



Bromine-based Products for Mercury Emissions Reduction






Chemtura Corporation of Today

- Global specialty chemical company listed on the New York Stock Exchange (“CHMT”)
- Major markets served are energy & electronics, transportation, and agriculture
- Committed to global sustainability and engineering chemical solutions that meet our customers’ evolving needs
- More than 4,300 employees worldwide
- Manufactures in 31 countries and sells products in over 100 countries
- Global headquarters in Philadelphia, Pennsylvania
- Regional headquarters and shared service centers in Sao Paulo, Brazil; Shanghai, China; Middlebury, Connecticut; and Manchester, United Kingdom



Chemtura's Leading Industry Positions

| Operating Segments | Business Segments | Industry Positions/Commentaries |
|---------------------------------|---|--|
| Industrial Performance Products | Petroleum Additives | <ul style="list-style-type: none"> ◆ Global manufacturer and marketer of high-performance additive components, building blocks for synthetic lubricant base-stocks ◆ World leader in high performing calcium sulfonate specialty greases and phosphate and polyol ester based fluids |
| | Urethanes | <ul style="list-style-type: none"> ◆ Global leader in the development and manufacture of hot cast elastomers |
| | Antioxidants & UV Stabilizer Specialties | <ul style="list-style-type: none"> ◆ One of the global leaders in development and production for polyolefin and other engineered plastics |
| Industrial Engineered Products |  | <ul style="list-style-type: none"> ◆ One of the three largest developers and manufacturers of bromine and bromine based-products |
| | Organometallics Specialties | <ul style="list-style-type: none"> ◆ One of the three largest developers and manufacturers of organometallic compounds, that have applications in catalysts, surface treatment and pharmaceuticals |
| Consumer Products |  | <ul style="list-style-type: none"> ◆ One of the two largest marketers/sellers of water treatment products used in pools/spas & consumer household cleaning products |
| Chemtura AgroSolutions |  | <ul style="list-style-type: none"> ◆ Leading niche developer and manufacturer of seed treatments, fungicides, miticides, insecticides, growth regulants and herbicides |

Great Lakes Solutions, A Bromine Leader

❖ Positioned to Develop and Support Growth in Energy and Electronics Segments

For close to a century, we have helped our customers meet their needs with a broad portfolio of products and solutions. We manufacture and market flame retardants, bromine and brominated derivatives.



| Key Products | Key End-Use Markets |
|--|--|
| <ul style="list-style-type: none">◆ Bromine & Derivatives◆ Flame Retardants | <ul style="list-style-type: none">◆ Clean Energy◆ Electronics◆ Building & Construction◆ Oilfields◆ Agriculture◆ Pharmaceuticals◆ Catalyst for Polymer Production |

Key Drivers for Growth:

- Mercury control regulation
- Greener innovation
- Flame retarded energy efficient thermal insulation
- Increased global fire safety standards



Global Presence

With sales, technology and manufacturing on three continents, we are truly a global business strategically positioned for regional growth



Our Access to Bromine

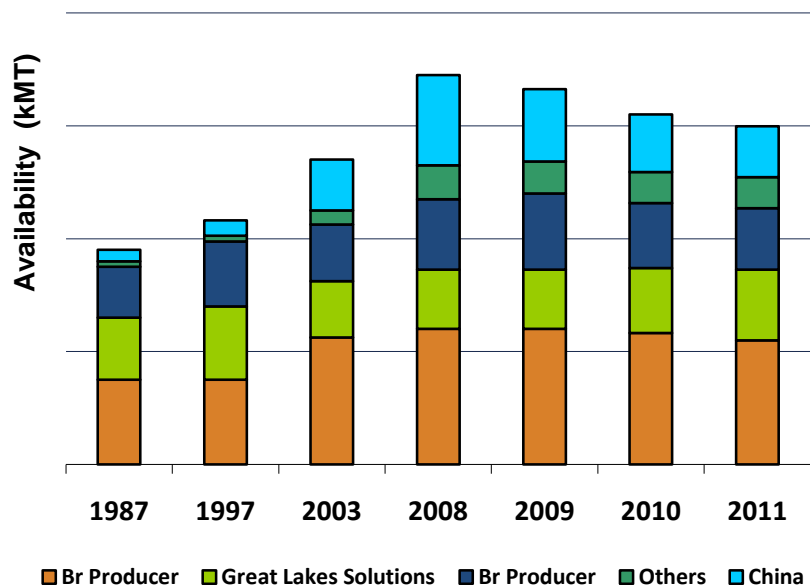
Building on U.S. strength for global regulatory expansion



