CASE STUDY I: Using Milling Technology and CFD Modeling to Improve Trona Utilization for SO_3 Control at AES Somerset

CASE STUDY II: Using Trona Injection to Control SO_3 and Improve Efficiency at a Coal-fired Power Plant

O'BRIEN & GERE www.obg.com

AES

NYSERDA

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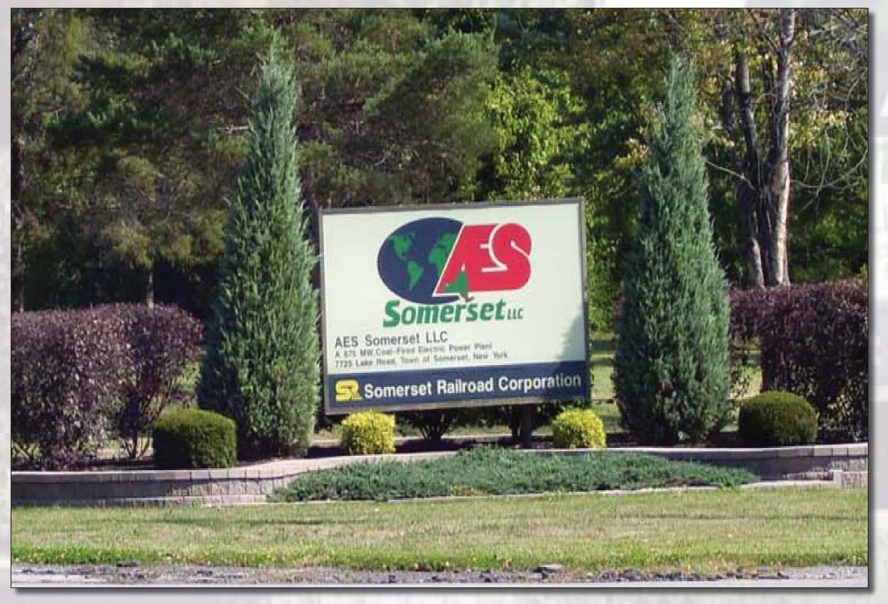
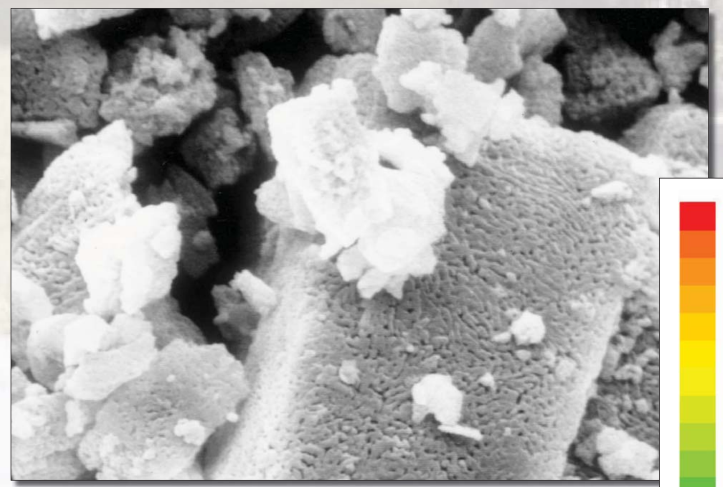
INTRODUCTION

O'Brien & Gere has succesfully 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.

