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COAL GASIFICATION:
Striking While the Iron is HOT

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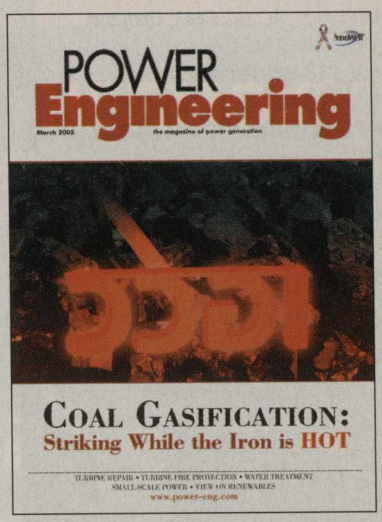

Departments

MERCURY REDUCTION TECHNOLOGY SHOWS PROMISE FOR TEXAS LIGNITE

Mercury control regulations being promulgated by the Environmental Protection Agency will pose especially formidable challenges to utilities burning Texas lignite due to its inherently high levels of mercury compared to other coals. Mercury in Texas lignite ranges from 0.1 to 0.3 ppm, compared to Eastern bituminous and Powder River Basin (PRB) coal, which typically have less than 0.1 ppm.

But a lignite-burning utility in Texas has teamed with EPRI and San Francisco-based URS Corporation to evaluate what could be a viable mercury control technology that uses salt injected into the furnace to enhance mercury oxidization, thereby greatly increasing the levels of mercury that can be readily removed from flue gas.

The project team has completed initial testing of the technology, which is aimed at coal-fired power generators equipped with an electrostatic precipitator and wet scrubber for particulate and SO_2 reduction. The tests were conducted at Texas Genco's Limestone Electric Generating Station in Jewett, Texas. Texas Genco is one of the largest independent wholesale electric power generating companies in the United States, selling electricity in the Texas wholesale power market (ERCOT).

"We want to lead the nation in operational excellence for independent power producers," says Craig Eckberg, Texas Genco's manager of air resources. "And this first phase of testing shows a great deal of promise for controlling mercury, not only for Texas lignite but very possibly for other kinds of coal as well."

The concept involves oxidizing elemental mercury with small amounts of a halogen injected into the boiler and then capturing the oxidized mercury by conventional SO_2 control devices. Mercury in the flue gas from coal-fired power plants is a mixture of elemental and oxidized mercury, but only the oxidized mercury is soluble in water and, therefore, can be captured by conventional SO_2 controls.

Eckberg explains that mercury removal enhancement using the halogen injection process appears especially encouraging with Texas lignite because the fuel contains a high level of mercury and low level of chlorine. The same is true to some extent with Powder River Basin (PRB) coal, which several Texas power companies, including Texas Genco, import from Wyoming and blend with their lignite.

Following some short-term tests that EPRI conducted over the last two years at other power plants burning North Dakota lignite and PRB coal, the Texas Genco/EPRI/URS team decided to test the approach at the Limestone Station. The presence of chlorine promotes the oxidization of mercury, and oxidized mercury is readily removed across a flue gas desulfurization (FGD) system, such as the wet limestone scrubber used at Limestone. EPRI researcher Ramsay Chang said the approach tested at Limestone was rooted in experience with plants that burn other forms of coal.

"We know that mercury in the flue gas at plants burning coals with higher chlorine content, such as Eastern bituminous coal, appears mostly in the oxidized form, which is removable by SO_2 controls. So we tried to create similar conditions at plants where the coal does not naturally contain the halogen believed necessary to promote the formation of oxidized mercury."

Eckberg describes the project's now-completed Phase 1.

"The team injected a calcium chloride solution into the boiler at incremental concentration rates to evaluate the change in oxidized mercury in the flue gas and subsequent removal of the oxidized mercury across the FGD scrubber. An alternate halogen, calcium bromide, was also injected and evaluated. We found that injections of calcium chloride at fairly low dosage rates of about 0.1 percent resulted in an increase in the oxidized mercury content in our flue gas and an increase from about 50 percent to 73 percent total system mercury removal across the FGD scrubber. What we saw with a very short-term calcium bromide test was an increase in oxidized mercury and a removal across the FGD scrubber that went up to 81 percent. Comparing these results to our baseline measurements, we found that we were typically removing about 45 to 55 percent of the mercury in the flue gas without doing anything, and the injection of a halogen moved it up to levels ranging from 73 to 81 percent."

