

HAARTZ ORGANICS PVT LTD

*A STUDY ON BROMINE MARKET TREND ANALYSIS AND
REGULATORY ENVIRONMENT IN INDIA.*

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INTRODUCTION

The global bromine market has witnessed steady growth over the years due to its diverse applications across multiple industries. Bromine and its compounds find uses in sectors such as flame retardants, oil and gas drilling fluids, water treatment, pharmaceuticals, agriculture, and electronics.

The global bromine market size reached US\$ 3.3 Billion in 2022. Looking forward, IMARC Group expects the market to reach US\$ 4.3 Billion by 2028, exhibiting a growth rate (CAGR) of 4.2% during 2023-2028.

OBJECTIVES

- To understand the bromine market size
- To identify the trends in bromine and its application
- Determining opportunities in the industry
- Understand the demand trends
- Understand the regulatory framework from bromine
- Find the process of getting authorizations and licenses from authorities
- Understand the checklists of PCCs

METHODOLOGY

- Research Design- Observational Type- Analytical and geographical
- Setting: This study would be secondary, focusing on obtaining data from already-existing surveys, legal papers, reports, regulatory documents, and recommendations. The data provided by CPCB & MPCB guidelines are also key sources of data.
- Study Population- Business leaders, industrial professionals of my company, and members of pollution control boards.
- Data analysis plan- which includes using Google Analytics and Microsoft technologies to analyse reports and surveys.

SWOT

- **Strengths- Demand for flame retardants is rising in the textile, consumer goods, and electronics industries.-** By delaying combustion and creating a layer of free radicals, brominated flame retardants keep fires at bay. Either carbon dioxide is released, or free radicals interact with oxygen molecules. thereby halting oxidation. Flame retardants are often utilised in construction materials, furniture, textiles, electronics, and other products.
- **Weaknesses- emergence of flame retardants without halogens-** Brominated flame retardants have been negatively impacted by potential environmental and health risks. With the introduction of stricter environmental, health, and fire restrictions, certain nations have outlawed the use of bromine in electronics and textile applications. Bromine flame retardants now have a sustainable substitute in the form of non-halogenated flame retardants. These alternatives could eventually be a challenge to the expansion of the bromine industry.

SWOT

- **Opportunities- Increasing the use of bromine in flow batteries is an opportunity-** Batteries made of bromine can be less expensive than lithium-ion ones. Batteries made of bromine are reliable and stable throughout time and do not deteriorate. Lithium batteries store energy in the electro codes, whereas bromine flow batteries store energy as a liquid in separate tanks. Hydrogen-bromine flow batteries are employed as dependable energy storage solutions in a variety of sectors across the world.They are a dependable source of sustainable power for large-scale industrial units.
- **Threats- Profound price volatility for oil and gas-** One of the main ways that bromine stabilises high-pressure oil wells is in oil and gas drilling. Bromine use in the oil and gas sector has reduced as a result of the decline in demand. In addition, OPEC members have declared that low demand necessitates a reduction in oil output, which will halt new site discovery and oil and gas drilling.

