

TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90-MW Coal-Fired Boilers

Participant

Wisconsin Electric Power Company (We Energies)

Additional Team Members

ADA-ES — Management Support/Design Input

Cummins & Barnard — A/E Services/Construction Management

Wheelabrator Air Pollution Control, Inc. — Baghouse Design and Installation

Electric Power Research Institute — Technology supplier

Location

Marquette, Marquette County, MI (Wisconsin Electric's Presque Isle Power Plant Units 7, 8, and 9)

Technology

TOXECON sorbent injection process

Capacity

270 MW

Coal

Powder River Basin subbituminous

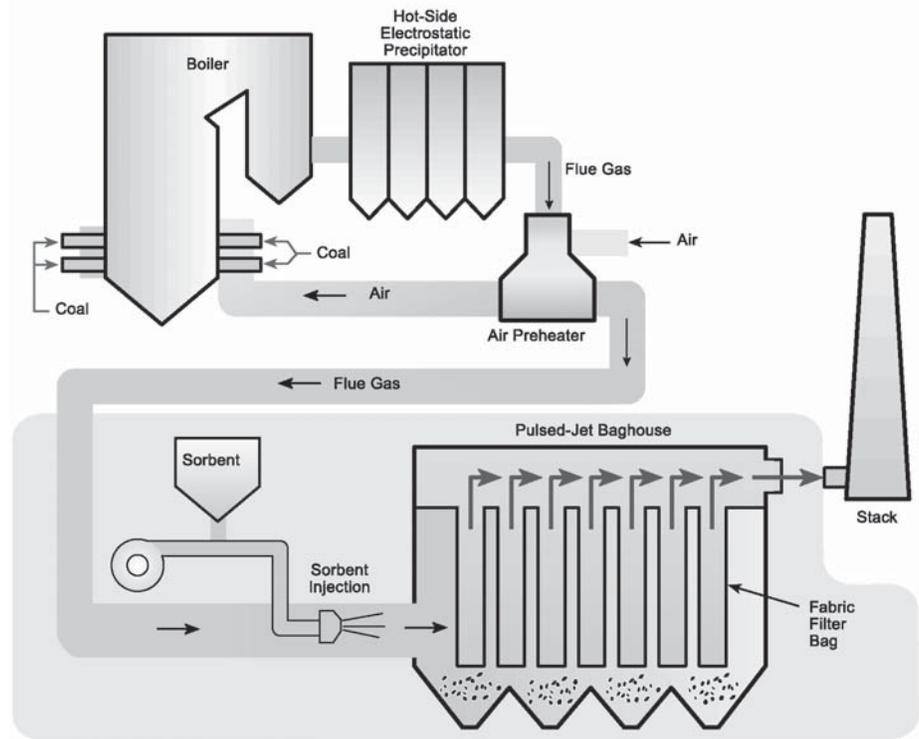
Project Funding

Total	\$52,978,115	100%
DOE	24,859,578	47
Participant	28,118,537	53

CCPI-1

Emissions Control

Mercury	■	NO _x	■
SO ₂	■	PM _{2.5}	■



Objectives

To achieve 90 percent mercury removal through injection of activated carbon; increase particulate matter (PM) collection efficiency (particularly for PM of 2.5 microns or less in size [PM_{2.5}]); to reduce already low sulfur dioxide (SO₂) and nitrogen oxide (NO_x) emissions at the plant by an additional 70 percent and 30 percent, respectively; to recover 90 percent of mercury captured in the sorbent; to achieve 100 percent fly ash utilization; to advance the reliability of mercury continuous monitors; and to successfully integrate the entire system.

Technology/Project Description

The project will demonstrate the TOXECON sorbent injection process for multi-pollutant control of a combined flue gas stream from three units totaling 270 MW. TOXECON, an Electric Power Research Institute (EPRI)-patented process, injects activated carbon and sodium-based sorbents into a pulsed-jet baghouse installed downstream of a plant's PM control device, which in this application is a hot side electrostatic precipitator. The primary PM control device removes the bulk of the PM. The TOXECON process is placed downstream of the air preheater to operate at relatively cool temperatures conducive to mercury and other pollutant absorption. Activated carbon and sodium-based sorbents are injected into the ductwork upstream of the pulsed-jet baghouse, where they mix and absorb pollutants in the flue gas. Upon entering the pulsed-jet baghouse, in-flight pollutant absorption continues and is significantly enhanced by fixed-bed absorption as pollutants pass through a sorbent filter cake that forms on the fabric filter bags in the baghouse. Sorbent captured in the baghouse is processed to recover up to 90 percent of the mercury to enable 100 percent fly ash utilization.

Project Duration 60 Months	Period of Operation 39 Months	Status/Schedule
		*Estimated date

Benefits

The TOXECON process leverages the high PM capture efficiency inherent in pulsed-jet baghouses and baghouse location to effectively utilize proven sorbents in achieving high mercury capture efficiency and added SO₂ and NO_x control, and to retain the sales value of fly ash as a cement additive. The advantages of this approach include: affording enhanced contact between sorbents and dilute phase pollutants; providing a temperature regime conducive to pollutant absorption; and requiring application to only a small portion of the fly ash. Demonstrating the TOXECON process on Powder River Basin (PRB) coal is an excellent test of the technology and representative of a broad market application. PRB coal is widely used and, as with other western subbituminous coals, contains high percentages of elemental mercury, which, because of its vapor state upon combustion, is more difficult to remove than solid state oxides of mercury (the form more common in bituminous coals). The TOXECON process has application to an estimated 167 gigawatts of existing coal-fired capacity. The TOXECON project alone is expected to annually remove 97 pounds of mercury, 4,020 tons of SO₂, 1,470 tons of NO_x, and 32 tons of fine PM.

Status/Accomplishments

The project was selected January 8, 2003 under the first round of Clean Coal Power Initiative (CCPI), and was awarded a cooperative agreement April 21, 2004. The National Environmental Policy Act (NEPA) requirements were met with an Environmental Assessment (EA) and issuance of a Finding of No Significant Impact (FONSI) in September 2003.

Construction activities were initiated in November 2004 and were completed in December 2005, at which time flue gas from Unit 7 at the Presque Isle Power Plant was directed to the TOXECON baghouse. Units 8 and 9 were brought on line in January 2006, and activated carbon was first injected into the system later the same month. Initial results are promising, demonstrating mercury emission reductions. Results will be quantified and optimized through parametric testing during 2006.

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R e p o r t	<i>Final Report Issued</i>	<i>10/09*</i>
	<i>Draft Report Issued</i>	<i>7/09*</i>
	<i>Operation Completed</i>	<i>4/09*</i>
	O p e r a t i o n	
S T A T U S	<i>Operation</i>	<i>1/06</i>
	C o n s t r u c t i o n	
	<i>Construction</i>	<i>11/04</i>
D e s i g n	<i>Award</i>	<i>4/04</i>
	P r e A w a r d	
	<i>NEPA Completed (EA and FONSI)</i>	<i>9/03</i>
	<i>Selection</i>	<i>1/03</i>