**CASE STUDY I: Using Milling Technology and CFD Modeling to Improve Trona Utilization for SO$_3$ Control at AES Somerset**

O’Brien & Gere has successfully used trona injection at the AES Somerset power plant to control SO$_3$ emissions. SO$_3$ emissions can result in a visible blue or brown plume and also cause corrosion of flue gas systems at coal-fired power plants. Although trona injection is proven to be effective for SO$_3$ control, this NYSERDA-funded study looked at using O’Brien & Gere’s milling technology, as well as using computational fluid dynamics (CFD) modeling for injection grid design, to improve the utilization of trona.

In addition, this study used SO$_3$ measurements at several locations in the flue gas system to determine the trona injection rate that would be needed to safely and effectively remove SO$_3$ at the air pre-heater inlet. Trona injection at the air pre-heater inlet lowers the acid dewpoint in the flue gas duct, therefore allowing a coal-fired power plant to lower the flue gas temperature. Lowering the flue gas temperature reduces fuel use and therefore emissions, including CO$_2$.

**ECONOMICS**

Trona injection rate to achieve 4 ppm SO$_3$:
- 2,600 lb/hr, unmilled (45 ppm baseline)
- 800 lb/hr, milled (45 ppm baseline)

Trona injection rate with in-line milling and improved injection grid / nozzle design:
- 800 lb/hr

Annual cost savings: $600,000 to $900,000
Capital cost for milling / automated cleaning system: $600,000 to $800,000
Annual operations & maintenance cost: $140,000
Net annual savings: $460,000 to $760,000
Approximate payback period: 1 year

**CONCLUSIONS**

- In-line milling substantially improved Trona utilization for SO$_3$ removal
- Use of CFD modeling for injection grid design resulted in improved Trona dispersion and performance
- Use of diverter nozzle design resulted in improved performance