

WHOI electrical personnel set up the Fluke 434 with current clamps and a voltage probe across the three-phase panel and left it monitoring the peaks and dips for almost two weeks. Analysis of the collected data revealed a bad connection somewhere in the panel, and the Ti30 was then brought in to locate it.

A scan of the panel with the infrared camera revealed an overheating bolt lug on a connection to the compressor in the building's central air conditioning and air quality systems. "We pulled the bolt off and found that for some reason there were threads missing on the inside portion of the bolt," Gagne recalls "The nut felt tight, but the lug was a little loose. It had arc welded itself to the bus bar. Carbon in between was causing significant resistance. With the tag team of the 434 and the Ti30, we were able to solve the problem."

Onboard solutions

Gagne's Fluke instruments are also used onboard the vessels. "We've always had some harmonics problems on our vessels. On the Knorr, for example, distortions took away from the amount of power on the grid and were causing problems with the onboard generators. We used the Fluke 434 to isolate distortion producing loads and then installed filters to remove them. On one vessel, we simply moved the filter closer to the source, and that solved the problem. Initially, the filter had been installed in the wrong place."

Besides isolating and correcting power quality issues such as harmonic distortion, the instruments are also used to troubleshoot the ships' onboard 480-volt electrical systems and their diesel/electrics propulsion systems. But one of the most interesting and revealing onboard problems was one that was detected but not corrected.

The problem was a large fan that normally circulates air in the engine room for the generator intake. Readings using the Fluke 434 Power Quality Analyzer indicated some anomalies in the power to the fan. The electricians discounted the readings, but they shouldn't have.

In retrospect, here's what happened: At one point, the fan was pulled to the stack for circulation because maintenance was occurring in the stack. The armored, low-voltage cable to the fan, which penetrated through the deck via a water-tight arrangement called a kick tube, was laid to its side, and it cracked, a condition covered over by many coats of paint. The analyzer detected the elevated phase current but nothing was done about it until, in Gagne's words, "Moisture and other contaminants got in there and (ultimately) it just blew. It blew, blew!"

The electronics manager laments that had WHOI personnel believed what the instrument was telling them they might have averted the failure. "One of the things we're going to have to do," he says, "is learn to trust what the instruments tell us. The tool was doing its job quite well. It recorded a small arcing condition, but we ignored it because the instrument was new to us. The oversight was hard to swallow at the time."

An additional onshore solution

One other issue Gagne addressed with the Fluke instruments concerned two shore-to-ship power cables that feed 400-amp, 480-volt, three-phase power to docked vessels from onshore generators. Voltage sags onboard a ship at the dock were apparent when power was being supplied over one of these six-inch diameter umbilicals. In response, Gagne set up the Fluke 434 on the transformer pedestal and monitored voltage and current for

a whole weekend. At the same time, onboard voltmeters monitored what was happening on the ship.

Gagne reports, "The voltage stayed the same on the shore side but the current dipped. The voltmeters on the ship were indicating the same thing. There was some sort of a voltage drop in between. Next, I took the Ti30 and just started walking along the cable, and at one point, it started showing some different colors. At the same time I could see that there were some scrapes on the cable."

The electronic manager reasoned that at some time in the past, the cable got pinched between the vessel and the dock, possibly damaging the dielectric (insulation) inside. A physical examination revealed that Gagne's opinion was correct. A crew made a temporary repair using a special waterproof splice. Once the cable was fixed, everything functioned well, and an order was placed for a new cable.