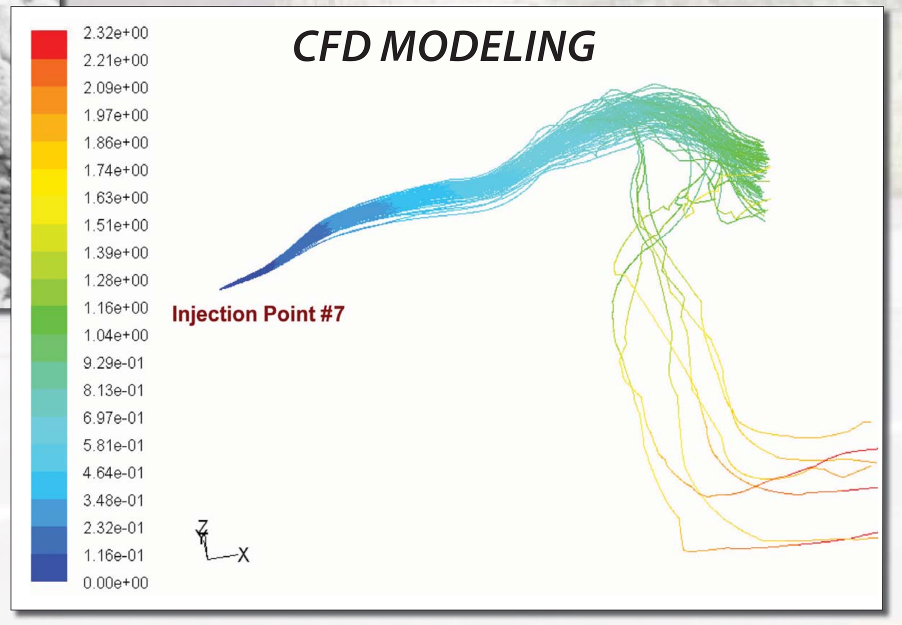
In addition, this study used SO_3 measurements at several locations in the flue gas system to determine the trona injection rate that would be needed to safely and effectively remove SO_3 at the air pre-heater inlet. Trona injection at the air pre-heater inlet lower the acid dewpoint in the flue gas 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.



AES SOMERSET, LLC - Barker, NY
Built in 1984; 1 unit @ 675 MW;
SCR and Wet FGD



TRONA - Sodium Sesquicarbonate
$Na_2CO_3 - NaHCO_3 - 2H_2O$



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

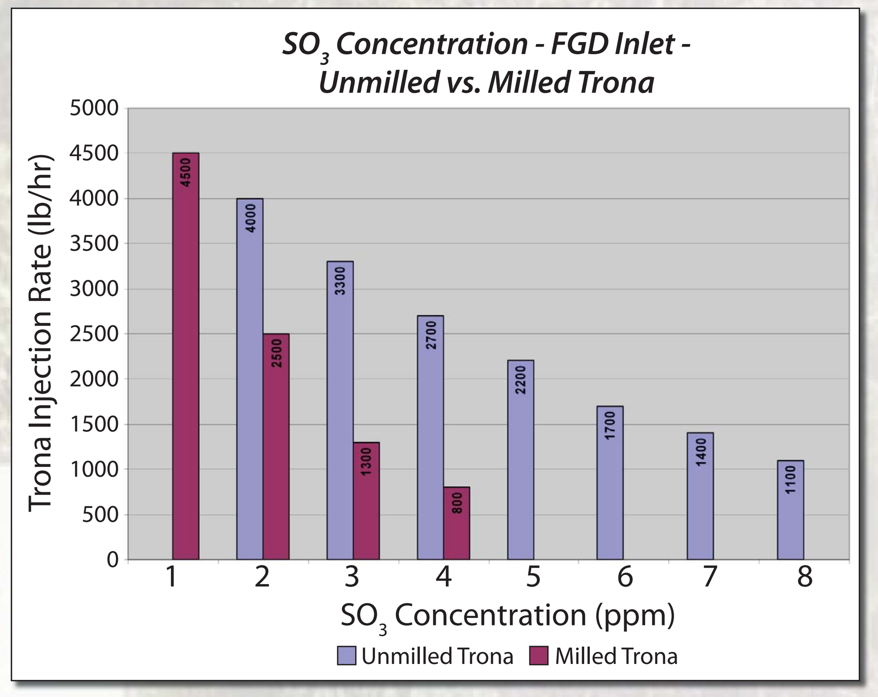
Annual cost savings: \$600,000 to \$900,000

