

CASE STUDY

COAL COMBUSTION RESIDUALS ASH POND CLEAN-UP PILOT SUCCESS, EAST COAST USA



An East Coast USA based coal burning power plant required a water treatment system for a coal combustion residuals (CCR) pond to comply with Federal EPA and state regulations. This “ash pond” was contaminated with a mix of heavy metals such as lead, copper, thallium, arsenic, and selenium.

To cap and close the ash pond, free and interstitial water, as well as any contact water from rain events, the ash pond had to be treated for the removal of heavy metals from wastewater prior to discharge to the local river. The General Contractor engaged with Envirogen to validate and optimize Envirogen's treatment approach for this water.

PILOT PLANT TRIALS: THE ASH POND CLEAN-UP PROJECT WAS PLANNED IN FOUR STAGES

Step 1 – Prior to designing the coal combustion residuals water treatment pilot system, the water was sampled to determine concentrations of the target contaminants. As expected, the interstitial water contained significantly higher concentrations of heavy metals (as much as 100x) compared to the surface water. This necessitated the design of a system that was not only effective at the higher contaminant concentrations, but also one with flexibility to operate economically over the range of conditions.

Step 2 – Envirogen's staff conducted on-site bench-scale chemical dosage and pH optimization experiments.

Step 3 – Continuous flow-through piloting trials ran for four weeks, using the sequence of unit operations proposed for the full-scale system, as follows: (1) Oxidant Addition, (2) Metals Precipitation with Iron, (3) Clarification, (4) Filtration, (5) Advanced Metals Removal System (AMRS), (6) Final Filtration.

Step 4 – Envirogen also conducted “worst case scenario” testing by spiking the feed water with elevated levels of arsenic and selenium, including the more difficult arsenite (AsO_3^{3-}) and selenate (SeO_4^{2-}) forms, respectively. This testing was done over a range of pH values.



PROVING THE CASE: ENVIROGEN'S ADVANCED METALS REMOVAL SYSTEM (AMRS) WITH ZERO VALENT IRON (ZVI) TECHNOLOGY

Envirogen's treatment system design for this coal combustion residuals pond was shown to remove all the regulated constituents present in the ash pond bulk (free) water to below permit limits, including lead, copper, thallium, arsenic and selenium.

The "worst case scenario" tests showed that selenate could not be removed with conventional iron co-precipitation, but could be removed to below the permit limits using Envirogen's Advanced Metals Removal System (AMRS) featuring zero valent iron (ZVI) technology at influent selenate concentrations as high as 300 ug/L. Envirogen's spiking tests also showed that arsenic at concentrations as high as 3,000 ug/L could be removed to below permit limits using iron co-precipitation and filtration, but that the Envirogen AMRS provided an enhanced level of safety, effectively removing residual arsenic, e.g., while chemical dosages are optimized.

The effluent water produced from Envirogen's pilot system was also tested for both acute and chronic toxicity and was found to meet the permit requirements for Whole Effluent Toxicity discharge (100% survival rates).

KEY OUTCOMES:

The case study validates Envirogen's treatment approach for the removal of heavy metals from wastewater and coal combustion residuals (CCR) ash ponds:

- Envirogen's advanced metals removal system (AMRS) featuring zero valent iron technology (ZVI) successfully removed arsenic and selenium consistently to non-detect values, even at elevated concentrations and range of pH.
- Envirogen's coal combustion residuals water treatment system allows power plants to meet EPA and more stringent local regulations for removal of lead, copper, thallium, arsenic and selenium.
- Treated water can be safely discharged to local waterways with no toxicity impact.



ABOUT THE CLIENT

The customer is a coal burning power plant located on the East Coast, USA. Exact details remain confidential.

ABOUT ENVIROGEN

Envirogen is a leading international provider of water and wastewater treatment solutions. We solve complex challenges relating to water availability and quality, and help our customers to increase productivity, reduce costs and meet environmental and sustainability targets.

We do this through offering:

- Best in class water and wastewater treatment and process filtration technology
- Expertise in design, project management and engineering
- World class manufacturing and servicing capability



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