AN EFFICIENT WAY TO MONITOR AND CONTROL SO_2 EMISSIONS WHILE MEASURING COMBUSTION EFFICIENCY

Importance of air pollution management is increasing for petroleum facilities worldwide due to factors such as stricter regulations, lower emission limit targets, local community relations, ESG (environmental social governance) evaluation, implementation of various carbon trading and data reporting programs.

Flare stack is a combustion device typically used to burn off excess flammable gasses during various startup, shutdown, maintenance, testing, safety, and emergency procedures.

Although the products of flare gas combustion are typically more environmentally friendly than the inputs, the associated environmental impact should still be managed. Improper flaring practices, particularly at Sulfur Recovery Plants that can result in release of sulfur dioxide (SO_2) above the required limit, and violate the plant operating permit requirements.

There are numerous health dangers associated with SO_2, and efforts are being made to control it.Various government agencies around the world, such as the European Environment Agency (EEA) and United States Environmental Protection Agency (US EPA) are implementing regulations to help manage and reduce flare gas emissions. These regulations typically require the continuous measurement and reporting of SO_2 and net heating value.

In order to reduce emissions, you must accurately measure and track them. This is why Continuous Emissions Monitoring Systems (CEMS) are used. Typical CEMS measure the flue gas in the stack after combustion. But in case of flare, the gas is measured before and the resulting SO_2 emissions are calculated in software. The gas is also composed of various hydrocarbons that need to be measured in order to accurately estimate the SO_2 emissions.

This is why a mass spectrometer was chosen for this application. A mass spectrometer uses an ionizer to convert the sample into ions, the detector then calculates the mass of each ion and outputs concentration of each hydrocarbon species. In order to reduce the costs, multiple flares are measured using a single mass spectrometer with stream switching between samples.

Over 18 hydrocarbon species were measured and reported, The SO_2 emissions are calculated based on Hydrogen Sulfide, Carbonyl Sulfide, Carbon Disulfide and flow rate.

The Limesoft Data Collection Unit (DCU) application communicates with the mass spectrometer, acquires all analog and digital values and stores the data in SQL database for the lifetime of the system. It provides control sequence programming for validation and calibration sequences, purge, blowback, sample handling, stream switching, trip point monitoring and condition-based.

The Live Measurement Data Acquisition System (LiMeDAS) application processes and validates measured data values, calculates corrected gas concentrations, computes required averages and totals (SO_2 and BTU), tracks calibrations, generates alarms, calculates availability, provides data visualization and reporting capabilities. Security is integrated in Limedas using Windows, all username and passwords are encrypted and an electronic operator logbook keeps track of logged in users and changes to the system.

As a result, Limesoft enables refinery operators to meet their environmental compliance obligations, monitor and measure combustion efficiency in real-time, enabling them to make better decisions with regards to managing their process and emissions.

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