

Gas-Phase Bromination for Cost-Effective Mercury Control

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Environmental Problem

Mercury becomes airborne as a pollutant when coal and other substances burn and falls from the atmosphere into lakes and rivers, where it is absorbed by microbes that are in turn eaten by fish. Mercury is especially damaging to the brains of developing fetuses and young children as a result of eating tainted fish. In late 2000, 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 reduce mercury emissions by almost 22% in the next 5 years. For those plants without flue gas desulfurization—by far the largest segment of the market—the dominant control method is expected to be activated carbon injection. The least expensive mercury control technology to retrofit onto these plants is the injection of a mercury-capturing sorbent material into the ductwork ahead of the plants’ particulate removal systems.

SBIR Technology Solution

With support from EPA’s SBIR Program and the U.S. Department of Energy, Sorbent Technologies Corporation developed an inexpensive, proprietary

treatment for powdered activated carbon sorbent-gas-phase bromination that increases its cost-effectiveness for mercury control by about 300%. Brominated powdered activated carbon (B-PAC™) can cut the cost of mercury compliance at power plants to approximately 25% of that of competitive products or technologies. Utility capital costs are virtually nil with the technology.

B-PAC™, a halogenated sorbent, has consistently demonstrated high mercury removal rates at relatively low injection levels across a wide variety of coals and configurations. Sorbent Technologies has tested the injection of B-PAC™ into power plant flue gases for mercury removal at seven different power plants. These plants have burned bituminous, subbituminous, lignite coals, and blends and include testing 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 lb of mercury removed, considerably less costly than previous technologies. B-PAC™ injection is now being tested on an increasing number of full-scale coal-fired power plant flue gas streams, all with similar positive results.

In addition, the company has developed a special version of its mercury sorbents for plants that sell their fly ash into concrete applications. Sorbent Technologies also is working on a version for plants with hot-side ESPs, two particularly difficult, high value-added market niches.

Commercialization Information

In recent years, Sorbent Technologies has been scaling 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 show that simple B-PAC™ injection ahead of an existing particulate collector can be a comparatively inexpensive, yet uniformly effective mercury emission reduction strategy. With B-PAC™, high-performance, low-cost power plant mercury control is now commercially available. By the end of the decade, revenues of more than \$100 million are expected as the company supplies B-PAC™ to utility customers. Sorbent



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Technologies can inexpensively 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

Sorbent Technologies Corporation is located in Twinsburg, Ohio, and has been working on mercury control from flue gas streams for more than 8 years. Sorbent Technologies is currently one of only four companies that has demonstrated full-scale utility sorbent injection mercury control and is the only one using its own advanced sorbent. The company completed the world's first and only dedicated utility sorbent production plant in the summer of 2004. This plant can profitably and continuously supply approximately eight utility boilers at present. The company had more than \$2.5 million in revenues in 2002, and more than \$5 million in 2003, with more than \$300,000 in profits. Sorbent Technologies Corporation received a 2004 Bronze Medal Award from the *Environmental Business Journal*.



SBIR Impact

- EPA directed operators of coal-fired power plants to cut mercury emissions by almost 22% in the next 5 years.
- Sorbent Technologies Corporation developed an inexpensive, proprietary brominated powdered activated carbon sorbent for mercury removal.
- Brominated powdered activated carbon (B-PAC™) can cut the cost of mercury compliance at power plants to approximately 25% of that of competitive products or technologies.
- By the end of the decade, revenues of more than \$100 million are expected as the company supplies B-PAC™ to utility customers.