FIELD TESTING OF ACTIVATED CARBON INJECTION OPTIONS FOR MERCURY CONTROL AT TXU'S BIG BROWN STATION

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Field testing of mercury control options with a TOXECON™ configuration has been completed at Luminant's (formerly TXU's) Big Brown Station. A series of parametric screening tests were performed with various sorbents, including activated carbon, enhanced activated carbon, and a proprietary sorbent enhancement additive. A monthlong test with a single sorbent and nominal injection rate was also performed. Mercury removals with all options exceeded target values of 55%, and short-term removals were observed as high as 90%, although significant plant modifications would be required to sustain removal rates approaching 90%.

While mercury control results at Big Brown were promising, elevated differential pressure across the high air-to-cloth (A/C) baghouse makes sorbent injection in the TOXECON configuration an unacceptable option for Big Brown. It was determined that activated carbon injection (ACI) at the monthlong injection rate added approximately 0.8–1.3 inches of H_2O to the test baghouse module (which is one of four modules serving Unit 2) at a Unit 2 load of 600 MW. However, there was also a residual component of ΔP that gradually increased for the bags of the test module and a control module, which contributed to bag deterioration. Investigation of the plant data and bag samples indicated that this residual component of ΔP was due to continual buildup of residual dust that was not cleaned off the bags. This mechanism of residual drag increase appeared to be occurring prior to and during field testing and appeared to be minimally affected by ACI. Following the conclusion of field testing, Luminant initiated a bag change for the test baghouse module. During the bag change, it was discovered that two of the eight hoppers on the test module were plugged and filled with ash. In these two hoppers, unusual deposits were found mixed with the loose ash, and the ash itself was reported to be very hot and smoldering. Some of the deposits appeared to have been molten and, when studied, provided indications that they may have formed at unusually high temperatures (>1000°C). While the cause of the plugged hoppers appears to be unrelated to the sorbent options that were tested, the plugged hoppers did create favorable conditions for self-heating of the high-carbon ash mixtures that are typical of the TOXECON configuration.

The economic analysis indicates that mercury removal for Big Brown in the configuration tested would be approximately $4000/per lb of removed mercury (assuming a 90% removal target with the enhanced-AC option). However, as indicated by the monthlong testing, the COHPAC at Big Brown does not have the ΔP margin to operate with continual ACI, so other strategies must be investigated. One option considered in the economic analysis was to increase the size of the COHPAC to achieve a lower operating A/C ratio. Enlarging the fabric filter (FF) to reduce the A/C ratio to today's design values, approximately 6 ft/min, would increase the mercury removal cost to approximately $7500/per lb of removed mercury if all the costs, including FF expansion, were accounted for as mercury removal costs.