FLUKE®

Hubbell: Tracking down random trips and problems

with common sense, sleuthing and power analysis

Application Note

Power Quality **Case Study**

Measuring tool: Fluke 43B Power Quality Analyzer

Operator: Steve Liscinsky, project engineer for Hubbell Wiring Device-Kellems

Features used: Voltage, amplitude, frequency, harmonics, loads, currents

The electrical loads in a modern factories, office buildings, schools and other buildings can challenge electrical equipment. In the old days most electrical loads were linear—either resistive or inductive—but today many of them create huge inrush currents or severe distortion on the ac waveform. Faced with these loads, switches may fail prematurely and motion sensors and ground fault circuit interrupters may trip for no apparent reason.

Hubbell Wiring Device-Kellems, a recognized industry leader with a well-deserved reputation for innovative and reliable products, will occasionally encounter an issue that defies explanation. That's when Steve Liscinsky gets called in. Liscinsky is a project engineer with Hubbell, and it's his job to investigate such situations in the field.

Liscinsky has become pretty good at tracking down issues—especially those related to unusual applications. And his favorite tracking tool is his Fluke 43B Power Quality Analyzer. But he doesn't generally start investigating with the 43B; like a detective, he begins by questioning the witnesses—an electrician, a maintenance person, a consultant—and gathering all the information he can. What is the problem? When does it occur? What else is happening at the same time?

Once he's found out all he can by asking questions, he gets out his 43B and starts to take measurements, generally starting with voltage and everything to do with it: amplitude, frequency and harmonics. Then he looks at loads and currents, concentrating on the circuits with the Hubbell equipment. "We'll look at the hot," he says; "we'll also look at the neutrals, too, especially in three-phase circuits, because that tells you a lot. That meter is particularly good for that; the resolution goes low enough that you can see if there's a problem or imbalance somewhere."

Load-side measurements can be particularly revealing, "and one reason why I really like that meter," says Liscinsky, "because it does a nice job with measuring inrush currents." Inrush currents can be sporadic, since they depend on the point on the incoming ac waveform at which a switch or relay contact closes. One measurement often isn't enough, "so we'll have to take many measurements. Statistically, we are comfortable taking about 30 measurements to get the peak," says Liscinsky. "It'll tell us if we've got much higher inrush currents than you'd normally see with just a few measurements, especially if there are some intermittent harmonic problems. That's where the meter works really nice."

Once the cause of a problem has been found, "we have to recommend a solution, whether it be splitting the loads or de-rating whatever switchgear you've got in there because of the high inrush currents, high harmonics or whatever."

Even when the application is found to be the cause of the issue, we will still take the information that we get and go back and review the performance of our product," he explains. "Even though the products are perfectly good and they have gone through extensive UL testing for their respective ratings, we may still make design enhancements based on what we find out in the field to make an even better product.

"Sometimes a problem isn't actually caused by either the incoming ac power or an actual load attached to one of our devices." Liscinsky tells of an incident in a plastic packaging plant. One particular Hubbell motion sensor was tripping for no apparent reason. "Normally, we would first try to rule out environmental conditions, and if they looked good, we would then check the line voltage for spikes by turning loads on and off, or by using the 43B's recording function, if necessary."

So, Liscinsky put his 43B on the input power and started monitoring for voltage spikes. There were spikes that coincided with the spurious tripping, but they did not appear to be large enough to cause a malfunction. Liscinsky discovered that on the floor above, directly over the sensor, there was a machine that ultrasonically welded plastic packages shut. The floor was wood. Liscinsky asked the machine operator to whack the floor with a hammer whenever he activated the machine. Then he went back downstairs, "and sure enough I could see the little light on the motion sensor flickering when the machine was being activated."

It turned out that the welding machine produced a big magnetic pulse, and that was enough to trip the sensor. "There was such high power," he says, "you could see the spike it put on the power line, but you would not have thought that it should have caused the sensor to false trip. But the spike on the power line did clue us into the welding machine because of the timing of the spike versus the trip."

Liscinsky also utilizes the 43B to demonstrate the situations to customers. When he finds a problem such as high inrush current, he can hand the 43B to the customer and show them what he has found. "The screen is large and easy to read. I can say to the customer, you hold this, and you read off the inrush current to me while I activate the load and take the numbers down," he says. "So the customer can actually see the readings, and they can witness the issue just by looking at the screen."

Liscinsky's advice for tracking down problems is to start by getting as much information as possible before going to the site. "Even if it ends up not being data you are not going to use, get as many clues as possible; that way when you go in to look at the application you have some kind of a logical plan of attack."

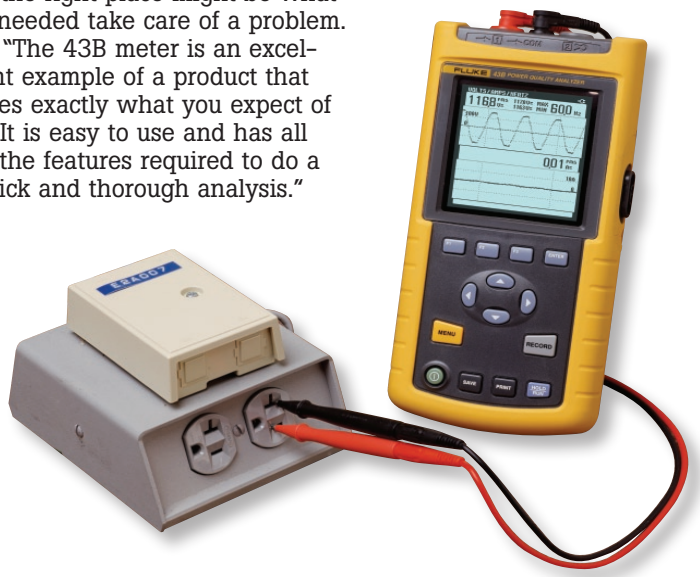
Once on-site, try to get together as many people as needed. "You may want to have the original electrician who did the installations there," he explains. "You have to find out who you need, as well as what you need."

Then set out to find the source of the problem. Run through everything, even if it doesn't seem to be involved. "If I don't think the voltage is a problem, even if I think immediately it's a load problem, yet if I am at the panel, I'll still do all the measurements, because it really doesn't take too long."

If measurements of voltage, current and wave shapes don't show anything in real time, especially with intermittent problems, then go to the record modes. "You can use them to record some suspected noise event. Your two choices, or the two steps are; try to initiate the power disturbance yourself by turning loads on and off, and if that doesn't reveal a problem, put the 43B in a longer record mode and wait for the power line disturbance."

Experience also helps. "The customer will explain the problem, and when you go in there and you see the actual application, a little bell goes off in your head saying, "I've seen this before and this is what I'm going to do first. That can save some time checking certain things." He cites as an example the case of an extruding machine in a manufacturing plant. "They were using our ground-fault current interrupting devices and they would trip when a high power 480 V drive started up," he says. "Immediately we went to look at the input voltage waveform to the GFCIs, looking for distortion of the wave, and it was there, a huge amount of distortion." In half an hour the problem was solved: "All we had to do was recommend the proper product for the application. This specific application required a device such as Hubbell's Industrial Grade GFCI which provides enhanced EMI filtering." In other cases, adding an isolation transformer, a line filter or a capacitor in the right place might be what is needed take care of a problem.

"The 43B meter is an excellent example of a product that does exactly what you expect of it. It is easy to use and has all of the features required to do a quick and thorough analysis."



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Web access: http://www.fluke.com

Printed in U.S.A. 6/2009 3497382A AW-EN-N