

FLOW MEASUREMENT EMPOWERED

David Sonka and Vinton Lee James IV, FMC Technologies Measurement Solutions, USA, look at how new technologies have improved the lowly flow computer to aid companies in accurately managing their products.

Traditionally it is taken for granted that a flowmeter and associated flow computer will perform basic tasks; gather information, store information, and along with predicative statistics, help engineers improve accuracy, anticipate repairs, and reduce failures. Custody transfer flowmeters are essential to regulating the movement of product, and the associated currency, from cradle to grave, in the hydrocarbon industry.

With so much depending on these instruments and the many technological advances in software based human machine interfaces (HMIs), it is surprising that flow computers have not become more user friendly over the years. Most engineers accept that flow computers are not easy, or even convenient, to use, but what could be done to make flow computers better?

Over the past two years FMC Technologies has undertaken a project to create a flow computer that is flexible, accurate, and easier to use. The idea is not to add unnecessary bells and whistles, but to use new technology to enhance the performance of that steady tool that has served the industry so well over the years. This article will review the advances FMC has made and report changes that one day soon may be standard in the industry.

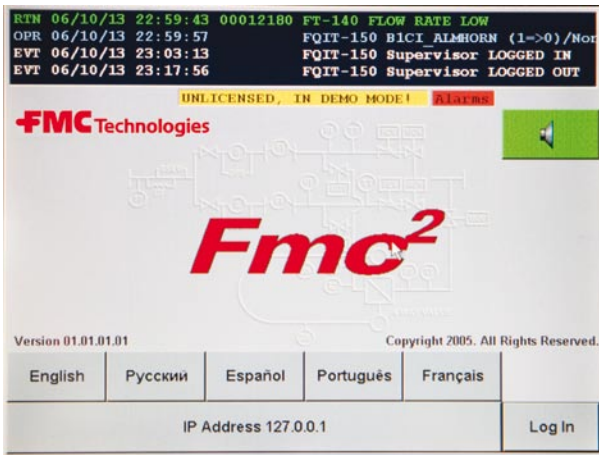


Figure 1. The *Fmc²* incorporates multiple languages that can be selected at the touch of the screen.

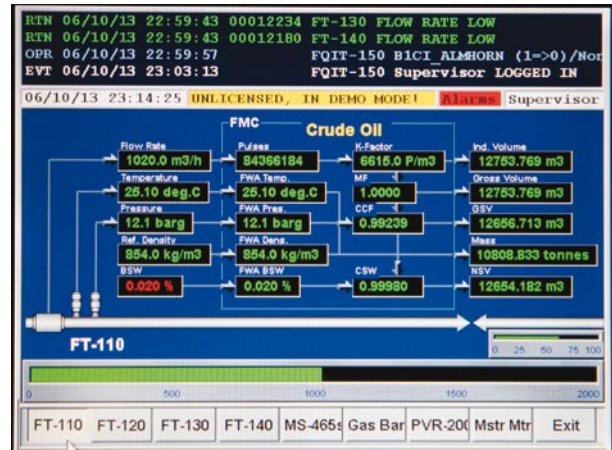


Figure 2. The meter's data display is in colour, shows abundant data, and is controlled via a touchscreen.

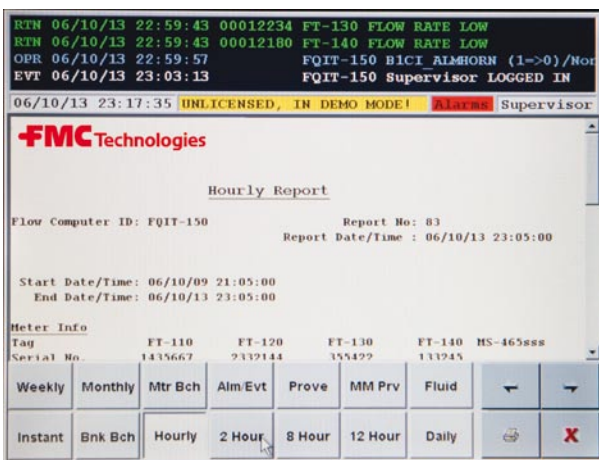


Figure 3. Onscreen viewable reports.

