

Gas-Phase Bromination for Cost-Effective Mercury Control

Albemarle Mercury Control Division

451 Florida Street
Baton Rouge, LA 70801
Telephone: 800-535-3030
<http://www.albemarle.com>

Environmental Problem

Mercury becomes airborne as a pollutant when coal and other substances containing mercury are burned. As an air pollutant, it falls from the atmosphere into lakes and rivers where it enters the aquatic ecosystem and is ultimately consumed by fish. Studies have shown that brain damage can result in children and fetuses of mothers who eat mercury-tainted fish. In late 2000, the U.S. Environmental Protection Agency (EPA) officially determined that the regulation of mercury emissions from U.S. power plants is “both appropriate and necessary.”

In March 2005, EPA directed coal-fired power plants to cap and reduce mercury emissions. For those plants without flue gas desulfurization—by far the largest segment of the market—the dominant control method is activated carbon injection. The most economical mercury control technology to retrofit onto these plants is the injection of brominated powdered activated carbon.

SBIR Technology Solution

With support from EPA’s Small Business Innovation Research (SBIR) Program and the U.S. Department of Energy, Albemarle Mercury Control Division

(formerly Sorbent Technologies Corporation, and hereafter referred to as Albemarle) developed gas-phase bromination, a proprietary treatment, for powdered activated carbons that can increase cost-effectiveness for mercury control significantly when compared to non-brominated powdered activated carbon. Albemarle’s gas-phase brominated powdered activated carbon, B-PAC™, also has demonstrated in several independent trials that it can reduce the cost of mercury compliance at power plants by 25% or more compared to competitive products. The equipment capital cost to utilize this technology is minimal when compared to other environmental equipment (e.g., scrubber, baghouses, and selective catalytic reduction).

Commercialization Information

B-PAC™, a brominated sorbent, has consistently demonstrated high mercury removal rates at low injection levels across a wide variety of coals and plant configurations. Albemarle has tested the injection of B-PAC™ into power plant flue gases for mercury removal at several power plants. These plants have burned bituminous, sub-bituminous, and lignite coals, as well as blends. Additionally, mercury removal has been tested with cold-side electrostatic precipitators (ESPs), hot-side ESPs, spray dryers, and fabric filters. Mercury removal performance at these sites has been observed to vary between 70% and 98%, at sorbent consumption costs of approximately \$2,000 to \$20,000 per pound of mercury removed, considerably less costly than previous technologies. B-PAC™ injection continues to be tested on an increasing number of full-scale, coal-fired power plant flue gas streams with similarly positive results.

In addition, the company has developed and commercialized C-PAC™, a Concrete-Friendly™ mercury sorbent for power plants that sell their fly ash

for concrete applications. The company also has developed and commercialized H-PAC™, mercury sorbent for utility and industrial plants with high temperature flue gas environments, such as hot-side ESPs.

The EPA SBIR award led to additional grants from the National Science Foundation (NSF), which led to the development of the aforementioned specialty mercury sorbents, C-PAC™ and H-PAC™.

Albemarle has scaled up its proprietary B-PAC™ brominated powdered activated carbon technology, demonstrating it at three coal-fired boiler sites. Data from a number of diverse power plant trials showed that simple B-PAC™ injection ahead of an existing particulate collector can be a comparatively inexpensive, yet effective mercury emission reduction strategy. With B-PAC™, high-performance, low-cost power plant mercury control and capture is now



B-PAC™ has consistently demonstrated high mercury removal rates at relatively low injection levels across a wide variety of coals and plant configurations.



commercially available. With minimal cost, Albemarle can use a mobile sorbent injection trailer to perform full-scale trials for utilities ahead of any permanent installations, allowing companies to “try before they buy.”

Company History and Awards

Albemarle is located in Baton Rouge, Louisiana, and has developed mercury capture from flue gas streams for many years. The company currently is one of only four companies that have demonstrated full-scale utility sorbent injection mercury control. The predecessor to Albemarle, Sorbent Technologies Corporation, completed the world’s first and only dedicated utility sorbent production plant in the summer of 2004. The achievements of Sorbent Technologies Corporation were recognized in 2004 when the company received a Bronze Medal Award from the Environmental Business Journal. In June 2008, Sorbent Technologies Corporation was awarded a 4.5-year, \$40.5 million contract from a major U.S. power generator to supply its proprietary brominated sorbents (PAC sorbents) to remove mercury from the flue gases of coal-fired power plants in the Midwest. Today, Albemarle continuously supplies several utility boilers with its proprietary brominated sorbents.

In July 2008, Albemarle Corporation, a specialty chemical company that provides innovative development, manufacturing, and clean energy products, acquired Sorbent Technologies Corporation. Albemarle Corporation has more than 3,400 customers

in 100+ countries and sells its products to consumer electronics, petroleum refining, packaging, construction, automotive, pharmaceutical, and agricultural end markets. Sorbent Technologies Corporation is now

conducting business as Albemarle Mercury Control Division to better reflect its commitment to environmental concerns through providing broader and expanded options for mercury emissions control.

SBIR Impact

- EPA has directed operators of coal-fired power plants to capture and dramatically cut mercury emissions.
- Sorbent Technologies Corporation, the predecessor of Albemarle, developed an inexpensive, proprietary brominated powdered activated carbon sorbents (B-PAC™, C-PAC™ and H-PAC™) for mercury removal.
- B-PAC™ can reduce the cost of mercury compliance at power plants by 25% or more of that of competitive products.
- In June 2008, Sorbent Technologies Corporation was awarded a \$40.5 million contract from a major U.S. power generator to supply its proprietary sorbents to remove mercury from the flue gases of coal-fired power plants in the Midwest.
- In July 2008, Albemarle Corporation, a specialty chemicals provider with \$2.5 billion in revenues that year, acquired Sorbent Technologies Corporation. The company currently does business as Albemarle Mercury Control Division.

