Wet Flue Gas Desulphurization System Optimization

Project Summary
ALDEN used CFD and scaled physical modeling to evaluate the performance of the planned WFGD by simulating the gas flow distributions through the system, and designed a spray grid for the WFGD Absorber to balance the distribution at each spray level to optimize SO₂ removal.

Project Overview
Williams Station Unit 1 is a 610 MW coal fired station owned by South Carolina Electric & Gas (SCE&G). The plant installed a new wet flue gas desulphurization (WFGD) system, which removes SO₂ entrained in the flue gas stream. The approach of the physical flow model study was to minimize the potential for liquid pullback into the absorber inlet ducts by improving the gas flow distributions into the absorber. A parallel CFD model study was performed to optimize the spray nozzle locations and spray types to reduce high gas velocity zones and create a uniform even spray coverage across the absorber vessel to optimize SO₂ removal.

Work Performed
ALDEN developed computational fluid dynamic (CFD) and scaled physical models of the planned WFGD system. The models used velocity inlet profiles based on field data to provide better accuracy of the simulations. Modifications to the inlet ductwork and within the WFGD were made to improve the gas flow and SO₂ removal efficiency. The CFD model was also used to design and optimize the spray nozzle grid and wall rings while the physical model minimized the potential for liquid pullback into the inlet ducting with designs to the inlet awning. The results of the study provided flow controls and a spray nozzle injection grid design to minimize liquid pullback while providing uniform spray coverage, which is necessary to optimize SO₂ removal.

Project Highlights
- ALDEN used both CFD and scaled physical modeling to simulate various performance characteristics of the system, using each modeling technique where it was best suited
- The physical flow model effectively minimized liquid pullback
- The CFD model was used to optimize the slurry spray patterns to maximize the removal performance
- ALDEN’s approach streamlined the modeling process, reducing both cost and time to achieve an optimized design solution
- ALDEN designed a cost-effective design for the WFGD system

FOR MORE INFORMATION,
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