Getting to 'accurate' faster

In the final analysis, the accuracy of a metering system comes down to two things: repeatability of the meter, and accurate, in-situ calibration, or proving. So what is there to improve on? The answer is proper analysis of the resultant meter factors.

Regardless of what methodology is used, running mean, statistical mean, multiple linear regression, or another, analysing meter factors can be a time consuming process. Depending on the application, analysing meter factors can take up to 10% of an operator's time. FMC Technologies considered this when evaluating improvements to standard flow computers. As a result, the new *Fmc²* Flow Management Computer will do the meter factor analysis itself. The user can select between various statistical analysis methods which comply with American and International standards and set the tolerance for acceptability of the meter factor. Once deemed acceptable, the *Fmc²* can automatically accept the meter factor. This feature is available for bidirectional, unidirectional, small volume provers (SVPs) and master meter provers. In conjunction with the supervisory computer, special software displays the relationship between meter factors and process variables such as temperature, gravity, viscosity and time.

When thousands, or even millions, of dollars rest on the accuracy of custody transfers, these calculations are critical to getting measurement engineers to their goals of accuracy and confidence faster.

Human machine interface

It seems as if the HMI on flow computers have been black and white numbers on small, hard to read screens forever. This monochromatic interface has certainly been adequate as long as the operator's calculations are correct and as long as they press the right buttons when making adjustments, but the screen is often difficult to read in variable light conditions, increasing the chance of error. The new *Fmc²* Flow Management Computer uses a larger 8.4 in. LCD colour touchscreen display that presents data in both tabular and graphical form, reducing the possibility of operator error. The screen is menu-driven and adjustments are made on the screen with a single tap of a finger or stylus, just like most personal digital assistants and banking or ticket kiosks. Onscreen displays can be set to alert users with alarms, to accelerate intervention when potential problems occur. Through the visual information and auditory alarms, the *Fmc²* flow computer works with the operator to safeguard accuracy and equipment.

All at the 'touch of a screen'

The type of measurement standard a company, or country, uses to calibrate flow computers can create time consuming interpretation and increase the risk of error. Consistency of measurement standards varies across the board, from API, to ISO, to AGA or to other less common standards such as the system used in Russia. In each case, flow computers must be calibrated differently, another barrier to ease-of-use. The FMC Technologies project has found a way to solve these problems. At the touch of a screen, standards can be adjusted based on the system's installation location. Another unique feature is the *Fmc²*'s ability to adjust to numerous languages including English, Spanish, French, Russian and Portuguese. By using the measurement options and the language options, both controlled via touchscreen,

