TechnipFMC

Case Study 2022

e-Mission

Facility optimization, production increase, and vapor reduction for upstream oil and gas production

Key results

Implementing e-Mission™ Thermal at a facility in the Bakken yielded the following benefits to the oil and gas producer:

- Increase in profitability and ROI from higher oil sales volume
- Installation in less than 8 hours
- Reduction in facility emissions by 40%
- Reduction in capital cost and operating cost for vapor recovery unit
- Notifications of operational changes through TechnipFMC InsiteX and Remote Operations Center (ROC)
- Near real time emissions and incremental oil sales quantification

System features

- Interfaces and integrates with new or existing instrumentation, control systems and SCADA following cyber-security standards
- Easy to configure & calibrate IoT model for most unconventional oil facilities
- Cloud based monitoring capabilities with real-time performance data output
- Includes gateway for wireless instruments

Regulatory background

Between 2015 and 2018 the North Dakota Industrial Commission (NDIC) received nearly 60,000 quarterly VPCRx test results. A review of the test results indicates the VPCRx does not exceed 13.7 psia (11.2 psia RVPe) during many of the warmer months of any given year. Additional data from field trials, sampling, and testing indicate typical equipment operating pressures and temperatures are over-processing the oil, lowering the RVP far below the 13.7 psia NDIC requirement; therefore, unnecessarily increasing vapor emissions and decreasing the amount of oil sold. Emissions are further increased though the excess burning of fuel gas in the heater treater burners used to heat the oil. This oil over-processing is increasing capital and operating costs for producers, requiring them to purchase, install, and operate additional equipment like VRT and larger VRU compressors, while simultaneously increasing emissions and decreasing the sale of produced hydrocarbons.

e-Mission™ thermal monitoring and control field trial description

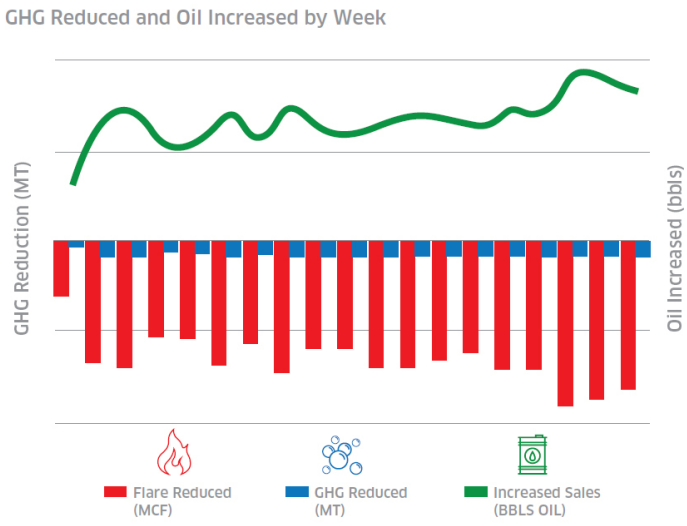
Working with a major oil producer, TechnipFMC installed the e-Mission™ Thermal monitoring and control system on multi-well facility producing 5,000 - 6,000 Barrels of Oil per Day (BOPD) in the Bakken. TechnipFMC installed wireless pressure and temperature instrumentation at key process stages at the facility to obtain the input data for the e-Mission™ Thermal system. The system computes the oil vapor pressure at the custody transfer point using these data points as well as the minimum temperature required to achieve the specified vapor pressure required for custody transfer.

A thermal mass meter was installed to quantify the flow of hydrocarbon vapor from the facility's oil tanks. Approximately 30 days of data was collected before e-Mission™ Thermal optimized the facility.

During this time, the e-Mission™ Thermal system calculated the crude oil vapor pressure, whilst oil samples were also collected. The vapor pressure of the samples was quantified using a Grabner mini-VAP system sample analyzer, configured to quantify the vapor pressure using the ASTM D6377 VPCR4 value. All data continuously streamed into the TechnipFMC InsiteX platform for remote monitoring and data collection.

e-Mission™ thermal field trial results

During the 30 days of data collection, the vapor pressure values from the e-Mission™ Thermal system and sample analyzer both indicated that the oil vapor pressure was around 8 psia. This is significantly lower than the custody transfer requirement of 13.7 psia. This indicates that the oil temperature going into the tanks is too high, which leads to excessive hydrocarbon molecules being expelled from the oil. Lowering the oil temperature would therefore result in increased oil sales and a reduction of tank vapor flow, because more hydrocarbon molecules remain in the oil phase. If the high temperature was due to excessive heat input from the upstream Heater Treater the e-Mission Thermal system would have been utilized to provide an optimal target temperature to the Heater Treater. However, in this case the Heater Treater was inactive due to the high oil temperature arriving at the facility.



To reduce the oil temperature an air-cooled exchanger was installed at the inlet of the tanks. The purpose of the air cooler is to reduce the oil temperature to the minimum required value to meet the specified custody transfer vapor pressure, thus maximizing oil sales whilst reducing tank vapor flow. Since the tank vapor at this facility is routed to a combustor, this optimization directly results in a reduction of facility emissions.

Initially the oil temperature was reduced in steps to obtain more data to compare the predicted vapor pressure and sample analyzer values. The results aligned well where the values predicted by the e-Mission™ Thermal system generally over-predicted the vapor pressure by approximately 0.5 psia throughout a range of operating conditions. No calibration or correction factors were applied during the trial. The thermal mass meter was used to record the vapor flow coming from the oil tanks. During initial cooling of the oil, the reduction of tank vapor flow was immediately obvious.

After sufficient confidence was established that the system could predict the vapor pressure, the system was configured to push an optimal oil temperature set point to the air-cooler control system to ultimately produce oil with a vapor pressure of 10 psia. The thermal mass meter indicated a reduction of tank vapor flow of over 40% compared to the 30-day baseline period. This resulted in an increase of 0.5% oil production. Later in the trial, the targeted vapor pressure setpoint was increased from 10 to 11 psia, resulting in even further tank vapor and emission reduction up to 55%.

The TechnipFMC e-Mission™ Thermal monitoring and control solution was quickly mobilized and consistently produced step-change results for the operator.

For additional information on the e-Mission-Suite, please contact us at: **e-Mission.support@technipfmc.com**

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