Automation and Measurement in a Thermal Plant

Executive Summary

The challenge in a thermal facility is to read all of the data from all of the various and differing electronic devices in the plant, possibly including a Distributed Control System (DCS) and then making sense of all that data by performing the required myriad of proper calculations and the reporting it all to your company, your partners, and the energy regulator.

The devices could be older Remote Terminal Units (RTUs) or Programmable Logic Controllers (PLCs), as well they could be newer Electronic Flow Meters (EFMs), or they could be custody transfer meters. Steam, water, everything needs to be accounted for. The regulator then requires that all the data be measured and handled like it was all from the newer EFM devices. Many companies try to, in effect, turn the traditional devices (or DCS) into an EFM. Companies will try to get the DCS to deliver all the calculations, logging, and reporting that an EFM does which is cost effectively impossible. Many plants are simply not meeting the requirements, but are trying to, with much manual effort, manual data gathering, and spreadsheet manipulation. The future is a software solution dubbed the Virtual Flow Computer (VFC).

The Solution

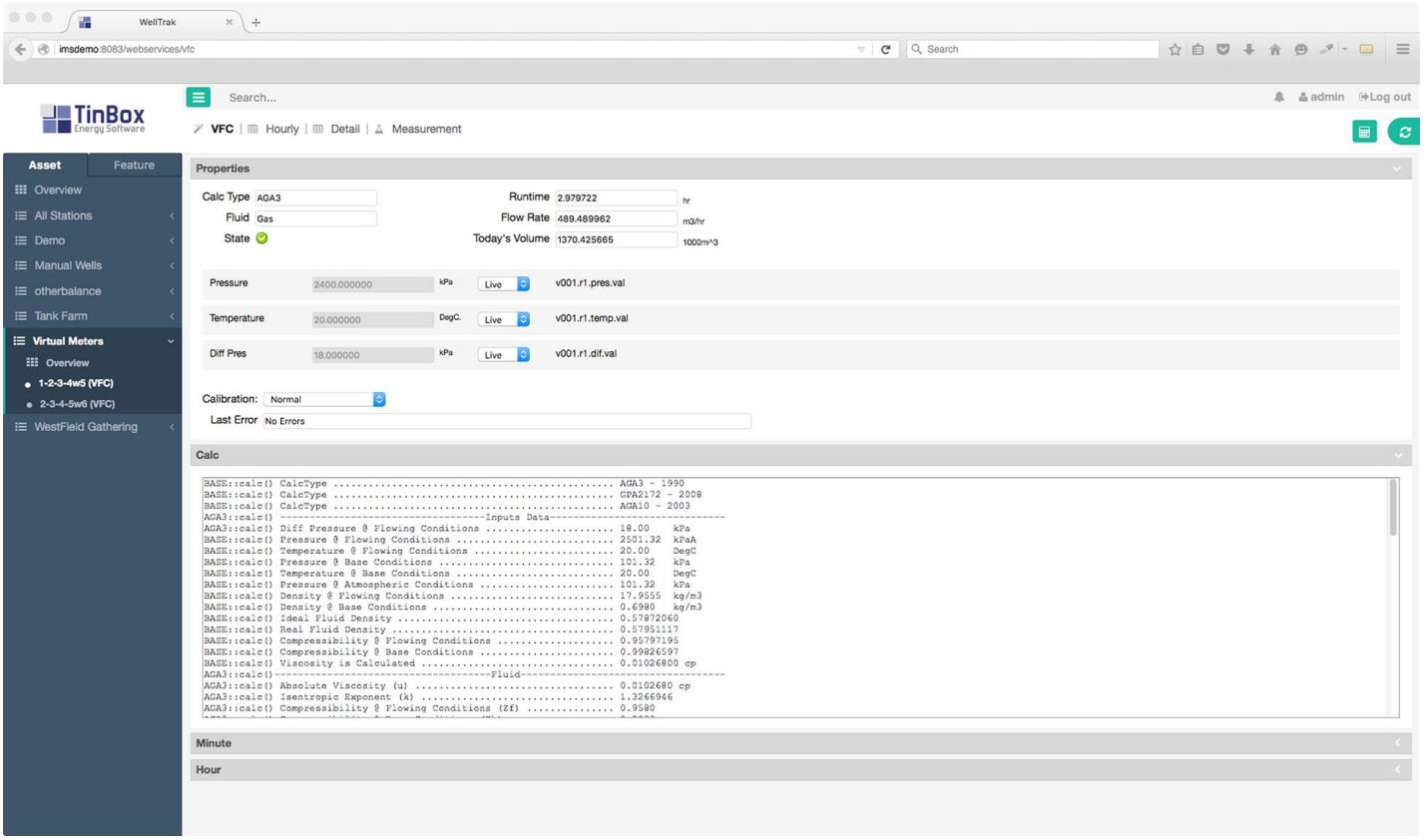
The Virtual Flow Computer is a set of software programs on one central computer server on the thermal plant's network. The VFC then gets access to all the meters and devices in the plant – this is achieved by different methods, but the VFC is programmed to understand all the devices in the plant. The VFC then receives all of the raw inputs from those devices (the temperature and pressure typically), and then performs all the work. That is, the VFC performs all the calculations and compensation calculations as defined by the industry (API, AGA etc.), in order to determine the actual flow that then is reported to your company, partners and the government. It is expensively laborious to do this work today using traditional methods (i.e. through expensive custom programming of devices or a DCS to perform those calculations). It requires more hardware (DCS) and you are using the devices to perform functions they were not built to do. All the events and alarms are also required to be logged, and the older devices do not do that.

If you don't have a DCS, then you are manually gathering the data off of the devices and performing those required calculations, and somehow manually creating the events and alarms logs. Spreadsheets are often used and many corporations are realizing that spreadsheets are a usable tool but should not be corporate data storage (certainly not for audit and validation).

This problem is quite specific to Canada where tens of millions of dollars per year are spent trying to resolve and perform these issues and tasks. The Oil Sands projects, for example, are extremely capital intensive with large complicated infrastructure of pipes and devices.

This unique problem required out of the box thinking and the development of a specialized solution – the Virtual Flow Computer. Virtual Flow Computer comes from: Virtual, simply because it is a software solution, and Flow Computer, the EFM that reads the meters and performs the calculations and logging of events and alarms (calibrations, gas analysis may be loaded into it, data extraction etc. other functions as well). The VFC can turn up to 1000 devices into EFMs through the built in functionality. This is on a standard, inexpensive server where it processes the data in Nano seconds.

The VFC is programmed with the configuration of all the devices it is intended to work with. Then the raw inputs of temperature and pressure are delivered into the VFC, which then does all the calculations and compensation calculations. The VFC has a pre-programmed set of functions to Alert if there is an issue or alarm, strict management of the data, records everything in the database for electronic ease of audit purposes, has all the Reporting built in (and ad hoc query capability), and performs and manages all the required test cases. This is very difficult to do manually with traditional devices. The VFC will perform the required 'Validation', also very difficult to do with traditional devices and DCS.
The VFC can easily have other functionality, open interfaces to other applications that could be used; such as balances, calibrations, maintenance, allocations, well test, prorations, ticket management, product densities and other valuable functionality.



In the future, there will be further complexity and more regulation and the VFC software solution can easily adapt to these changes. These are the many reasons the Virtual Flow Computer or Central EFM is being called the future for thermal plants and other applications (multi pad drilling platforms etc.)

We can provide much more information, including the specific aspects of Directive 017, that the VFC meets as well as the specific calculations, test cases, logging of events and alarms, and reporting, including EPAP. There is also detail on ROI cost savings and value available.