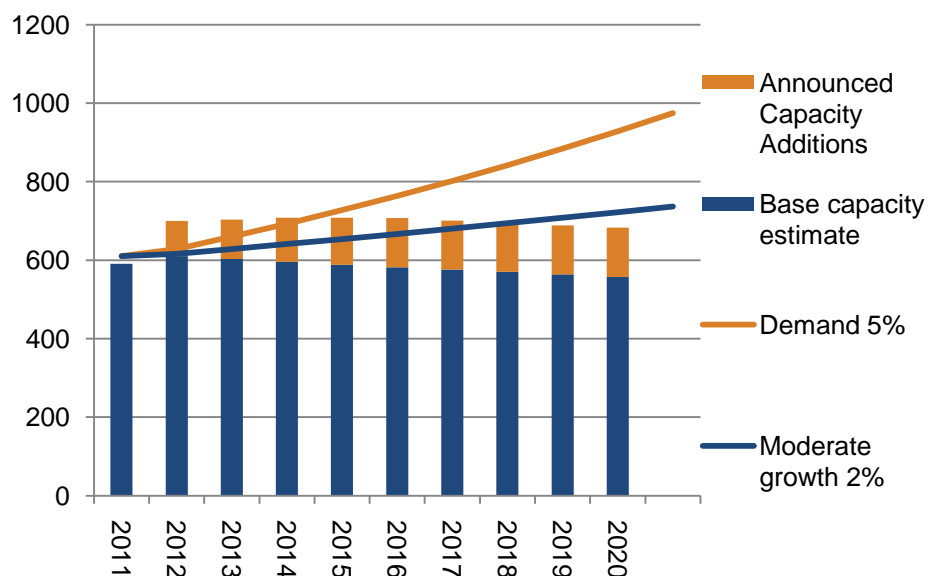
Bromine Industry Dynamics:

Global bromine availability and investment a key priority for many years

Global Bromine Availability



Global Supply and Demand

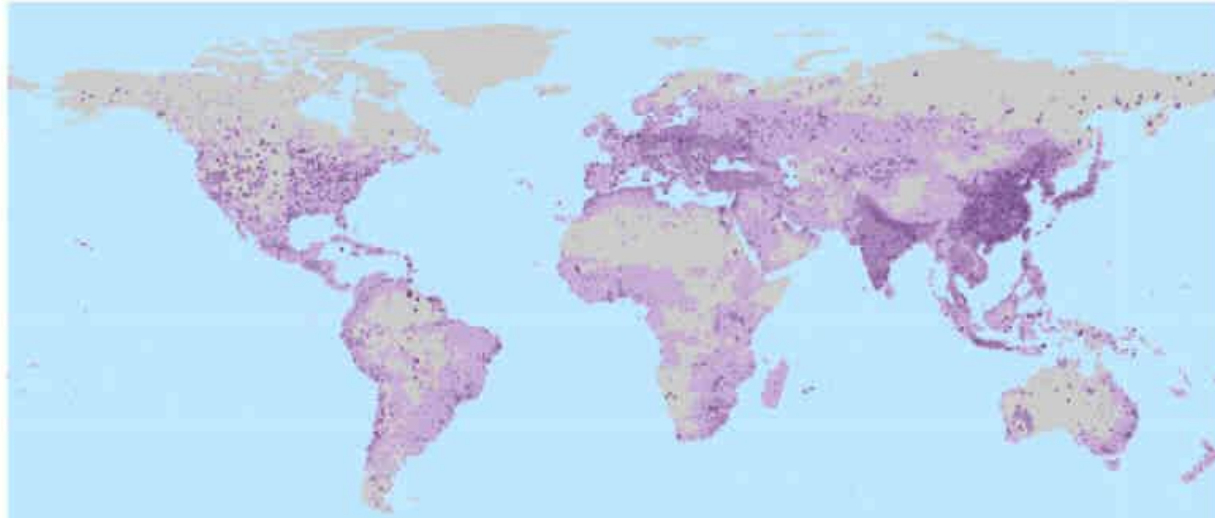
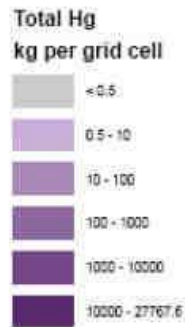