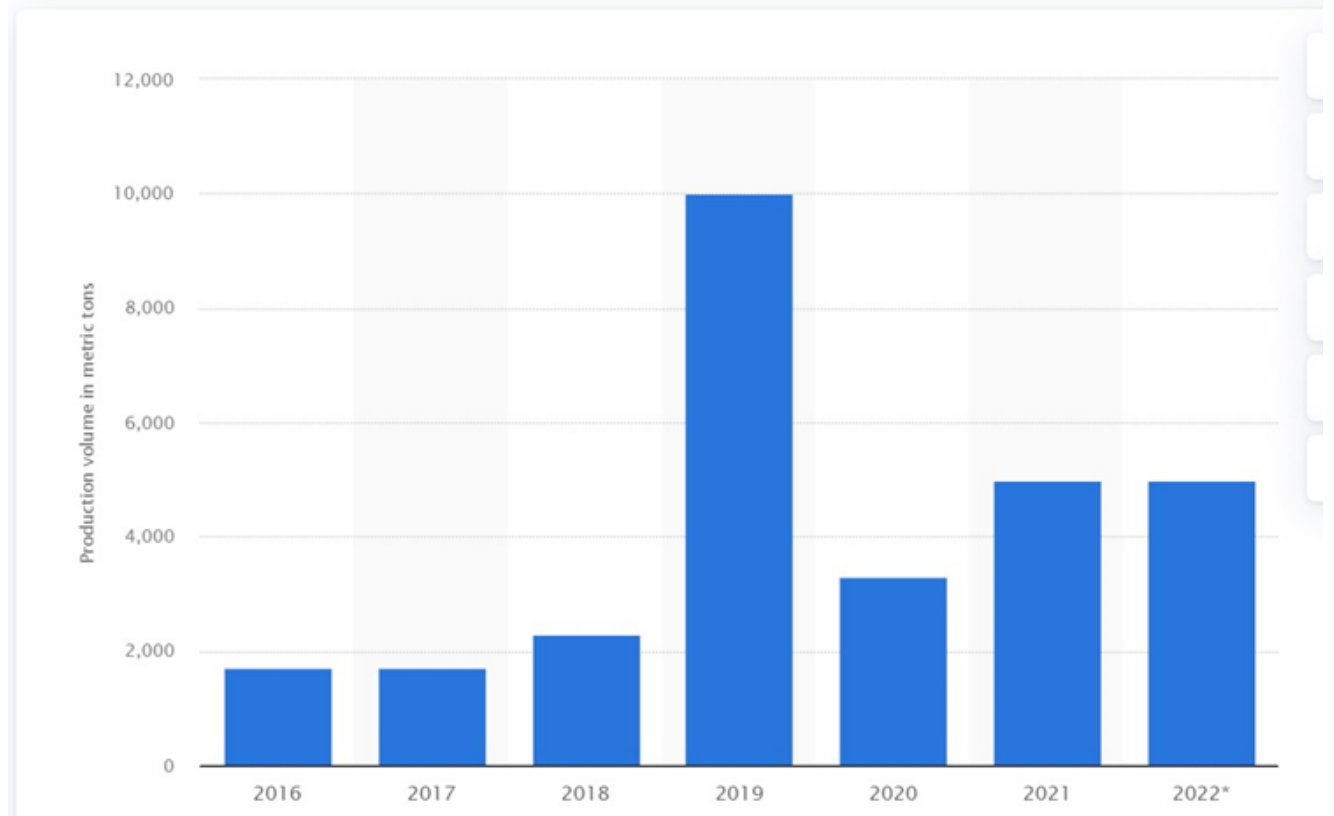
RESULTS

- Globally Bromine market stood at USD 3.3 Billion in the year 2022 and it has expected to reach USD 4.3 Billion by the year 2028 at a CAGR 4.2
- The Indian bromine market stood at USD 450 Million in 2022 with a CAGR of 8%
- There is big opportunity for india.

PRODUCTION IN INDIA

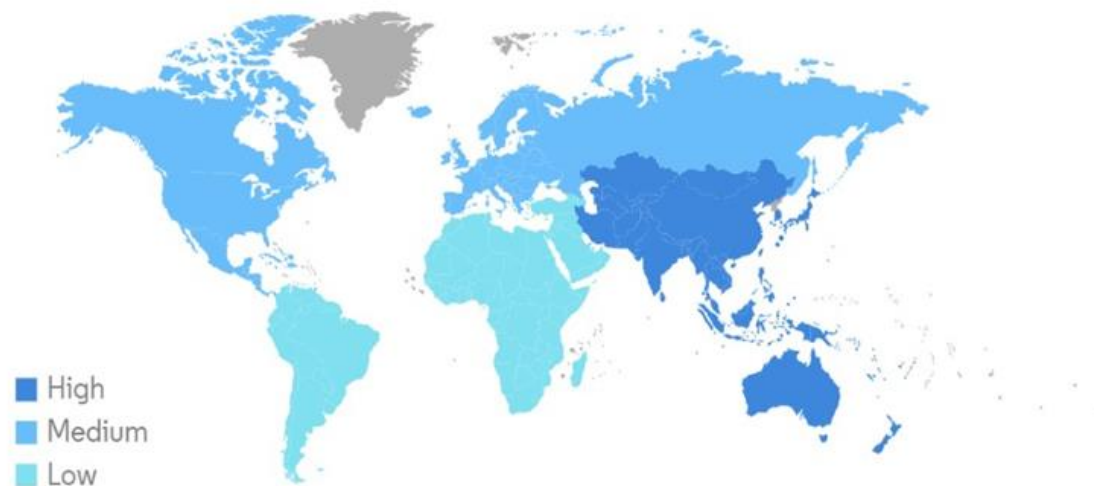
The above graph showcases that how there is consistent growth in the production of bromine by volume from the year 2016 to 2022 and in 2019 right before covid there was a sudden high surge in the production and from 2020 to 2022 due to covid the production fell but started gaining momentum again.

