



FALCONEER™ IV
VIRTUAL WORKFORCE SOLUTION
For MULTIPLE HEARTH & FLUID-BED
INCINERATORS

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1 INTRODUCTION

1.1 FALCONEER™ IV REAL-TIME PROCESS PERFORMANCE SOLUTION

FALCONEER™ IV leverages the information used to design and operate the process with the real-time information from the process. FALCONEER takes the data from DCS and SCADA systems and adds “wisdom” or intelligence to the raw information. FALCONEER provides intelligence by using the plant’s process knowledge combined with the raw process data. FALCONEER comprehensively accounts for ALL process information by concurrently auditing & alerting at the highest, process-wide level as well as the individual sensor level. The key benefits of this performance auditing system should result in a more efficient plant, improved reliability and safety, and increased profitability. Real-time charts, advisory screens and reports will allow the engineer or supervisor to quickly review all the RIGHT information WHEN they need to look at it, resulting in time and efficiency savings. FALCONEER takes these tools that are normally used offline by these groups and incorporates them into a comprehensive online auditing and advisory suite. Identifying and/or preventing a single incident can often provide immediate payback with this solution.

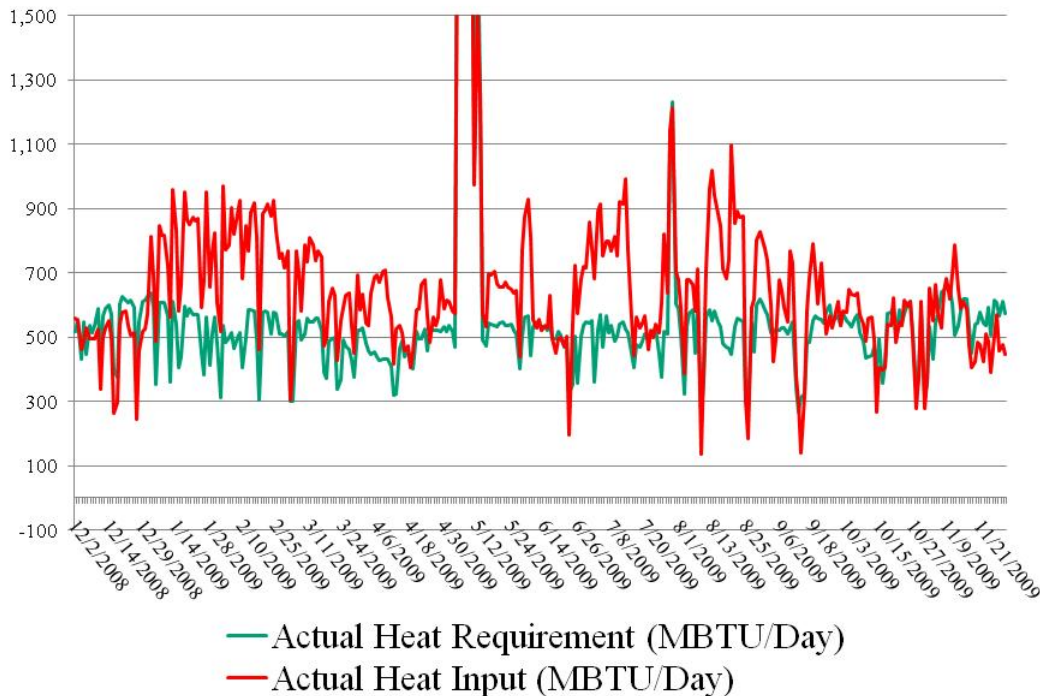
Incinerator facilities have invested in systems (SCADA, Data Historians, Networks, PCs) to generate, collect and **save operational information while also using it to improve control** over their wastewater treatment facility. However, most of the time, this information is not used and simply wasted, thus **losing the opportunity to increase the ROI on this capital investment**. **FALCONEER™ IV’s intelligent real-time process performance software solution** can help manage all the information from the process to identify energy savings opportunities. Focusing on hearth and fluid-bed incinerator systems, several prime operational targets for operation are 1) Natural Gas Cost Savings; 2) Higher, more consistent sludge feed; and 3) Real time statistical process control. In several incinerator systems, FALCONEER has looked at the cost of operation due to variable and/or below design operations, using Key Performance Indicators (KPIs) as part of the solution. The solution was designed to better identify energy and cost savings due to operational inefficiencies occurring in real-time. Once identified, the cause of the inefficiencies can be more readily corrected and/or controlled, leading to energy and cost savings.

