Incompatible Systems:

The Fallacy of Combining SCADA and Gas Measurement

by Danny Lee and Ardis Bartle

Can a single system provide both the SCADA and gas measurement functionality needed in a corporation? Based on the real-time requirements of the SCADA system vs. the historical audit trail requirements of the gas measurement system, both systems can stress the technological limits of existing hardware and software platforms. SCADA systems are a necessary tool to automate pipeline operations and provide for optimization of the manpower of the pipeline. SCADA is designed to provide real-time information. Measurement systems provide highly detailed custody transfer information to companies and their customers in order to meet existing agreements and contracts. In essence, the gas measurement system is the cash register of the company.

Historically, SCADA applications are viewed in companies as an operational tool for day to day real-time metering of the data. Rarely is this data utilized outside the control room. These SCADA systems are normally proprietary products which do not necessarily interface well with gas measurement systems or with the various other types of systems which are used to retrieve data from electronic flow meters (EFMs). In many companies, due to the proliferation of various EFMs from different manufacturers, there is not one SCADA system, but a variety of systems ranging from multiple SCADA systems to EFM manufacturers proprietary “host” communication systems to polling systems based on Man-Machine Interfaces (MMI) packages. By necessity, mature measurement systems have interfaces to all of these avenues of data retrieval, but SCADA systems frequently do not, because interfacing to other systems has not been the focus of SCADA.

Additionally, SCADA systems do not address the problem of integration of existing orifice charts. While many companies continue to replace orifice charts with EFM devices, the economic equation does not justify replacing “all” charts with EFMs in the next 10-20 years. For many producers, orifice charts may be their only record of gas flow. Measurement systems provide interfaces to chart integration equipment and SCADA does not.

Proprietary SCADA systems provide a whole group of problems that need to be recognized. For example, SCADA systems capture the data at a moment in time when the value was sampled. The quality and timeliness of this data is adequate for measuring a sample such as a rate or pressure that could easily change from one minute to the next, but this approach does not provide a complete picture of the data that is accumulated in hourly or daily intervals. Since gas measurement is recorded in hours and days, the snapshot provided by a SCADA application provides an inadequate picture of the data.

Getting back to the analogy of the “cash register”, the SCADA system is used to determine occasionally the balance in the register, while the gas measurement system records the equivalent of a proper record containing all the credit and debit transactions. SCADA systems are traditionally lacking in their ability to handle the concept of editing and manipulation of historical data. Most SCADA data is considered “write-only” and is not intended to be changed. Some SCADA systems will allow the user to manipulate historical data, but an adequate audit trail to track the changes does not exist. Generally speaking, gas measurement systems view all data as a variable that can be edited at any time. Many times this data is to be examined and/or

modified in chronological order. SCADA systems are simply not designed to allow for this type of manipulation of data.

Based on the functional requirements and capabilities of the SCADA system vs. the gas measurement system, we see numerous reasons why merging the two types of systems is unsatisfactory:

1. The SCADA system is not a suitable primary gateway for the gas measurement data collection for the following reasons:

* Not all SCADA systems support the proliferation of different RTU devices in the SCADA industry. The SCADA system could be one gateway to the gas measurement system, but not necessarily the primary one.

* Many companies rely on EFM manufacturer's software such as TotalFlow WinCCU32, Flow Automation AutoScan, or Bristol Babcock OpenBSI to retrieve their historical measurement data. The specific host software packages are capable of retrieving the complete and total audit trail needed to provide gas historical record for both hourly and or daily data.

* Orifice charts still represent a majority of the data recorders used in gas measurement. Even though there is a desire to replace these devices, it is not economically feasible to do so. Orifice charts mean that data needs to be entered in a variety of simple formats such as ASCII data files to elaborate solutions such as Chart 5 Integration Stations.

2. Real-time and historical measurement data are two totally different types of information. Regardless of whether the SCADA system utilizes a proprietary or client/server database architecture, there is no good rationale for merging this information. There are several reasons why this is not an appropriate solution:

* The SCADA system is a real-time based system, which is requiring updates in lengths of seconds, minutes or hours, based upon the polling volume of the SCADA system. Even though this may be perceived as a nominal load for a low volume of EFMs or RTUs, this can be a high volume if the devices are numerous and being polled at a frequency of a minute or less. On the other hand, the gas measurement system places high demand activities on the historical database, especially as the data arrives and is moved into its own distinct set of tables. Also, the large database files involved with storing the audited and edited data will impact the speed of the SCADA system. A small system of 200 meters might possibly have acceptable performance but a system with 10,000 meters is another matter entirely.

3. Needs of gas measurement system vs. needs of SCADA system. There are some important distinctions between the two systems, including accuracy and timeliness of data and the ability to reconcile large batches of data.

* The issue of when and where data is "time stamped" is central to the differences between normal SCADA and gas measurement processing. In a SCADA, data is retrieved and "stamped" within the SCADA system and the exact time of the retrieval is not critical. For custody transfer measurement data, it is essential that the actual field device create and timestamp records at precise intervals (normally hourly or daily). It is not feasible for a SCADA system to attempt to emulate this behavior because the SCADA cannot simultaneously access hundreds of EFMs at the top of the hour. Obviously a SCADA system can be programmed to retrieve the historical

records from the EFM, but the burden of retrieving the large amount of measurement data conflicts with the real-time SCADA requirements.

* Gas measurement systems are commonly required to export massive amounts of data to downstream systems, which is not a normal SCADA function. Any time that changes occur to the measurement data, this could cause many of the downstream operations to be affected. This intensive export process could have a major performance impact on the SCADA “real-time” processing capabilities.

4. “The Concept of Best of Breed” is defined as freedom to select the best application software available for the requirements on an as-needed basis. Merger of SCADA and gas measurement system into a single “monolithic suite” of products does not serve the gas industry well because it strictly limits the ability to choose the best software available. In the broad software marketplace, we have seen the impact of a “monolithic suite of products.” Microsoft has presented the marketplace with this concept, but has it served the best interest of the customer? With the recent ruling from the Department of Justice, the wording was “Many of these actions have harmed consumers in ways that are immediate and discernible.”[1]

Fundamentally, SCADA system and gas measurement systems have totally different functional requirements. The desire to bring both of these systems together achieves no savings in any of the following areas:

* Maintenance: Maintaining a single system still requires separate expertise in SCADA and gas measurement (and lots of finger pointing when the problem is unclear). There is no discernible savings in maintenance labor.

* Physical Hardware: There is no less physical hardware. Additionally, a combined system is a single point of failure. If SCADA is down, likewise gas measurement is down.

* There will be little to no savings in engineers, i.e., SCADA personnel will be responsible for real-time data as well as keeping the system up and running, and the gas measurement personnel will be responsible for acquiring the custody transfer data for each meter, regardless of whether it is achieved through the SCADA system or other devices. Gas Measurement personnel responsibilities include changes that affect downstream operations, which requires a completely “different” set of skills than SCADA personnel.

In conclusion, why use a crowbar to force the functions of two completely different systems into one box when there is no justifiable reason to do so? ***P&GJ***

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