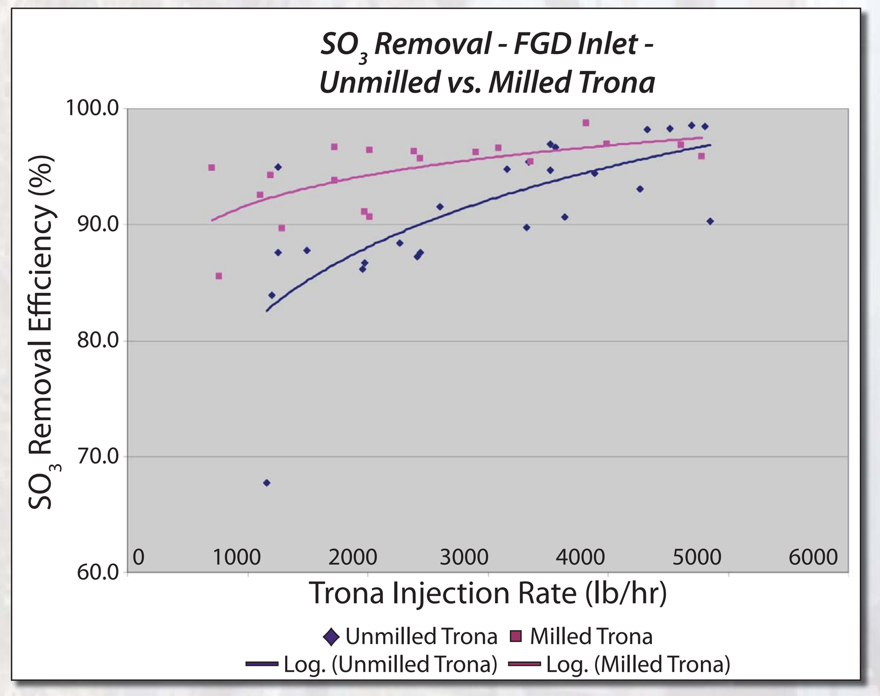
Capital cost for milling / automated cleaning system: \$600,000 to \$800,000

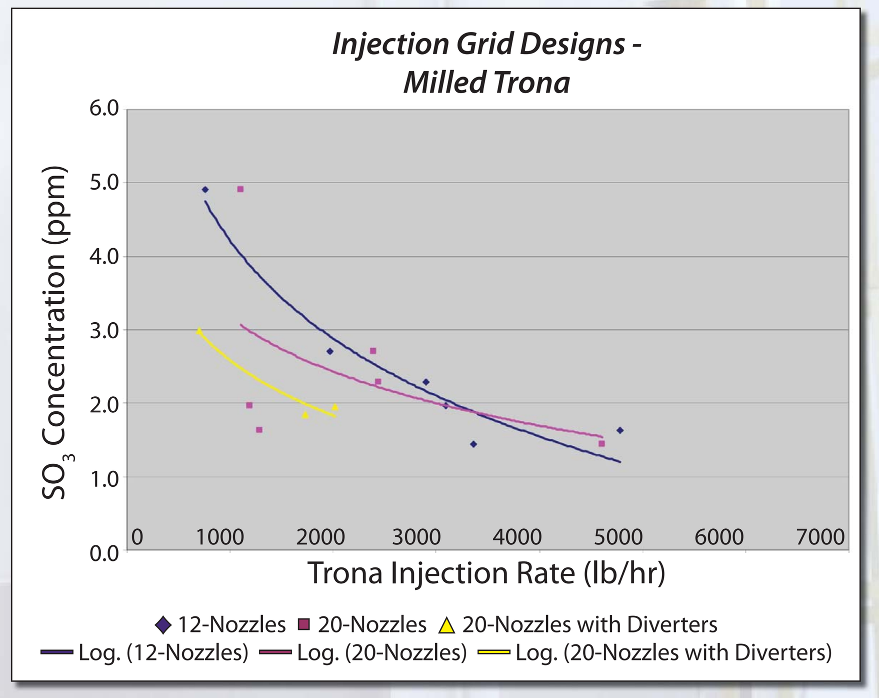
Annual operations & maintenance cost: \$140,000

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

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