Although the initial results must be validated and effects on other elements of the plant must be determined, Chang terms the results to date "intriguing and encouraging." The project team plans to solicit participation from other power generators in the region while continuing its investigation at the Limestone Station in 2005 and 2006. Texas Genco has been in discussions with other utilities in Texas that use lignite and PRB coal to help move the study forward.

"In addition to determining what the long-term balance-of-plant impacts might be, we want to look at the cost-effectiveness of various materials that may be used," says Eckberg. "We are seeking additional participation to further evaluate various raw materials that could be used to see what might be the most cost effective halogen to be used in the process."

Along with calcium chloride and calcium bromide, the project team is interested in evaluating other materials that may provide similar results but may be more cost-effective. Although the initial tests showed that calcium bromide required the lowest dosage rate and produced the highest mercury removal across the scrubber, it is also the most expensive of halogens tried so far. In the next phase, the project team wants to look at various industrial sectors and see what low-cost products or raw materials might be available that could be employed in with the technology.

"We also want to optimize what rates of halogen injection will be necessary to achieve mercury reduction targets," he says. "We want to inject as little as possible into the boiler to get the desired results and minimize any impact on plant operations. At this point we don't have a real good handle on what those optimal levels will be. So far our tests have been over days and to really evaluate the effectiveness of the technology and the impact on plant operations, it needs to be over a period of at least three to six months."

Through EPRI, the project team is offering project participation to other utilities in the industry who may be interested because it would appear this has applications for other coals with similar properties.

"Texas Genco is interested in a collaborative effort across the industry to further understand and develop this technology because we have done a pretty good job of proving out the concept and determining that the technology will work," he says. PE

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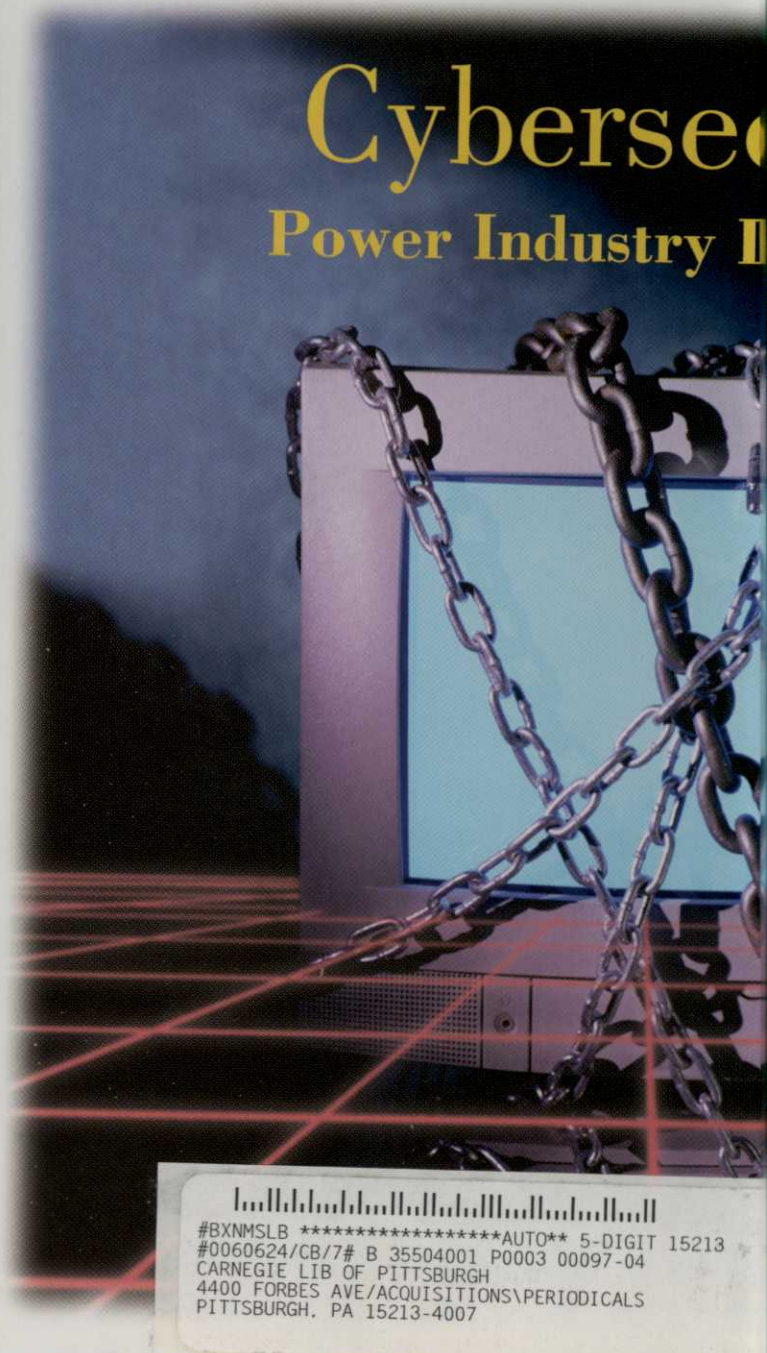