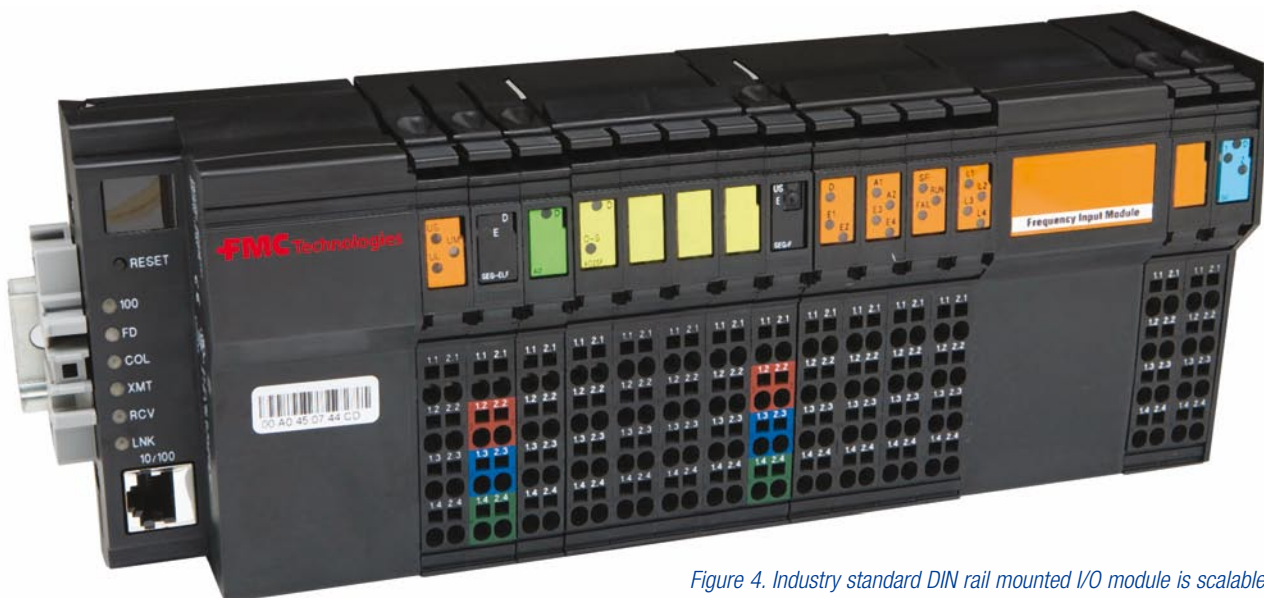


Figure 4. Industry standard DIN rail mounted I/O module is scalable.

the *Fmc*² virtually becomes a universal flow computer, something the industry had not yet developed.

Customisable configuration

No two companies or countries analyse data exactly the same way. The ability to tailor information in variable formats helps communicate the meaning of the information faster. Off the shelf, the *Fmc*² has a broad based configuration capability that allows customisation to check repeatability of a prove against a user entered maximum allowed repeatability, and a user entered required number of trips (i.e. any trips; consecutive trips, all except the outlier; standard deviation of any trips; or standard deviation of consecutive trips). Further, output data can be configured to produce customised reports, screen visuals, and English or metric measurement units.

The Modbus Master interface of the unit can be user configured to collect data from any Modbus slave device such as a gas chromatograph, an ultrasonic meter, and other flow computers. With full PI flow control functions, the *Fmc*² provides bumpless transfer modes, and selectable secondary variables, for use in override situations such as back pressure control.

Trend reports, enhanced intervention, and quality historical backup

Flow engineers are unique animals with precision running in their veins and doubt flowing through their minds. Flow engineers insist on reviewing data up, down and sideways, 'just to be sure.' That is a good thing for flow control, but generating that 'up, down, and sideways' data can take way too much time and effort. The FMC team considered data analysis as part of the project to optimise the flow computer. This led to options incorporated into the *Fmc*² that allow easy generation of standard report templates or user configured report templates that can be either printed in hard copy or displayed on the user screen. The unit archives the latest 100 historical reports of each data set. This gives users the ability to recall historical data


on any given data set to check that data set against real time information. The comparative data enables operators to take preemptive action, ultimately leading to greater availability, improved reliability, scheduled maintenance, and reduced failures. Trend screens for system diagnostics and optimisation are standard tools incorporated in the *Fmc*².

Modular, yet scalable

Most flow computer modules can be scaled today with the installation of additional hardware. But why depend on hardware for expansion? Why not software? One benefit that makes the *Fmc*² easy to upgrade to a complete supervisory control system is its scalability. This unit serves double duty by acting as a high integrity, standalone flow computer, or an integral part of a larger integrated supervisory computer control system that delivers greater flexibility and control to management. The system is designed to serve either purpose but if expansion is part of a company's future, and most companies want to expand, easy scalability is an important option.

Information accessibility

As prices rise and shipments become more valuable, decisions become more critical; availability of information from flow computers becomes even more important. The *Fmc*² has the ability to send or receive information from a DCS computer to speed access and facilitate action. The *Fmc*² allows multiple users, from anywhere in the world, to access real time screen reports of flow volumes. Anyone can see the reports, just like the onsite engineer. This may aid collaborative evaluation, and facilitate decisions about system diagnostics, repair or replacement.

Currently the *Fmc*² flow computer has been installed on multiple sites and is being beta tested by one top 10 energy company. To date, the *Fmc*² has performed as anticipated giving flow engineers more accuracy, control and flexibility in performing their jobs. If beta tests continue to confirm what flow engineers anticipate, the flow control meter of the future, will be here sooner than most can imagine! 

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