

Troubleshooting 4 to 20 mA process control systems without breaking the loop

Where pH is important

Application Note

Anyone who works in any kind of manufacturing plant knows that nothing can ruin a day faster than unscheduled downtime. The lost production time means lower output, which can have a sizable price tag. In a process plant that lost productivity can be magnified because an entire batch of a product could be ruined if the outage occurs at a critical point in the process.

Keeping processes up and running properly requires efficient and accurate troubleshooting tools. An instrument technician in the oil, gas, and chemical industry for the last 15 years knows that only too well. He's responsible for maintaining and troubleshooting pressure, flow, temperature, and pH transmitters in a chemical processing plant. As you might expect, powering down the equipment is the option of last resort.

He has been using Fluke tools since he first started in the field. "When you're working in process control, you need to have equipment that you trust; I don't know an instrument tech who doesn't almost exclusively use Fluke for all of their test equipment."

When he saw the Fluke 773 Milliamp Process Clamp Meter at a trade show in early 2011, he saw huge possibilities for using it in the plant where he works. The 773 measures milliamp (mA) signals without breaking the loop, which makes it ideal for troubleshooting the transmitters, valves, and programmable logic controllers (PLCs) found in process plants. It also sources and measures dc voltage, so it can be used to troubleshoot voltage input and output devices. The clamp section of the meter is detachable and can be used as a remote jaw, connected to the main body by an extension cable to make it



The clamp section of the Fluke 773 clamp meter is detachable, connected to the main body of the test tool by an extension cable.

easier to take measurements in tight spaces.

Finding intermittent problems without breaking the loop

"The biggest thing I've found with the 773 is that I can troubleshoot a live device without having to power down, and possibly miss something going on in the process. When you're dealing with chemicals you can have an ongoing problem that's very quick and intermittent and eventually leads to a single major breakdown. I can take the 773 to the process instrument, hook it up, observe the output, and compare it to an indicator. It can eliminate the transmitter as a point of error

in the loop using mA simulate, and the clamp meter provides its own 24-volt loop power for performing substitution and isolation tests."

Before using the 773, he had to go to the power supply, de-energize the circuit, go back to the instrument, hook the meter up in series, and then go back and re-energize the circuit and do the calibration check. "Every time I don't have to power down an instrument, it probably saves me three to four minutes per instrument, and that adds up because every hour that one of our processes is down runs several thousand dollars."

Beyond the litmus test

Most often he uses the 773 on pH transmitters. "Our process is very tough on pH measuring equipment, so I frequently have to go out in the field and verify the calibration on our pH transmitters. With the 773 I never have to power the instrument down and I can test my pH probes as well as the transmitter."

When an operator first contacts him about a problem with pH measurements, he asks the operator to take a sample of the product in process and check the pH with litmus paper. "Litmus paper doesn't lie, but it's not exact enough. So if they tell me that the litmus test is indicating that the pH is wrong then I go out and do some troubleshooting on the pH probes and the transmitters."

The process environment is harsh and can take its toll on instruments. He estimates that the problem is process related rather than instrument related probably only 20 percent of the time. "Using the 773 helps me quickly eliminate a process problem so I don't tear everything apart and start replacing parts when I don't need to."

He carries a pH scale printout that shows the correct milliamps for the product in process. He hooks up the clamp meter to the transmitter and then puts the pH probe into a standard buffer to verify that it is working correctly. "If I don't get the

milliamp reading that I expect, I know right away the probe is no good." If the probe is bad, he replaces it and runs a quick calibration using the 773. "Since it's a troubleshooting situation I can use the clamp meter to do a field calibration. Besides using the milliamp reading, I sometimes use the milliamps source function to send the signal back into my control system to make sure there isn't an issue there."

Two tests are better than one

He finds the voltage reading function in the 773 comes in especially handy. "When you're in instrumentation everything is pretty much 24 volts power and you need to make sure your loop has the correct voltage in it. If you can read the voltage and the current with the same instrument, you can troubleshoot pretty quickly to see if you have a power supply issue at the instrument."

For example, if a cable gets nicked as it's being installed, it may cause an intermittent power issue. "That's where it's a big help to be able to read the voltage with the same device that you read the current. You start by reading voltage at the instrument to find out whether you're getting good power or inconsistent power. If it shows good power, then you know that the circuit should be intact."

Separating process from instrumentation

The 773 has also come in handy in verifying reinstallations of instrumentation after maintenance. A while ago his team performed maintenance on an entire process area, removing all the instrumentation and taking it to the shop to be calibrated with the Fluke 744 Documenting Process Calibrator. They rebuilt some valves and put everything back into service. It wasn't long before plant operations noticed that the flow rates were not the same—they were a little bit lower. Also, the control valves were not opening as they had before at a certain set point.

"We were able to use the 773 clamp meter to quickly show the operations manager that our process instruments were operating exactly the way they did before the maintenance. We had the calibration from the 744 to prove that the equipment was good when it was in the shop, and after it was reinstalled we could show him that the output in milliamps matched everything that the displays on their control system were showing them. We were able to show them six or seven things in the loop really quickly because we didn't have to power anything down." It turned out there was a process problem, which they were able to find and fix quickly.

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