

Diagnostic Emission Reduction Tuning With an FTIR

Background

A CleanAir client who operates a biomass electrical generation facility installed a dry sorbent injection (DSI) system to curtail HCl and SO₂ emissions. The client received a performance guarantee by the DSI system vendor. Fuel, process variability, and injection strategies were not fully considered and a small sample size of testing initially showed good HCl reduction. A few months later, more comprehensive testing was performed to confirm HCl reduction. However, HCl emissions were much higher than in the previous test. The client asked CleanAir for assistance in tuning the DSI.

CleanAir's Approach

The goal of the test program was to find the minimum injection rate of DSI that sufficiently reduces HCl well below the compliance limit. Other components measured on the FTIR included NO_x, NH₃, H₂O, and CO₂. CleanAir used an extractive Fourier Transform Infrared (FTIR) Spectrometer to monitor HCl and SO₂ upstream of the DSI injection point and at the stack (outlet of all control devices). With strategic plumbing and a network of pumps, one instrument was used for both inlet and outlet locations with minimal downtime between the two measurements allowing for near real-time HCl reduction calculations that were not skewed by fuel variability.

Results

The client, CleanAir, and the DSI vendor collaborated to find correlations in the data that corresponded not only to changes in the DSI, but also changes in other parameters such as DSI lance configuration, limestone injection, and resonance time of dry sorbent in the gas stream. In tuning the DSI rate for HCl reduction, CleanAir showed the correlations and relationships in the different pollutant types that had previously been unknown. Ultimately, the client was found to be in compliance with an average DSI rate approximately 20% less than before saving the client money on sorbent usage. CleanAir also developed a custom feedback loop strategy based on our analysis of the data that could further decrease DSI rate.



Summary

CleanAir leveraged real-time FTIR data to create correlations between process and control parameters. These correlations were used to reduce overall HCl emissions while optimizing control parameters.