Success Story

AEP Applies EPRI Research on Wetland Treatment Systems to Remove Mercury from FGD Landfill Leachate Pond

American Electric Power Company (AEP) operating company Ohio Power Company needed to reduce mercury levels in the flue gas desulfurization (FGD) landfill leachate ponds at its James M. Gavin coal-fired power plant in Ohio. They installed chemicalbased treatments at another pond, but had concerns about on-going chemical costs

and increases in other chemical parameters in the discharge. Drawing on prior EPRI research and a consultation and site visit from EPRI, AEP decided to try using a passive vertical flow wetland system for mercury removal. They designed, constructed, and installed a pilot-scale system downstream of a leachate pond that would treat 50% of the leachate flow. The vertical flow wetland system uses long-leaf sphagnum moss, sand and gravel to filter water flowing from the pond. The wetland system was able to remove 93% of the mercury as well as significant concentrations of other minerals. AEP plans to design and install full-scale wetland treatment systems at the same site.

AEP Applies EPRI Research on Passive Wetland Treatment Systems to Design Pilot-Scale System for Treating Mercury

Ohio Power Company, an AEP operating company installed an FGD system for removing sulfur dioxide (SO2) at the James M. Gavin plant in Ohio in 1995 to comply with Clean Air Act mandates. Solid waste and fly ash from the combustion process are mixed with lime and compacted in a permitted solid waste landfill. FGD leachate from landfill percolation is treated in ponds, and the final leachate discharge must achieve a human health water quality-based average effluent limit for total mercury of 12 nanograms per liter (ng/L) to meet federal and state regulatory requirements. Mercury levels at the Gavin plant leachate pond were exceeding the regulatory limit. AEP had installed chemical-based treatments, but had concerns about the on-going high cost of the chemicals and the difficulty of getting the mercury levels down to 12 ng/L without causing increases in other chemical parameters such as increased total dissolved solids and iron.

AEP decided to explore solutions for reducing mercury levels in the leachate pond that were more environmentally and cost effective than chemical treatments. Based on EPRI research over the last several years, AEP decided that a constructed vertical flow wetland treatment system might be a viable option. A constructed wetland is an engineered, passive system that uses natural processes and wetland vegetation, soils and associated bacteria to remove contaminants from wastewater. "I

"EPRI's expertise and guidance on passive vertical flow wetlands helped us design a system for effectively treating mercury."

Christina Svoboda
American Electric Power



AEP's vertical flow passive wetland treatment system uses longleaf sphagnum moss to remove mercury from a landfill leachate pond.

Challenge

AEP needed to reduce the mercury levels in a FGD landfill leachate pond at a coal-fired power plant in Ohio.

Solution

AEP used EPRI's research on vertical flow wetland treatment systems to build a pilot-scale system to treat mercury from the pond.

Results and Benefits

The pilot-scale system removed 93% of mercury from the leachate pond flow.

AEP shared the pilot-scale results with regulators.

AEP plans to install full-scale vertical flow wetland systems at the site.



was aware of EPRI's research with vertical flow wetlands," says Christina Svoboda, a principal environmental specialist at AEP. "They had good results with mercury on some pilot projects and I thought it could be applicable to our site." AEP asked EPRI for guidance and after a site visit by EPRI's John Goodrich-Mahoney and subsequent conversations, AEP decided to install a pilot-scale vertical flow wetland system to treat 50% of the leachate flow at one of the leachate ponds at Gavin's FGD landfill to evaluate the effectiveness of the approach before committing to a full-scale system.

Vertical Flow Wetland Treatment System Achieves Ninety-Seven Percent Mercury Removal Rate

A passive vertical flow wetland treatment system was constructed and installed in November 2011 downstream of the outlet to the Gavin FGD leachate pond. AEP designed the system and tested several different media to see which would be most effective at removing mercury. The vertical flow media is composed of highly permeable, long-leaf sphagnum moss as well as sand, pea gravel, and other aggregate materials. The water flows downward through the various media to an under-drain system and upwards to a horizontal perforated pipe that controls water levels. Water from the perforated pipe then flows over a cellular geogrid wall composed of interconnected plastic cells filled with sphagnum moss and planted with wetland grasses which provides additional aeration and treatment to a pool. The use of sphagnum and the cellular geogrid wall were both innovative enhancements to traditional wetland treatment systems.

The wetland system removed an average of 93% of total mercury, well below the regulatory threshold of 12 ng/L and far exceeding AEP's expectations. The system also removed large percentages (dissolved and particulate) of several other pollutants, including arsenic, aluminum, cobalt, thallium and selenium. The results were shared with regulators and AEP has also discussed the results at several conferences and other venues. Based on the success of the pilot test, AEP decided to install three full-scale wetland treatment systems. They anticipate designing the full-scale systems for possible installation in 2015. Christina Svoboda received an EPRI 2013 Technology Transfer award for her leadership in applying EPRI research in the design of the pilotscale wetland treatment system. According to Goodrich-Mahoney, "Ms. Svoboda expanded on EPRI's research to design an innovative solution for removing mercury from AEP's landfill leachate ponds."

Related EPRI Products

Title	Product ID
Pilot-Scale and Full-Scale Evaluation of Treatment Technologies for the Removal of Mercury and Selenium in Flue Gas Desulphurization Water	1017955
The Springdale Project: Applying Constructed Wetland Treatment to Coal Combustion By-Product Leachate	TR-111473

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com)

CONTACTS

John Goodrich-Mahoney, Principal Technical Leader 860.245.5852, jmanoney@epri.com

3002004204

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Electric Power Research Institute

3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 USA 800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

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