Production volume of bromine in India from 2016 to 2022
(in metric tons)



MARKET BY REGION

Bromine Market - Growth Rate by Region, 2023-2028

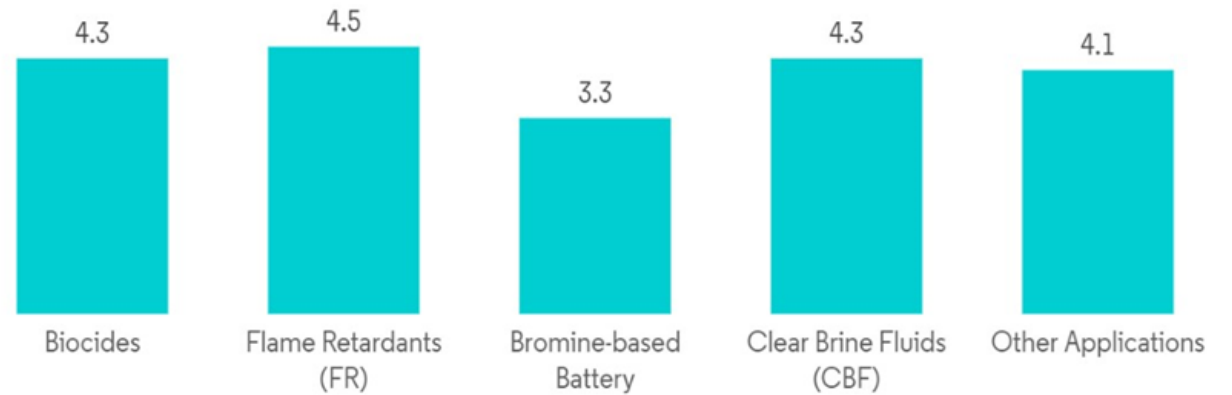


The above image indicates the growth rate of bromine market by region we can see that there is high growth rate in the emerging Asian market such as India and China also the Asia-pacific region of Australia has higher growth rates than developed markets like USA and Europe.

GROWTH BY APPLICATION

- The global bromine markets by its application and its CAGR from 2023-2028 forecast can be indicated in the above graph.
- Biocides and clear brine fluids tie at 4.3% growth.
- Flame retardants maintains its highest growth application in bromine segment at 4.5% growth.
- Bromine based battery is at the lowest, while other applications stood at 4.1%.

Bromine Market, CAGR (%), by Application, Global, 2023-2028



BROMINE-BASED BATTERY

The most unique application being the bromine-based battery, A zinc-bromine battery is a type of rechargeable battery that generates electricity through the interaction of zinc metal with bromine in the presence of an electrolyte made of an aqueous solution of zinc bromide. For stationary power applications, ranging from home to grid-scale, it is being explored as a substitute for lithium-ion batteries. In comparison to lithium-ion battery systems, the water-based electrolyte makes the battery system less prone to overheating and fire.

The global market for zinc-bromine batteries should grow from \$37.0 billion in 2021 to \$115.9 billion by 2026, at a compound annual growth rate (CAGR) of 25.6% for the period of 2021-2026.

MARKET TRENDS

Demand for Flame Retardants is rising.

- Because it effectively puts out flames, bromine is frequently used as a component in flame retardants.
- There are over 80 distinct varieties of brominated flame retardants (BFRs) on the market, each with a unique set of chemical characteristics. Brominated bisphenols, diphenyl ethers, cyclododecanes, phenols, phenoxy ethanes, and derivatives of phthalic acid are a few of these.
- To prevent or delay the spread of fire, brominated flame retardants are also utilised in commercial and industrial contexts, such as in furniture, textiles, building, electrical, etc.

MARKET TRENDS

China has a high demand for bromine.

- China, along with Israel, Jordan, and the US, is one of the top producers of bromine. The main use of bromine in China is for flame retardants. According to the most recent study released by the US Geological Survey (USGS) in January 2022, the anticipated bromine output in China for 2021 was 75,000 tonnes.
- Because of the expanding electric car industry in the area, China is one of the key markets for zinc-bromine flow batteries. According to the China Association of Automobile Manufacturing, from December 2021 to December 2022, the nation produced 96.9% more new energy cars.