Key Drivers:

- China Bromine Depletion
- Flame Retardant Demand Recovery
- Gulf of Mexico Clear Brine Fluids Recovery
- Mercury Control Growth

Global bromine availability will be tight for many years to come. The industry will keep up with demand, but it will require investment.

Leadership in Mercury Control



GLOBAL DISTRIBUTION OF ANTHROPOGENIC MERCURY EMISSIONS TO AIR IN 2005

Source: [United Nations Environment Programme Global Atmospheric Mercury Assessment: Sources, Emissions and Transport](#), 2008, using 2005 data, as presented by the Arctic Monitoring and Assessment Programme Secretariat

- Largest emission densities: U.S., India, China and various locations in Europe
- International Mercury regulations directed by United Nations Environment Programme (UNEP)
- Great Lakes Solutions is the only Bromine producer to be a member of the UNEP Global Mercury Partnership Group

Great Lakes Solutions: GeoBrom™

Mercury Control for a Cleaner, Greener Future

- Coal-fired boiler operations striving to reduce mercury emissions to meet federal clean air regulations can rely on Great Lakes Solutions GeoBrom™ product line for a U.S. supply of brominated products for mercury control.
- Our proven commitment as a global, sustainable supplier in the United States includes more than \$100 million of American infrastructure investment, with an additional \$170 million planned for 2013-2015, along with an experienced organization able to provide superior customer support.



