



STORM'S SOAR SYSTEM FOR AUTOMATED FLUE GAS SAMPLING



In This Issue:

- STORM's Automated Flue Gas Sampling System (SOAR) Overview

Next Issue:

- HVT Testing is Still Important

Storm Technologies, Inc.

PO Box 429
Albemarle, NC 28002

Phone: (704) 983-2040
Fax: (704) 982-9657
www.stormeng.com

With emission limits growing ever tighter, efficient combustion is a necessity for most boilers to meet these lower limits. Well-tuned units are achievable when all equipment is kept in good operational condition. Many plants face a variety of tuning challenges, and it is important to keep the boilers operating efficiently and reliably. This becomes even more of a challenge when once base-loaded plants are required to chase load demand due to the increase of renewable power on the grid. When it comes to combustion tuning, STORM's automated flue gas sampling system is a great tool. It allows for more firing combinations and tuning adjustments to be made and tested in shorter timespans over the traditional manual traverses of the flue gas after the furnace exit. What does this mean for you and your plant? With the improvement in testing efficiency, your dollars spent on testing go further. Our SOAR system allows for more testing to be done with fewer testing personnel, thus allowing for more tuning adjustments and combustion improvement opportunities for less money.

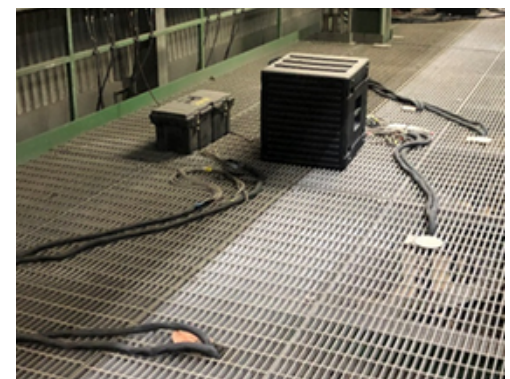
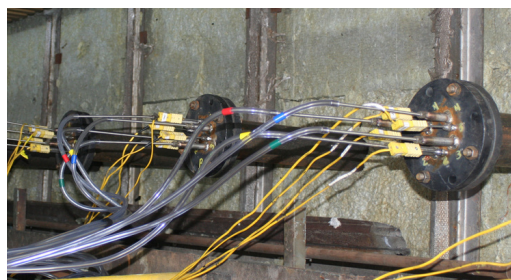
Technology has come a long way from Orsat measurements; which are very time-consuming to obtain results and use various chemicals to determine the oxygen, carbon monoxide, and carbon dioxide levels in the flue gas. With the development of portable combustion gas analyzers, gas conditioners, and multipoint probes, the testing crew manpower and the time to complete numerous tests on the boiler with various mill/burner combinations have been made more efficient.

However, manually traversing flue gas ducts can still be time-consuming and requires two to four personnel in most cases.



Manual Traversing

VS



Automated SOAR Traversing with Multipoint Probes



Figure 2: SOAR Equipment (PLC/Solenoid Box, Gas Analyzer & Gas Conditioner)

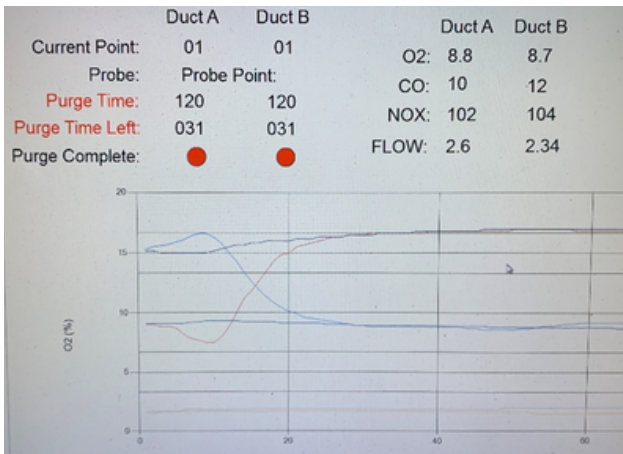


Figure 3: Real-Time Trending of Gas Constituents

Lately, this system has been used for efficient boiler tuning at several facilities around the country. Some testing and tuning efforts have been accomplished for satisfying Mercury and Air Toxics (MATs) requirements. This serves as a useful tool for fast, accurate results when tuning for optimum combustion. For example, at one facility when set up and used for tuning, a total of twenty-two tests were completed; tuning six different mill combinations in just under five days onsite by one STORM personnel. As part of this specific tuning effort and most all others, the goal is to improve the balance of flue gas within the boiler to minimize CO and NOX. The following example (right) illustrates the CO profile within the economizer duct during the baseline testing and is compared to the balance following combustion tuning utilizing the SOAR system.

This is why STORM's team of engineers and technicians worked to develop a system to further improve the efficiency of this type of testing. STORM's Automated Flue Gas Sampling System (SOAR) was developed and produced in-house over 10 years ago and has proven to be able to traverse flue gas ductwork more efficiently than manual traverses. For example, a larger backpass ductwork flue gas sampling may take four personnel testing manually as two teams and take 1-2 hours to complete a single test where 96 test points are measured. With the SOAR system, testing the same sample grid can be completed in 25-45 minutes with a single personnel. Note that total testing times can vary based on the desired sample time at each point.