**STANDARD OPERATING PROCEDURES ACCORDING TO MPCB
FOR BROMINE PLANT OF HAZARDOUS WASTE CATEGORY
NO- 28.1, 29.1 OF SCHEDULE-1**

Utilization Process:

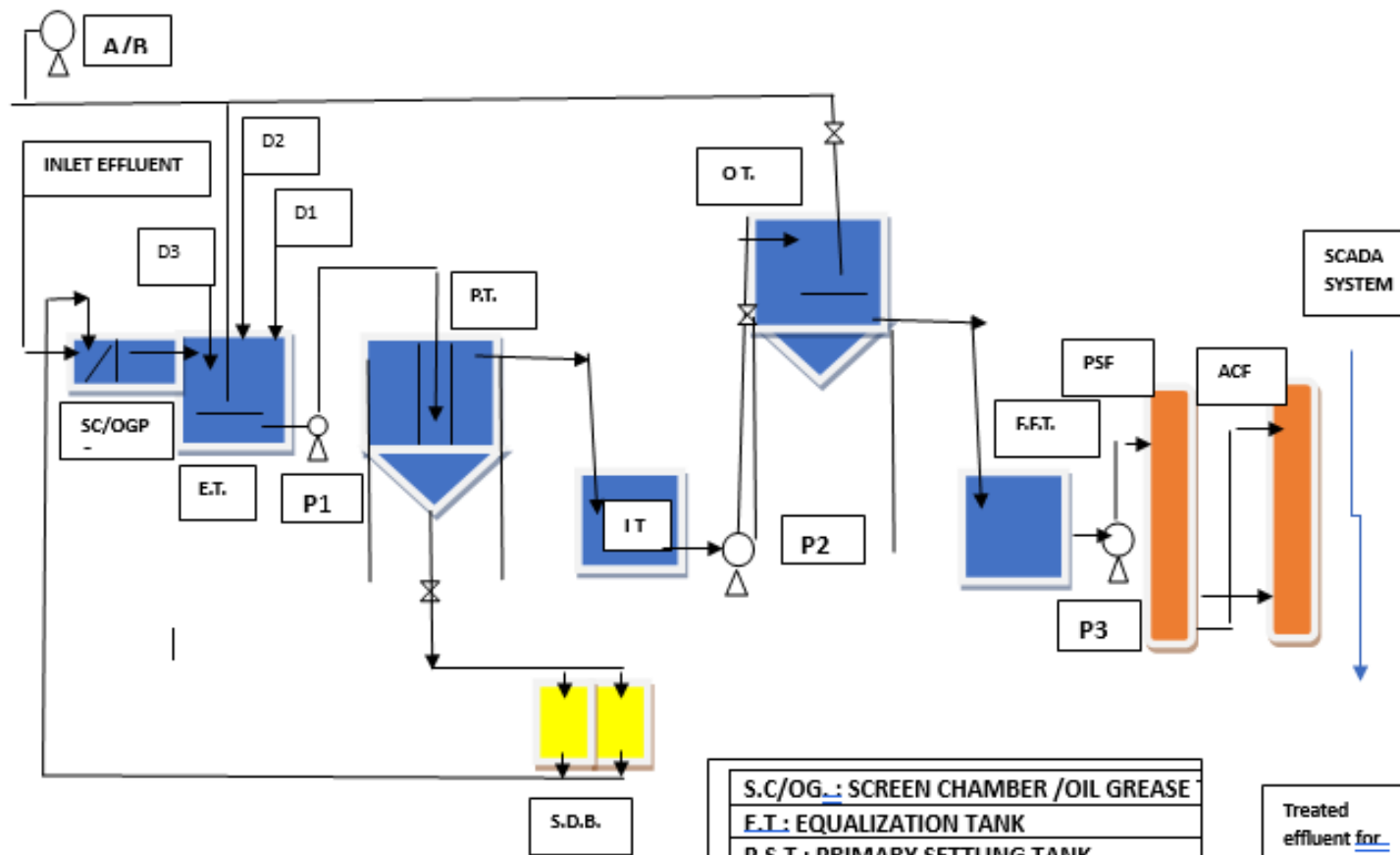
- - i. Spent Alkali Bromide, i.e. NaBr, KBr are first Concentrated at specific gravity and transferred to reactor.
 - ii. Then these are acidified in order to de-emulsify the organic impurities present in the waste, the impurities are as bottom residue collected in drums and stored for disposal to CHWTSDF
 - iii. Acidified bromide is fed to packed stripping column where chlorine gas and steam are passed from beneath the column.
 - iv. Chlorine reacts with alkali and liberate bromine as vapours by using steam.
 - v. Vaporised bromine is condensed to get crude bromine liquid. The acidic effluent generated from the reaction column is sent to ETP.
 - vi. Crude bromide is further distilled to remove traces of impurities and chlorine. Recovered chlorine is reused in stripping column.
 - vii. Bromine is again passed through sulphuric acid for removal of moisture and is re-boiled for drying (moisture removal)
 - viii. Pure bromine is bottled in amber bottles and also collected in drums.
 - ix. The impurities are collected and stored for disposal to CHWTSDF.

