

# power boiler apc solutions

## application study: improving ESP performance when using dry sorbent injection (DSI)

### application summary

DSI is becoming more attractive as a low-cost option for acid gas removal, especially when the acid gas content is already low and low removal efficiencies are needed to regain compliance.

With all types of dry sorbents, the dust load to the ESP is increased, especially at high stoichiometric ratios. In most cases, the size distribution of the injected sorbent is fine enough to suppress the current in the inlet fields of the ESP, and sometimes the sorbent resistivity is high enough to further aggravate the conditions at the ESP inlet, resulting in particulate emissions exceedances.

Poor ESP performance can be corrected by one or a combination of techniques designed to lower the resistivity of the dust. As an example of the effects of one technique, a utility in Europe experiencing high opacity on its lignite-fired boiler ESPs due to temperature-induced high resistivity was able to reduce emissions with one low-cost technique. A test was carried out on the Forced Draft (FD) side of the air preheater to prove that cooling on the FD side would cool the hot gas ID side sufficiently to improve ESP performance.



### ESP inlet gas cooling choices

Depending on the ambient humidity, required temperature drop, dust characteristics and opacity improvement requirements, the following approaches to improve ESP performance are available:

- ID side evaporative gas cooling tower\*
- FD side air volume addition cooling\*
- FD side inlet air fogging cooling\*
- Catalytic flue gas conditioning with  $\text{SO}_3$ \*
- Vaporized flue gas conditioning with  $\text{H}_2\text{SO}_4$ \*

\* technologies patent applied for

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Skillman NJ 08558 [www.boldeco.com](http://www.boldeco.com)  
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### project description

The most efficient way to improve ESP performance is to lower the resistivity of the flyash. Along with resistivity changes from fuel switching, temperature-induced high resistivity is the most commonly experienced reason for poor ESP performance. This can be caused by inefficiencies in various equipment, including pulverizers, separators, air heaters, burner design, and seasonal temperature fluctuations. DSI can be a cause of poor ESP performance that can be corrected by lowering the resistivity of the gases.

In one power station in Europe, the emissions exceedances were caused by a poorly operating airheater that resulted in excessively high resistivity of the lignite ash during summer months due to high air heater exhaust temperatures.

Since the plant was equipped with an oversized FD fan, it was determined that the least expensive option for cooling the ESP inlet gases was to install a special damper on the FD side of the air preheater to increase the air capacity in the air preheater. This solution produced cooler gas temperatures on the ID side, resulting in lower resistivity of the flue gases going to the ESP, and thus, correspondingly lower dust emissions. This solution is just one of the many low-cost options that are available from BoldEco to improve ESP efficiency in the case of DSI implementation.

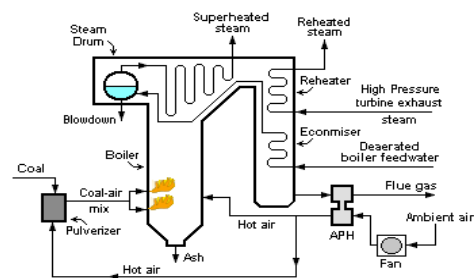
### efficiency improvement

Performance improvements from example modification:

- PM:
  - Before:  $>150 \text{ mg/Nm}^3$
  - After:  $<35 \text{ mg/Nm}^3$
- Gas Temperature:
  - Before:  $>170 \text{ }^\circ\text{C avg.}$
  - After:  $<140 \text{ }^\circ\text{C avg.}$
- In-Situ Dust Resistivity:
  - Before:  $3.9 \times 10^{12}$
  - After:  $8.2 \times 10^{10}$
- Average Power Levels Field 4:
  - Before: 220 mA
  - After: 690 mA

### keywords

- $\text{PM}_{10}$ ,  $\text{PM}_{2.5}$ , particulate control
- ESP optimization
- low capital cost
- sorbent flexibility
- FD side air preheater gas cooling



Note: APH is the air preheater

Available exclusively through:

Inquiries: JoAnn Pacinelli

email: [pacinelli@capitalexchange.com](mailto:pacinelli@capitalexchange.com) • phone: 412.427.0133

