Electrostatic Precipitator Performance Optimization

Project Summary

ALDEN used scaled physical modeling to simulate the planned ESP upgrades and to design performance devices to optimize the fluegas velocity, ash, and pressure losses through the ESP system. Flow controls, and ash handling devices were developed to optimizing particulate removal and to minimize ash deposition and the system pressure losses.

Project Overview

Alden Research Laboratory (Alden) and Air Consulting Associates (ACA) were contracted by Southern Environmental Inc. (SEI) for the planned Electrostatic Precipitator (ESP) upgrades for a large US utility. Alden was contracted to perform the upfront physical flow model studies while ACA was contracted to provide technical support throughout the entire project. An ESP operates by electrically charging ash particles in the fluegas and then attracting the charged particles onto collecting plates which are then rapped to send the ash to the hoppers where it can safely be removed from the system. For optimum system operation, the distribution of the gas velocity must be very uniform entering the ESP to maximize the collection efficiency of the ESP and to minimized particulate emissions. Upstream duct fallout of ash particles and the flue gas distribution into the ID fans are also important components of ESP operation that must be considered to inhibit premature outages.

Work Performed

Physical flow modeling techniques were used to develop and optimize duct and ESP flow controls and ash handling devices to achieve best performance targets for ash removal. The connecting ductwork from the existing air preheaters to the rebuilt ESPs were also included in the studies to provide flow controls designs to optimize air preheater performance. The model simulated the field gas velocities, pressure losses, and ash particulate transport and removal.

Project Highlights

- Scaled physical modeling was used to simulate, design, and optimize the operating performance of the ESP system
- ALDEN’s recommended design achieved the ICAC EP-7 targets for uniformity of flue gas velocities at the inlets to the first collecting fields and at the outlets of the last collecting fields to maximize particulate removal efficiency
- ALDEN designed a cost-effective design for the flow controls and perforated plates to provide optimal ash removal
- Each of the three units passed their respective performance test guarantees after the recommendations from the physical flow model had been implemented

FOR MORE INFORMATION,

Contact our Headquarters, Holden, MA at +1 (508) 829-6000 or by e-mail at : info@aldenlab.com