Some facilities may have already made significant improvements in instrumentation and controls and energy cost savings around their multiple hearth incinerators and sludge centrifuge systems, reducing their gas usage by over 60% over the past few years. They



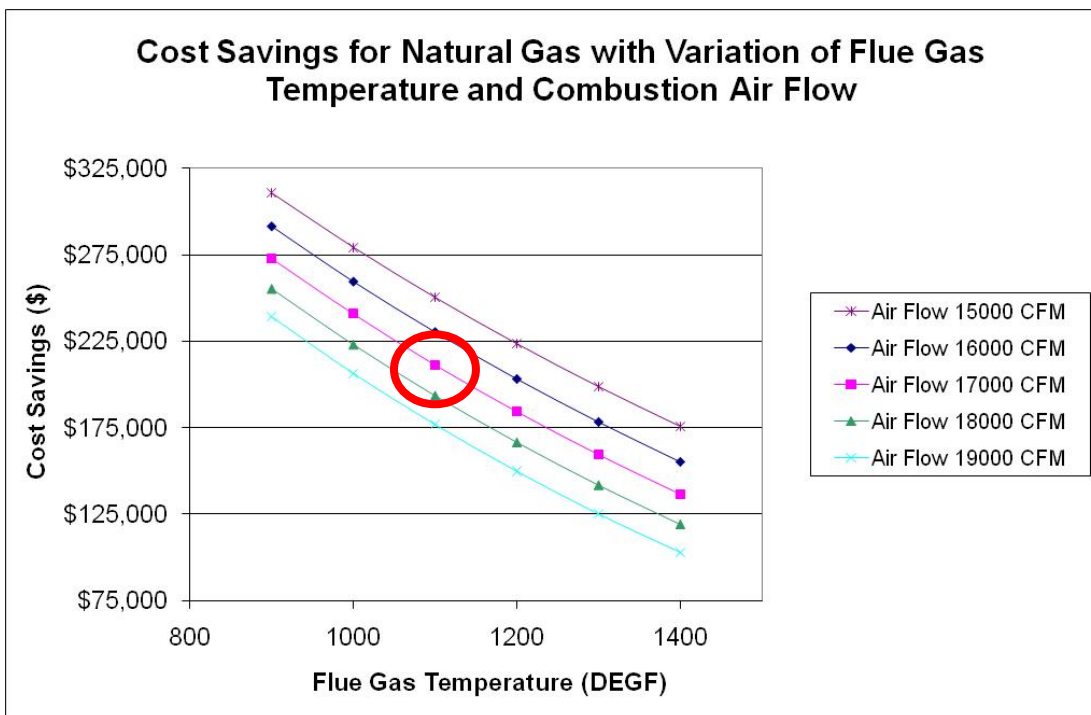
are ready to take this improvement in information and control to the next level. Such sites are interested in understanding how to optimize their use of natural gas therefore further reducing the cost of using natural gas to supplement their operational requirements. To this end, FALCONEER was asked to conduct an analysis of additional natural gas cost savings opportunities based on last year's historical data (2008 Dec to 2009 Nov) provided by a typical site. The total annual cost of natural gas usage in 2009 on incinerators and auxiliary boilers is estimated at \$1M based on this information.

