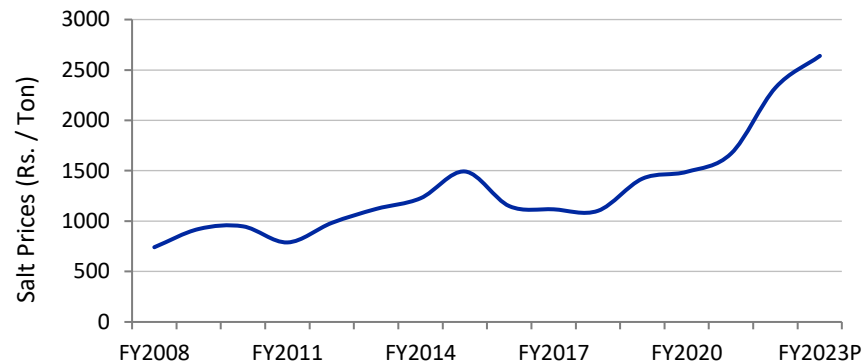
- ECU realisations firmed up in Q4 FY2022 due to rising energy prices; they are expected to remain firm amid elevated energy prices, healthy domestic demand and increasing exports to Europe.
- Chlorine realisations are often negative in the market which depress ECU realisations unlike in developed market where chlorine fetches higher realisations than caustic.
- Spike in coal prices will be a major headwind as power costs remain the major input for caustic soda production though the rise in caustic soda prices has tempered the impact of higher energy costs.
- Performance of caustic soda players is expected to remain healthy in FY2023 amid higher production and elevated caustic soda prices, particularly in H1 FY2023, although the gains will be limited by higher energy costs. Further, 1 MMT of capacity addition in next 12-18 months may impact capacity utilisation and domestic prices.

Exhibit: Salt Consumption in India In million tons



Source: ICRA Research

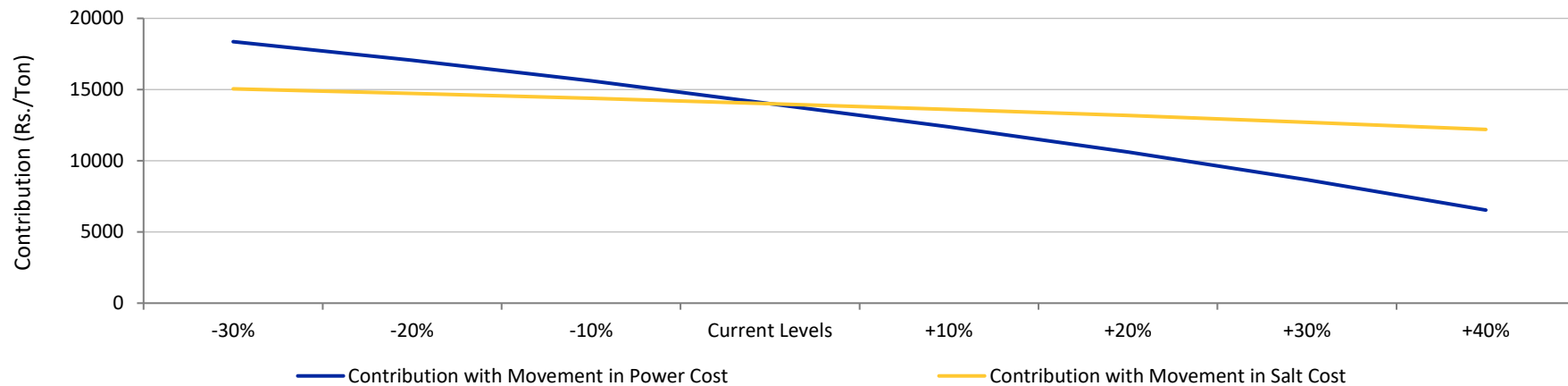
Exhibit: Salt Prices



Source: ICRA Research

- India produces 30 million tonne of salt every year from which Gujarat has a share of 80%. Rajasthan is the second largest producer of salt with a share of about 10%, followed by Tamil Nadu, Andhra Pradesh, Maharashtra, Odisha and Himachal Pradesh.
- In Himachal and Rajasthan, salt is harvested by mining, while in other states, including Gujarat, salt is produced through a solar-evaporation process of sea water. Around 90% of the salt in India is produced through the solar evaporation process which is seasonal.
- Companies have been taking stakes in salt producers to secure supplies of salt

**Exhibit: Impact of salt and power costs on contribution margins**



- Rising coal prices have resulted in elevated power generation costs for players with captive power plants
- Players are shifting towards procurement of grid power along with other sources of cheap power like renewable, resulting in lower plant load factors for their captive plants



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