CHECKLIST OF MINIMAL REQUISITE FACILITIES BY CPCB

- Storage tank(s) of adequate capacity to store spent
- Alkali bromide of at least two weeks requirement.
- Storage tank (s) shall be placed above the ground and contained with low raise parapet/bund wall with slope to collect slippages, if any, into collection pit.
- Alternatively, storage tanks may provide with HDPE liner system beneath the tank and leachate collection system below HDPE liner.
- Cool dry, well ventilated coverage shortage sheds for spent alkali bromide and spent acidic bromide tanks within premises.
- Mechanised systems for transfer of spent alkali bromide and spent acidic bromide from tanker to storage tank and storage tank to each unit operation
- The process unit shall have proper ventilation (preferably with ventilation ducts above the process units connected to ID fan with exhaust above roof level)
- Acidification reactor
- Stripping column
- Distillation Column
- Filter Press
- Cooling tower

MINIMAL CHECKLIST CONTINUED

- Boiler operated electrically or by fuel as permitted by the concerned SPCB/PCC depending upon type of fuel, suitable air pollution control devices shall be installed with the boiler followed by stack of height as prescribed by the concerned SPCB/PCC.
- Adequate effluent treatment plant followed by suitable treatment to meet inlet norms of CETP, through technologies like advanced Oxidation Process (AOP) or Reverse Osmosis (RO) or Multi Effect Evaporator (MEE). In case, CETP is not available zero discharge conditions as prescribed by the concerned SPCB/PCC shall we meet.
- Stack to have sampling port, platform, access to the platform, etc, as per the guidelines on the methodologies for source emission monitoring publishes by CPCB under laboratory analysis techniques LATS/80/2013-14
- Dedicated hazardous waste storage area for temporary storage of hazardous waste generated during utilization process.



<u>S.C/OG.</u> : SCREEN CHAMBER /OIL GREASE
<u>E.T.</u> : EQUALIZATION TANK
<u>P.S.T.</u> : PRIMARY SETTLING TANK
<u>I.T.</u> INTERMITANT TANK
<u>F.F.T.</u> : FILTER FEED TANK
<u>S.D.B.</u> : SLUDGE DRYING BEDS
<u>P.S.F.</u> : PRESSURE SAND FILTER
<u>A.C.F.</u> : ACTIVATED CARBON FILTER
<u>P1</u> : EFFLUENT TRANSFER PUMP
<u>P2</u> :SLUDGE RETURN PUMP
<u>P3</u> : FILTER FEED PUMP
<u>D1/D2/D3/D4</u> : CHEMICAL DOSING TANKS
<u>A/R.</u> : AIR BLOWER
<u>O T</u> " <u>Oxidation</u> Tank
<u>D1/D2/D3/D4</u> : CHEMICAL DOSING TANKS

Treated
effluent for
Gardline

EFFLUENT TREATMENT PLANT

TREATED EFFLUENT PARAMETERS BY CETP

PARAMETERS	CETP INTEL STANDARDS
Chemical oxygen demand (COD)	3500 ppm
Total suspended solids (TSS)	100 ppm
Total acid number (TAN)	50 ppm
Total kjeldahl Nitrogen (TKN)	50 ppm
Total Dissolved Solids (TDS)	2100 ppm

AUTHORIZATION MEETINGS

In order to get new approval or renewal for consent to operate industries must apply for it with MPCB and they must attend the authorization meeting where they must prove their plant is up to date with regulations and built with the SOP guidelines from MPCB AND CPCB and they have provisions for wastewater treatment and waste management to get approval to manufacture.

Thank You