Our Portfolio has a Product for Every Technology

GeoBrom™ HG 520

- *Calcium Bromide solution (52% by weight aqueous product)*

GeoBrom™ HG 52S

- *Calcium Bromide dry powder product*

GeoBrom™ HG 400

- *Sodium Bromide solution (40% by weight aqueous product)*

GeoBrom™ HG 40S

- *Sodium Bromide dry powder product*

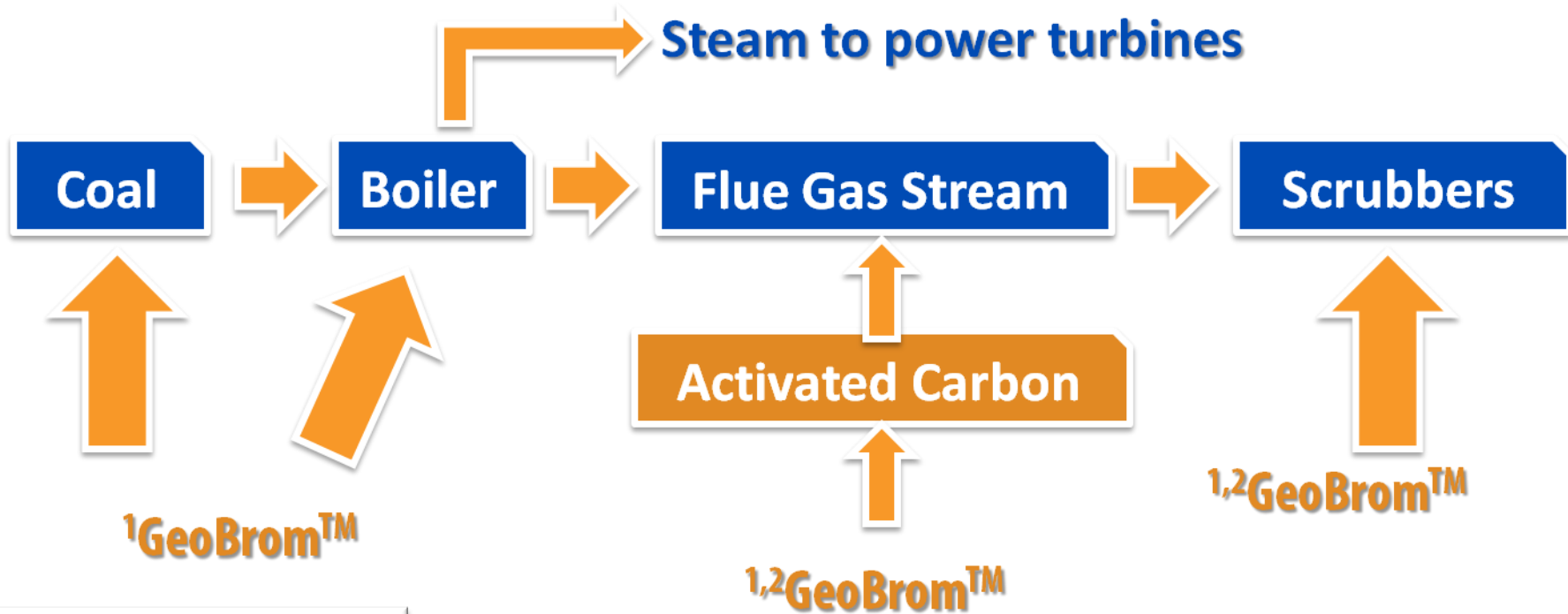
GeoBrom™ HG 480

- *Hydrobromic Acid (48% by weight aqueous product)*

Other Bromine Derivative products available

- *Other concentrations of Sodium Bromide solutions, inorganic bromides*

GeoBrom™ Performs in All Mercury Control Technologies



Calcium Bromide

1GeoBrom™ 520
1GeoBrom™ 52S

Sodium Bromide

2GeoBrom™ 400
2GeoBrom™ 40S

Effective in the boiler, on activated carbon products, and in other downstream addition technologies

Why is GeoBrom™ a Good Option?

- **Full product range of brominated derivative products for all proven technologies**
- **Added to pulverized coal, the combustion chamber, or the flue gas stream**
- **Does not cause increased boiler corrosion**
- **Effective enhancement for Hg removal with all APC Devices**
- **Can be used alone or with Sorbents for capture**
- **Economical solution for mercury control**
- **Does not negatively influence fly ash sales**
- **Sustainable, secure supply and part of a full customer solution package from a financially secure supplier**
- **Effective mode of introducing bromine to activated carbon products**

GeoBrom™ is Versatile & Effective

Brominated Technologies: Most Successful and Most Widely Used

| Technology | Mercury Control% | Preferred Coal Type | Comments |
|------------------------------------|------------------|------------------------|---|
| Activated Carbon | 40-80 | Bituminous | Limited by mercury oxidation; fly ash impacts for resale; particulate control required |
| Br Activated Carbon | 60-95 | Sub-bituminous Lignite | Issues with SO ₃ impacts; fly ash Impacts for resale; particulate control required |
| Nalco ³ CaBr | 75-95 | Sub-bituminous Lignite | Scrubber or particulate control required |
| Alstom ² (Vosteen) CaBr | 75-95 | Sub-bituminous Lignite | Scrubber or particulate control required |
| Chem Mod ¹ CaBr | 75-95 | Sub-bituminous Lignite | Scrubber or particulate control required |
| 48% HBr | 80-90+ | Sub-bituminous Lignite | Dry sorbent injection; particulate control required |
| Other Br Sorbents | 50-75 | Bituminous | Particulate control required |
| Sulfur Technology | 50-75 | Bituminous | Scrubber technology |
| Dry Sorbent Injection | Co-benefit | Bituminous | Particulate control required |