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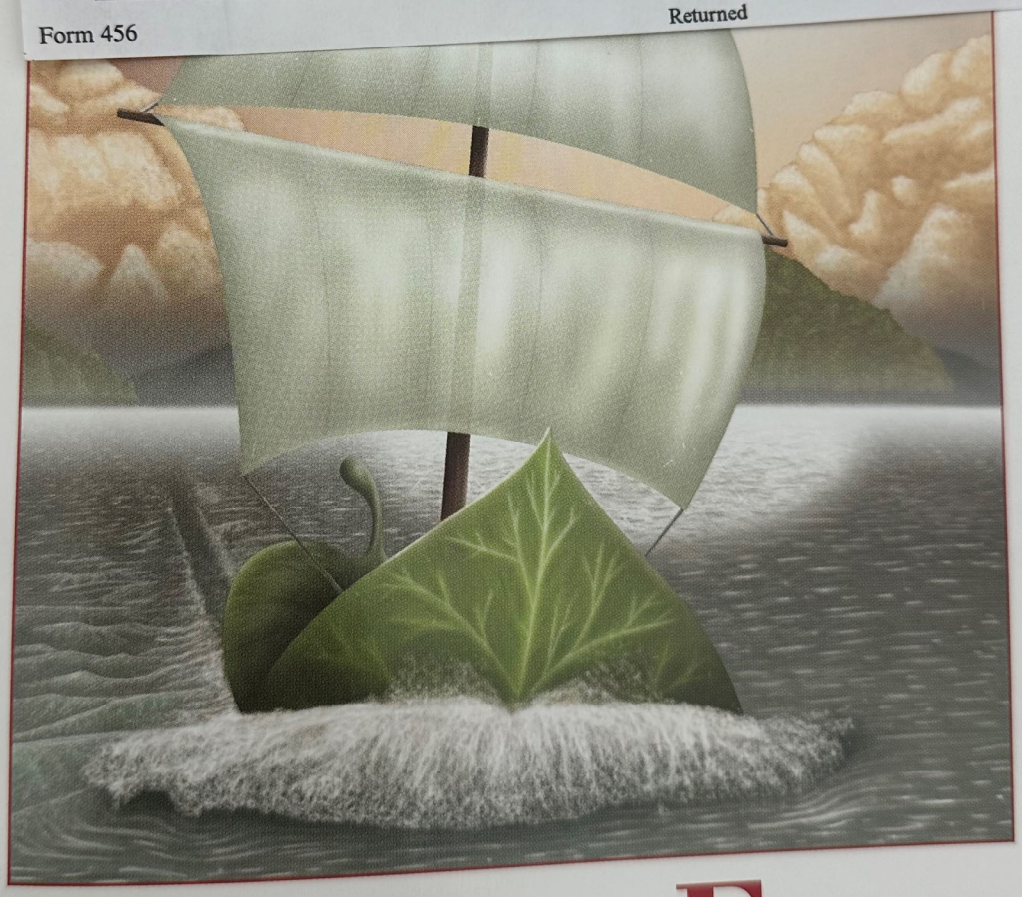

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