Employees Find Innovative Ways to Meet Air Quality
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Environmental compliance issues are at the forefront of much of what electric utilities do every day. Compliance issues influence numerous decisions regarding power plant operations, as well as finances; are debated by regulators and politicians at every level of our society; and have a direct effect on Americans' quality of life—we all want a clean environment, but we also need a stable, affordable supply of electricity.

South Mississippi Electric approaches these complex issues with a simple purpose—to find the most cost effective solutions that effectively meet any applicable regulations. Employees at Plant Morrow have recently identified an innovative solution to help meet new regulations required by the Clean Air Interstate Rule (CAIR) which was enacted in 2005 to address sulfur dioxide (SO2) emissions created from burning coal. The Morrow staff has also been considering how to meet other new emissions regulations, including reducing NOx (nitrogen oxides) and capturing mercury.

The most common process for removing SO2 is to use flue gas desulfurization (FGD) systems, or in industry terms, "scrubbers."

Greg Chancellor, environmental process engineer, has been leading a team effort to meet emissions regulations at Morrow. "Plant Morrow's original design included scrubbers that remove about 60 percent of SO2," Chancellor says. "This was a conscious choice by SMEPA at the time, even though there were minimal environmental regulations then. The system also allowed us to meet initial Clean Air Act regulations.

"However, the new regulations require additional reductions. We began by looking at replacing our scrubbers, which much of the rest of our industry is doing. Installing new FGD technology is very expensive, and now it is difficult to obtain the equipment and construction labor because there is so much demand.

"We started to proceed in that direction, but proposals for new NOx, SO2 and mercury removal systems were about $400 million, which was cost prohibitive. When we learned that, we elected to explore other options."

To accomplish the task, Chancellor and his team decided to see if they could redesign and upgrade the existing scrubber units, to increase the 60 percent treatment of flue gas. URS Corporation, an engineering firm that specializes in such projects, was hired early last year. After extensive modeling and design, they determined that the units could effectively be modified to scrub 100 percent of the plant's flue gas steam.

"With that plan, we can capture 98 percent of the SO2," Chancellor notes. "And with some additional upgrades that will improve the plant's overall reliability, it will cost a fraction of those original

estimates." The plan calls for replacing the inlet ducts to reroute all the flue gas to the scrubbers, as well as improving the actual desulfurization process. (See sidebar and diagram.) Preliminary phases of the project will begin this year, with much of the upgrade set for the plant's planned maintenance outages during the next two years. The upgraded equipment should be operational by 2010.

"This is an exceptional solution," says Jim Compton, General Manager/ CEO. "Not only are we reducing a major capital cost for our Members, there will much less overall construction and disruption to our operations. The biggest benefit may well be that this process will also capture a large percentage of mercury without additional pretreatment methods, which were also under consideration.

"This design allows us to look longer at NOx removal processes separately and delay that decision. The NOx technology is rapidly improving and we want to wait and get better technology for NOx, while addressing SO2 and mercury now."

Because the modified scrubbers will actually reduce the temperature of the flue gas as it passes through the plant's 400-foot tall stacks, the inside walls of the chimneys will be relined to prevent possible damage from the changed conditions. Also this year, new mercury continuous emissions monitoring system (CEMS) equipment will be installed on the stacks to meet self-reporting requirements which become effective January 2009. In addition, new SO2 and NOx CEMS will be installed to replace existing equipment, which was initially installed in the mid-1990s but is now obsolete.

ANATOMY OF A SCRUBBER

Scrubber technology uses the calcium in limestone to react with and remove the sulfur from the exhaust gas that leaves Plant Morrow's furnaces.

The limestone is crushed into a fine powder and diluted in water to create a concentrated slurry. The mixture is then pumped into the scrubber, where it is sprayed through nozzles (like showerheads) into the ducts carrying the gas. When the gas passes through the mist, sulfur and calcium molecules interact and attach to each other, so the sulfur is carried away in the watery mix.

After leaving the scrubber, the slurry goes to a water treatment tank and the heavier calcium/sulfur particles settle and are drawn off in the form of calcium sulphate. The sediment is transported by conveyor belt where it is safely stored in the plant's landfill.

Huge pumps are used to move the slurry through the scrubber. Part of the new project will replace the current pumps as well as a backup pump, which will help ensure the system's reliability. The new pumps will increase the scrubber's capacity to 15,000 gallons of spray per minute for each pump, also improving the system's efficiency.

Other aspects of the project, including the installation of a new limestone ball mill and improving the slurry recycling system, will make the entire process state-of-the-art.