¹<http://www.chem-mod.com/results/current-results.html>

² Pearson, T.E., Air Quality VIII Conference, 10/24/27/2012, Arlington, VA

³Reference: Nalco Case Study CH-980

⁴ GeoBrom™ is intended for general mercury control application. Great Lakes Solutions does not endorse any particular emission control technology. Please consult your technology provider regarding proper application and technology rights.

The GeoBrom™ product line has been demonstrated in all three major calcium bromide technologies at commercial scale and is approved for use in manufacture of brominated sorbents

Great Lakes Solutions

We Build Customer/Partner Relationships

▪ Domestic supply

- Great Lakes Solutions has the strongest U.S. bromine position
- Secure, established U.S. operations
- More than \$100M in investments 2009-2011 in the U.S., and plans for another \$170M in the future

▪ Supply Security and Sustainability

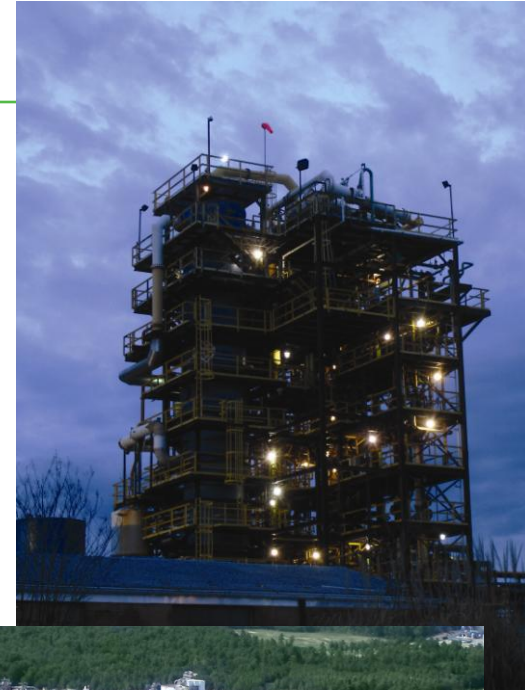
- Multiple carrier options
- Inventory in multiple strategic locations
- Three U.S. bromine plants, two additional bromine sources
- Multiple sources for calcium bromide plants in the U.S.

▪ Expertise with CaBr and NaBr Products

- Equipment and training
- Handling and technical support
- More than 30 years experience handling tens of thousands of tons/year

▪ Flexibility and Customization of Solutions

- Ease of order process
- Delivery accommodation
- Logistics and product support for test trials
- Flexibility with logistics
- Product expertise to support customer facilities
- Customer service - assigned representatives for each customer
- Ability to support site specific storage where required
- Broad package range: drums to bulk in trucks and railcars



We will be here for you for the long haul...

The Value of GeoBrom™ and Great Lakes Solutions for Mercury Control

GeoBrom™ products have been designed for incorporation into new technologies that use bromine or brominated derivatives products for the efficient reduction of toxic mercury emission from coal-fired boilers and power plant installations.

The GeoBrom™ product line provides sustainable, secure, U.S. manufactured brominated products for mercury control by a company with proven ability to solve complex customer logistical challenges and requirements.

- **Effective and proven at commercial scale in technologies**
- **Reliable U.S. supply**
- **Cost-effective solutions for mercury control**
- **Flexibility to meet customer needs**
- **Customer support and creativity for all facets of the order and delivery process**

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