Significant savings opportunities based on improved monitoring and control were identified based on 2009 usage conditions, even before optimization efforts are considered. FALCONEER can determine and track on a daily basis how much heat and gas was required for incinerator operation and how much heat and gas was actually provided by the combination of digester gas, digester sludge and natural gas. The cost savings were the difference between the natural gas fed and the natural gas actually required to make-up the heat requirement. This excess heat, which is directly related to excess gas use, and therefore the opportunity to reduce gas cost, is shown below. The **green line** in the calculated **required heat input** in MBtu per day and **the red line** is the **actual heat input** in MBtu per day. FALCONEER will help reduce and eliminate these differences.





The study also considered the benefits from additional optimization efforts. The analysis investigated variations of flue gas temperature and combustion air/flue gas flow. The savings identified above at typical current incinerator conditions are **circled in red**. The cost savings opportunities identified can be achieved by identifying and notifying operations in a timely manner for proper control actions. To this end, FALCONEER™ IV performance solution can provide real-time forecasting and calculations using the relationship between flue gas temperature, combustion air flow, THC, and natural gas feed as alarms and real time trending for operators in order to have better control over the natural gas usage without overfeeding it. Based on some conservative estimates, the likely cost savings opportunities will range from **\$150K to \$200K per year** on incinerator process area alone with good control of combustion air flow and flue gas temperature.



The FALCONEER™ IV Virtual Workforce™ solution can help at all operational levels.

1) ENGINEER TOOL

- TRACK and OPTIMIZE digester gas use and natural gas use on incinerators
- TRACK and OPTIMIZE total incinerator heat requirements & compare to actual heat use

2) OPERATOR TOOL

- IDENTIFY, ALARM on Excess Gas Use
- ADJUST with online SOPs or Troubleshooting Manual
- PROMOTE Uniform Operator Response and Knowledge

3) SUPERVISOR/MANAGER TOOL

- INFORM & REPORT – Automated Event Based and Daily on Excess Gas Use
- Track, Investigate, Educate, Control



Our solution comprises several modules providing continuous sensor and process validation and process performance auditing and optimization, sensor and process abnormal condition monitoring. Based on our experience, FALCONEER™ IV can help hearth incinerator and fluid-bed incinerator facilities **validate, insure, troubleshoot & optimize the safety and cost savings for their waste water treatment plant in a number of ways.** These benefits include:

- Determining when excess natural gas use is occurring and then alerting operators for action can save several thousands of dollars per day (5-10% of annual cost) when the adjustments are made.
 - This advisory alert can help reduce natural gas usage per ton of sludge feed.
- Identifying periods of high excess air to the incinerator and adjusting saves both natural gas costs on incinerator and electricity costs on the fan plus helps maximize waste heat recovery.
 - Excess air requires more natural gas to reduce O2 levels to optimal %.
 - Cost savings may be available by reducing excess air by better control of natural gas usage and amount of excess air input.
- Monitoring operating conditions on natural gas usage and air input can decrease variability in tons of sludge burned and increase in average tons of sludge burned.
 - Improvement on incinerator performance can help to increase the sludge feed to incinerator.
- Validating instrumentation and providing daily reports based on fault analysis for more timely identification of bad sensors.
- Process optimization and targeting operational cost improvement after corrective actions based on the performance auditing results.
- Proactive and preventative actions based on performance auditing results will allow you to identifying non-optimal conditions as they begin to occur or problems and failures as they are about to happen, and will allow for rapid corrective action that may prevent or mitigate the economic, environmental, and safety consequences.
- Validating sensor data & process information to help with control decisions and to meet environmental and safety reporting requirements
- Providing timely alerts of pending sensor, equipment or process failures or abnormal conditions to avoid unsafe operations or unscheduled shutdowns
- Troubleshooting time is reduced. Difficult problems, or multiple cause problems, are more readily diagnosed. Engineering, maintenance, and operations resources are focused where they are most needed and provide the biggest economic payback
- Saving costs from avoiding unnecessary preventative maintenance.
- Increased efficiency and minimization of high costs due to failing equipment.
- Reduction in the cost, time and resource commitment required to install and maintain your process performance application, thus allowing for a quick return on investment.
- Payback on the investment (ROI) of less than 2 years.