By utilizing PLC controls, STORM's SOAR system uses solenoid valves with the press of a button to measure excess oxygen (%), carbon monoxide (ppm), and nitrogen oxides (ppm). The system also utilizes a PLC-controlled data acquisition system to record temperatures if the installed multipoint sampling probes are equipped with thermocouples. The major benefit of this system is its ability to quickly and accurately sample flue gas from multiple points across the duct. This allows for more tests and tuning adjustments to be completed in a single day. However, this system can also be utilized for checking pockets of CO or low excess oxygen with a "live" reading in the ductwork as adjustments are made to the burners or airflows during tuning efforts. STORM also utilizes this system in conjunction with other testing services. Depending on the plant's capability and personnel, testing can be completed at the furnace exit while the SOAR is running a test at the economizer outlet. Again, more test results with less manpower equals improved testing efficiency onsite.

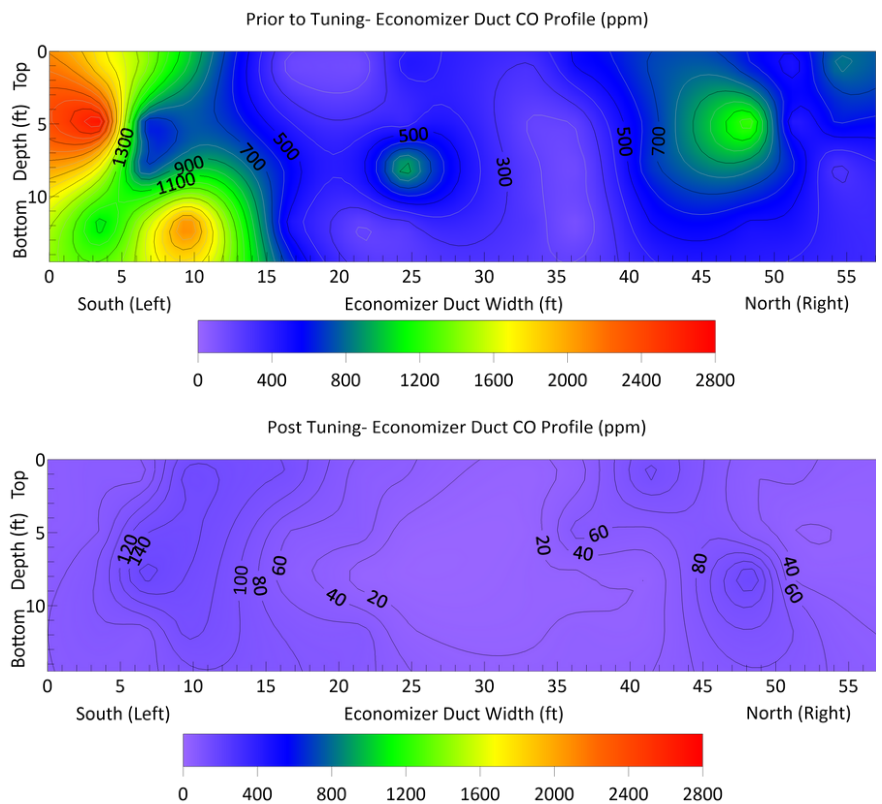


Figure 4: Pre and Post-Tuning with the SOAR System

STORM continues to focus on the fundamentals of combustion (i.e. The 13 Essentials for Optimum Combustion). These are critical for optimizing large fossil fuel-fired units. With that said, STORM's first essential goal when it comes to optimizing combustion is to have a balanced oxidizing environment in the furnace with a single point below 2% for pulverized coal-fired boilers. The downside of the SOAR system is that it is utilized at the boiler exit or economizer outlet, which can be problematic for tuning if the boiler has excessive amounts of air-in leakage upstream of the test plane. This is why STORM recommends that an HVT test also be completed in conjunction with the SOAR testing to verify in-furnace conditions at the start of tuning as well as once the final adjustments have been set. HVT testing utilizing a water-cooled probe for traversing the furnace exit grants a more in-depth look at the conditions inside the furnace. STORM has found that the results from the economizer outlet can indicate that the flue gas is balanced, and combustion appears to be great but in actuality, the furnace may have too little excess oxygen for optimum combustion. This is the primary reason that testing at the economizer alone is often not enough. The presence of reducing environments or secondary combustion could be present; sometimes masked by air-in leakage between the furnace and economizer.

Whether reducing CO or NOx levels are your goal or you are looking to tune the boiler at multiple load points with multiple mill combinations, utilizing the SOAR system can make that effort more efficient. If you are interested in working with STORM to improve the combustion at your facility, please give us a call. We look forward to supporting you and your team with the SOAR system to optimize combustion and identify areas that may have opportunities.

Respectfully,

Travis Turner

Travis Turner
Field Service Engineer
Storm Technologies, Inc.

Disclaimer: These suggestions are offered in the spirit of sharing our favorable experiences over many years. Storm Technologies, Inc. does not accept responsibility for the actions of others who may attempt to apply our suggestions without Storm Technologies' involvement.

Want to learn more?

Large Electric Utility Boiler Combustion and Performance Optimization Seminar

Visit www.stormeng.com or call
704-983-2040 for more information

Topics:

- Basic Steam Generation
- Boiler Fundamentals & Design
- Boiler Performance and Operations
- Impact on Emissions and Control
- Tuning for NOx / CO & Combustion
- Fuel Qualities and Slag Properties
- Pulverizer Performance
- Heat Rate Awareness
- Comprehensive Testing Methods
- Fundamentals of Combustion
- Water & Steam Properties

