Mercury Reduction Alternatives for the Alcoa Warrick Power Plant

Project Definition
Devise a strategic solution, led jointly by Cummins & Barnard and Michigan State University, that will ultimately reduce the amount of mercury emissions produced by Alcoa’s Indiana-based, Warrick Power Plant.

Industrial Sponsors:

Applicable Design Scope
- Fabric Filter Baghouse System: fixed filters designed to collect the oxidized mercury from the passing flue gas
- Sorbent Injection: injecting carbon upstream of the ESP to bond with the mercury for collection in the fields of the ESP
- Fabric Filter Baghouse System w/ Sorbent Injection: activated carbon promotes mercury oxidation in the flue gas, improving the mercury capture capability of the filters

Global Effects of Mercury
- Coal-fired power plants are large point source emitters of harmful Hg emissions
- Once emissions enter the atmosphere, the mercury enters watersheds in the form of precipitation
- 1 in 6 women of child-bearing age have toxic Hg levels in their blood
- 131 million acres of U.S. lakes are contaminated with mercury
- 44 states have fish consumption advisories in place

Design Alternatives
Several current and developing mercury removal technologies were researched and analyzed to determine their applicability to Alcoa’s Warrick Power Plant configuration

Process Modeling
Problem Identification → Identification of Design Alternatives → Research and Critique Design Alternatives → Identify Suitable Solutions → Validation Review of Solutions → Determination of Most Effective Solution

Testing & Validation
- Fabric filter baghouses with sorbent injection are field-proven solutions to mercury control
- Significantly lower sorbent consumption as compared to injection upstream of ESP
- High effectiveness (>90%) achieved with low injection rates

Final Recommendations
For Alcoa’s Warrick Power Plant units 1-3, installing a common fabric filter baghouse system with sorbent injection capabilities is currently the most suitable solution, offering the most effective and field-proven approach to meeting emission reduction mandates of 90%.

Evan DeTone
Ben Dreher
Jordan Hauser
Scott Stieber