



MERCURYPAK SCRUBBER DEVELOPMENTS AND PRODUCT IMPROVEMENTS

In 2011, new US EPA regulations were promulgated to reduce emissions from sewage sludge incinerators (SSI) under section 129 of the Clean Air Act. Because of this action, new SSI mercury emission limits have been enforced since 2016. EnviroCare International (ECI) has designed, fabricated, and tested scrubbers using Sorbent Polymer Composite (SPC) mercury removal materials invented and manufactured by W.L. Gore. In 2015, ECI installed the first of many MercuryPak Scrubber systems containing SPC modules to remove

elemental mercury in the flue gas stream of fluidized bed incinerators (FBI's). Over the years, ECI has installed nineteen MercuryPak Scrubbers. These scrubbers have been successful and have met their goals of reducing mercury emissions below the regulatory limit of $37 \mu\text{g}/\text{dscm}$ @ 7% O_2 for existing source FBI limits.

For each client, ECI offers a post-installation service contract to perform routine inspections and carbon trap measurements across various layers of SPC modules. This is done to ensure

performance is being met, to recommend when modules should be replaced, and to further our research and understanding of the technology. By doing this for years, we have built up a database of performance data and have improved the technology by:

Using new generation modules with better surface coatings

Optimizing the wash cycle

Providing gas conditioning upstream of the modules

Using an EnviroCare VenturiPak scrubber system upstream

In a number of installations, our research indicated that performance dropped off, not related to the amount of mercury that has been captured (e.g., module capacity), but rather due to changes in

EnviroCare International has Installed 19 MercuryPak Scrubbers in North America to Meet the World's Most Stringent Mercury Regulations



the SPC material surface hydrophobicity (ability to repel water). Clean and/or new modules are easily able to shed water due to this hydrophobicity. Over time as the SPC modules accumulate fats, oils, greases (FOGs) and particulate the water does not easily drain from the module. This creates a sheeting affect that can blind the SPC and create significantly lower surface area for mercury adsorption. Surface contamination can limit the lifespan of the modules.

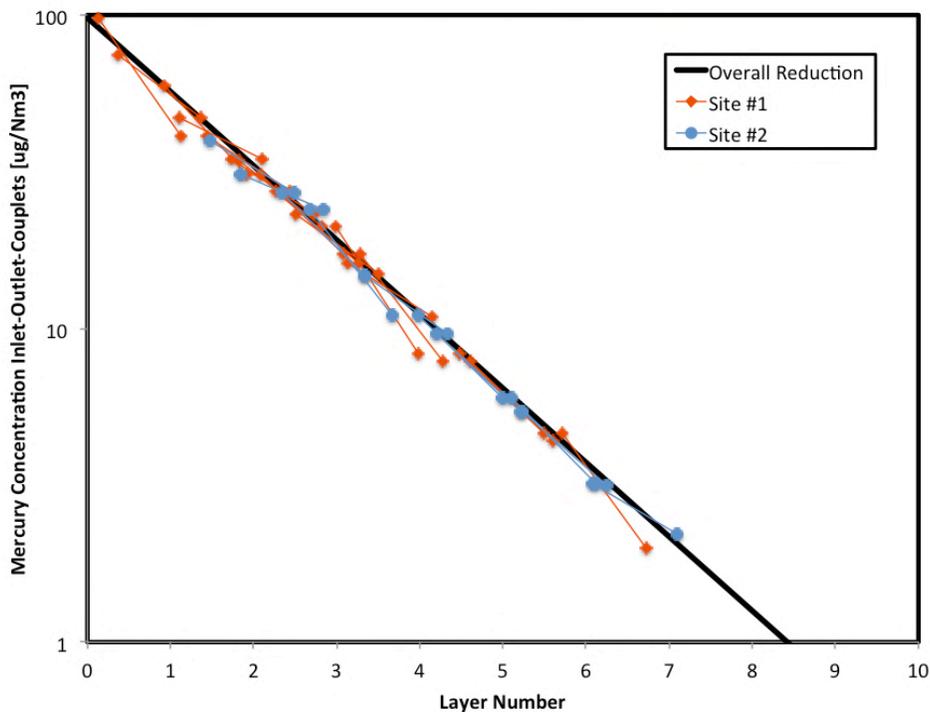
To address the change in hydrophobicity, three changes have been implemented. First, an improved SPC material is used that exhibits longer lasting hydrophobicity. Second, our system wash cycles have been optimized. Third, a gas conditioning system has been installed at several sites. This gas conditioning system slightly lowers the relative humidity to below 100%, which has the effect of

keeping the surface of the SPC modules dry. To condition the gas, we have used inline heaters and plume suppression air from an existing secondary heat exchanger.

Installations that use the EnviroCare VenturiPak scrubber ahead of mercury modules have not experienced the same level of surface contamination of FOGs and particulate deposition as found with older traditional scrubbers.

By implementing these changes, we have observed MercuryPak scrubbers with modules that have been in use for several years perform as well as scrubbers with brand new modules. Taking data from several years of testing, we can plot the inlet and outlet mercury concentrations versus

the relative layer number, as shown in the figure below. This figure shows that the percent reduction of mercury across the module is constant for almost all inlet levels of mercury (these are for nearly constant gas flow rates). Further, we can extrapolate the data to determine how many modules it would take to achieve US EPA new source FBI limits of 1.0 µg/dscm @ 7% O₂ for a given inlet concentration and flue gas flow rate. We can also meet country specific mercury emission limits using the same approach.



EnviroCare is looking forward to continuing to support our existing customers as well as opportunities that may require higher efficiencies to meet more stringent mercury emission limits. Please do not hesitate to contact us to discuss available options.

Respectfully,



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