PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Environmental and Water Resources

6/2008

FULL-SCALE TESTING OF A MERCURY OXIDATION CATALYST UPSTREAM OF A WET FGD SYSTEM

CONTACTS

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Background

To provide alternatives for power plant owners to comply with the Clean Air Mercury Rule promulgated by the U.S. Environmental Protection Agency, NETL is funding development of technology to remove 70 to 90 percent of flue gas mercury emitted from coal-fired power plants." One of the technologies under development is a solid mercury oxidation catalyst, to be tested at a 200 MW scale over a two-year period at a power plant firing Powder River Basin (PRB) Coal.

Mercury can generally be found in one of two forms in coal-fired power plant flue gases: water-soluble oxidized mercury (Hg^{+2}), or water-insoluble elemental mercury (Hg^{0}). Because it is soluble in water, oxidized mercury can be more easily captured by power plant pollution control devices such as wet flue gas desulfurization (FGD) systems. Elemental mercury, on the other hand, is more likely to pass through an FGD system and be emitted at the power plant stack. Increasing the conversion of elemental mercury to oxidized mercury in flue gas streams through the development and use of cost-effective advanced catalysts would facilitate mercury capture by downstream wet FGD systems.

Primary Project Goal

The goal of the project is to test at full scale the use of solid, heterogeneous catalyst downstream of an electrostatic precipitator (ESP) to promote the oxidation of Hg^{0} in coal flue gas, demonstrating that catalytically oxidized mercury is removed by a downstream wet FGD absorber and ends up in the FGD byproducts. The test is intended to confirm the required catalyst quantities and catalyst life for achieving an average of 70 percent or greater oxidation of Hg0 in PRB flue gases over a 24-month period.

Objectives

- Conduct laboratory evaluations of catalysts to select the optimum catalyst formulation for the host unit flue gas
- Design and fabricate a full-scale catalyst reactor to be installed at an operating power plant

PARTNER

URS Group

PERIOD OF PERFORMANCE

07/24/2006 to 04/30/2010

COST

Total Project Value
$4,400,980

DOE/Non-DOE Share
$2,327,745 / $2,073,235

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- Conduct long-term tests (24 months) of a promising oxidation catalyst in a flue gas produced by a power plant firing PRB coal. Catalyst oxidation activity and FGD capture of Hg will be recorded
- Conduct tests to determine the ability to regenerate the catalyst after 24 months of operation and to determine optimum regeneration conditions

Accomplishments

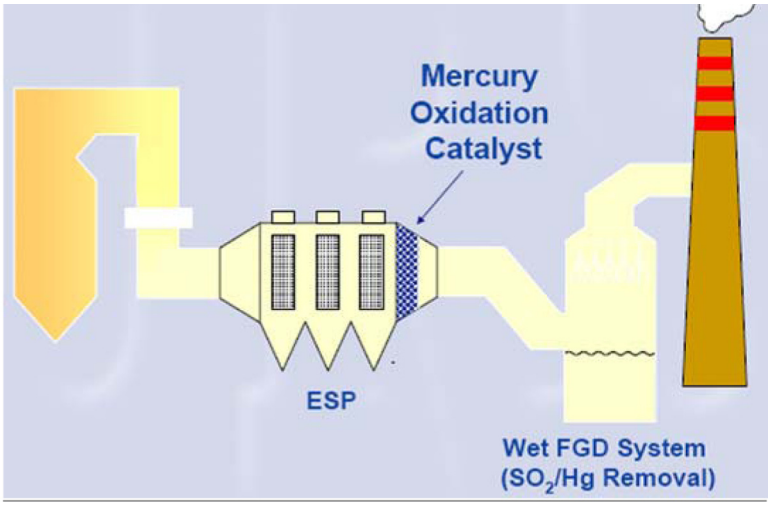
Project design and award of equipment and installation contracts are complete, with major construction scheduled to begin late 2007.

Benefits

This technology will oxidize mercury in flue gas streams from coal-fired power plants, resulting in greater mercury removal at plants equipped with wet FGD systems. Mercury is a known neurotoxin, and a number of health effects can potentially occur if organic mercury is ingested in large quantities. Improved mercury removal technologies, therefore, offer public health benefits. The oxidation of mercury by a dedicated oxidation catalyst, with capture of oxidized mercury in a downstream wet FGD system, is an alternative that can allow continued beneficial use of power plant fly ash in concrete and other applications. By avoiding the use of mercury sorbents that may affect the use of fly ash, revenue from ash sales can be preserved.

Planned Activities

- Fabricate and install the catalytic oxidation reactor and install catalyst by mid-2008
- Conduct long-term oxidation catalyst testing in PRB flue gas at the Lower Colorado River Authority's Fayette Unit 3 in LaGrange, Texas, beginning mid-2008
- Perform catalyst regeneration testing



The mercury oxidation catalyst is located between the ESP and the wet FGD where both SO_2 and mercury are removed.