Smart Field-mounted Control Components

They obey your commands and tell you how they're doing

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You are already accustomed to the smart and versatile nature of communicating process controllers. The dumb and obedient field devices have for some time been evolving in the same way.

Access to process information and the ability to act on it is becoming faster and easier year upon year. Watch-keeping and actions that once involved a walk and poke round the plant are now being done from the control room. Archived records become readily available for environmental conformity and process fault and incident analysis.
There are impressive case histories of time and cost savings on commissioning, maintenance, asset management, process up-time and record keeping.
Control components that make this possible have **digital electronics and sensing devices built in** and are often called **smart** or **intelligent**. These are also marketing words so judge each case for yourself.
A communications cable leaving the control room calls at each component enabling you to watch and manipulate its parameters. This has bestowed great benefits onto process diagnostics, preventive maintenance and plant up time; and don't forget wiring complexity.
Components under discussion include control valves, power control devices, temperature sensors, signal converters, transducers and motor drives. Controllers, indicators and PLCs have long had smart features. They too are often remote but can still keep in touch with a control centre.

Control valves

A control valve is not often located where you can see it working. You may see its 4-20mA command signal and an analog position signal in the control room. What more could you want to do without leaving your seat?

Fieldbus Valve Positioner

- Control the valve position with a digital signal (modbus,profibus etc)
- Set the stroke (the span and zero positions of the valve)
- Make its travel linear
- Measure the applied thrust or torque
- Observe the dead band
- Measure the speed
- Count the number operations
- Measure and control the flow; usually a more relevant and linear manipulated variable than position
- Measure upstream and downstream pressures.

All these functions can be built in to a microprocessor incorporated into a control valve and exploited from the control room while the process is running.

Power Control.

Many heat processes are controlled using low-cost solid-state contactors (SSRs) operating in the time-proportioning mode. At this basic level, more features may not give you a payback and you may not even justify a load ammeter. A small but handy step up market is a bit of circuitry that compares the coincidence of a control pulse with the resulting load current and gives an alarm upon finding an inconsistency. For example; pulse present but no load current (= load open circuit); also no pulse but load current present (= short circuit SSR). This says "you'll soon be making scrap, get out here"

There are many rich control features that let you grow the SSR into a sophisticated SCR unit. Though they use traditional logic and analog techniques I rate them smart even before we turn to microprocessor use.

Communicating SCR

Some smart features of SCRs

- Soft start
- Control by voltage², current² and true power
- Transfer between these modes
- Voltage, current and power limiting and monitoring
- Line-voltage monitoring
- Receive measurements over the analog control line
- Heat sink temperature alarm
- Partial load failure alarm
- Phase unbalance monitoring and control

With communicating SSRs and SCRs access to these features over your Ethernet link enables remote adjustment, fast fault diagnosis, automatic or operator intervention and recording of load and process behaviour.

Signal Conditioner.

Signal conditioners

A typical conditioner may come with millivolts input and voltage output with 3-way (in/out/ground) isolation, adjustable gain and offset, high input impedance and a robust low-impedance at the output.

A current in/current out isolator would also offer adjustable gain and offset. It would have near zero input impedance (current sink) and very high output impedance (current source).

You find appropriately ranged models buried in flow transmitters or thermocouple heads.

Other functions include: **Inversion, thermocouple/mA with isolation, mV, Volt and mA signal scaling, custom linearizing, voltage-to-frequency (V/f) and f/V conversion, math functions, relay or logic alarm outputs.**

Many models now are field configurable in respect of magnitude and type of input and output signal. On typical models this can be done by manual adjustments and DIP switches; alternatively by a PC. LCD displays are available showing the process signal and other parameters to aid field configuration.

Using an extra module you can, with a standard browser calibrate and configure some models and view all the sensor's data directly. You can automatically trigger e-mail messages when process variables or maintenance-based performance parameters exceed preset limits.

For all that you can do from your chair, don't forget: **the best fertiliser is the farmer's foot.**