FLUKE®

Use Study

HVAC Applications

Name: Bob Axelson

Title: Chief Engineer – Facilities Administration

Company: STARZ Entertainment

"Having worked in the air conditioning industry in the deep South, Northeast, and now the mountain region, I have experienced numerous issues that the ability to understand and compare critical data is imperative to correctly diagnose issues."

"What would I use a wireless measurement system for?"

Charting voltage, amperage, and temperature variances

The ability to chart voltage and amperage in conjunction with temperature is a much-needed tool in our industry. Having worked in the air conditioning industry in the deep South, Northeast, and now the mountain region, I have experienced numerous issues that the ability to understand and compare critical data is imperative to correctly diagnose issues.

Voltage, amperage, and temperature variances cause problems with a lot of gear—from delicate electronics to multi-ton air conditioning equipment. Being able to reliably track variations over a period of time can be the only way to properly diagnose operational problems.

For example, Liebert CRAC control transformers provide multiple high-voltage taps from 460–495 volts to achieve the proper low voltage output to convert to 5.0 volts dc to power their processor. If you get out of the needed 5.0 range, problems and/or damage can occur effecting the unit operation. On many occasions we would rely on all three combinations of voltage, amperage, and temperature to correctly diagnose problems. Having the ability to time stamp and chart variances gives you the ability to deal with the power provider, equipment vendor, and/or the customer with precise information. This can be imperative when dealing with warranty issues and providing the proper solution to what can be a complicated issue.

On more than a few occasions, I have had gear that has either tripped breakers or blown fuses and shut down. This is complicated by the fact that the equipment will have been off for a period of time and will indicate no issues on restart. All testing will show the gear to be operating within specified manufacturer parameters making diagnosing problems difficult or impossible. What this equipment is serving can make this issue either an annoyance, such as a rooftop air conditioner serving an office area, or a disaster if it is cooling a data center. Proper diagnosis is imperative in either case. Restarting the problem gear and attaching the wireless voltage modules to the incoming power legs, and the wireless amperage modules to the specific offending device, along with the wireless temperature module, you could watch for issues without living at the site. The ability to place the recording module separate from the other modules would allow you to keep it safe and out of the weather. The results would be apparent and time stamped allowing for correct and proper diagnosis. We would see a voltage variance, an increase in amperage, or an overheating condition all with a time stamp. This would allow a correct diagnosis and repair, saving time and money, and improve the tech's reputation with the customer.

The Fluke wireless system

One central meter that receives wireless voltage, amperage and temperature readings from multiple sister meters placed in a variety of locations up to 20 meters away.

FLUKE®

Use Study

Electrical applications

Name: Bill Weindorf

Title: Foreman
Maintenance Electrician

Company:
Metropolitan Electric

"A big advantage with the Fluke system is we could place the modules inside the enclosure and close it so that they stay clean and the enclosure is safe"

"What would I use a wireless measurement system for?"

A four-man recording meter

The Fluke wireless system is like a four-man recording meter. You could put modules inside an enclosure and record data for an extended period of time, then download the data for a load study or to look for trends.

If you were troubleshooting a power quality issue, you would look at voltage and current to verify how they interact. When the voltage decreases and the current doesn't change or only changes slightly, the source of the problem is upstream from the point of measurement. When the voltage decreases and the current increases the source of the problem is downstream from the point of measurement. You'd use voltage and current modules around the conductors of the circuit under test and monitor all the readings on the DMM to see how they move together. If you have a load that varies, you want to see it move up and down and what it does to the voltage. Having remote modules for this is great because it reduces the safety risk.

We do a lot of load studies at cell sites. When a mobile carrier adds more equipment at a site, they need to know if the electrical service is adequate to handle the increase. I would put the current modules around the service conductors that supply power to the cell site to log data and monitor them over a period of time to see if there's enough capacity to add more load.

We had floats in a sanitary pump station that would "dial out" to notify us when they had a fault—which they were doing frequently. Being able to put wireless modules around the float contacts to log data and monitor more than one measurement simultaneously would be very helpful in determining what was causing the problem. In this scenario, we would use three voltage modules across the float contacts to record when the floats open and close. We'd leave them on for an extended period of time—these things always seem to occur at 2 or 3 in the morning. A big advantage with the Fluke system is we could place the modules inside the enclosure and close it so that they stay clean and the enclosure is safe.

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Use Study

Transportation application

Name: Pat Weldon

Title: Manager of Electrical Infrastructure and Support

Company:
A commercial airline

"The modular design of the Fluke system and its ability to take simultaneous readings would be very helpful. Many problems are intermittent and we can't have technicians standing at a panel forever."

"What would I use a wireless measurement system for?"

Equipping an entire team of technicians

The Fluke wireless system would be very helpful in our monthly testing of UPS units, remote power panels (RPP) and power distribution units (PDU). The cabinets have their own monitoring systems built in, but they are not always as accurate as we'd like them to be, so we verify them by taking amperage and voltage measurements on a regular basis. Instead of using an expensive power quality meter, I could hang current and voltage modules inside the cabinets of the RPP and PDU and leave them for a period of time to measure balances and voltage fluctuations.

We have 36 technicians and I can't give them all power quality meters, but I could give them the Fluke wireless system to take measurements, which would be a big advantage for our predictive maintenance program.

We are continuously checking power and load issues as part of our general maintenance activities. The modular design of the Fluke system and its ability to take simultaneous readings would be very helpful. Many problems are intermittent and we can't have technicians standing at a panel forever. Being able to hang modules to log data would be very advantageous.

The size and wireless capabilities would come in handy. For example, if you're in a cabinet, you can hook up the modules on one side and then walk around to the front to flip switches and get readings. In the datacenter, there are some cabinets where there is no room to set a meter down. With the Fluke system you could hang the modules, close the cabinet and get your readings.

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Use Study

Hospital application

Name: Jon Pike

Title: Engineering Tech

Company: Healthcare organization

"The Fluke wireless system would allow us to measure a wide voltage range, moderately high currents, and temperature in a single system."

"What would I use a wireless measurement system for?"

Creating a more complex "instant data acquisition system"

The Fluke wireless system would be very handy for large-scale projects as well as the development and troubleshooting of test systems. I work in an R&D environment, so we're often developing test setups for new things, which sometimes results in a scattered layout of stuff. Being able to attach measurement modules in various places some distance apart would really help.

Fluke's wireless system opens the possibility of creating a more complex "instant data acquisition system" on short notice. If there's a time sensitive troubleshooting situation—say a test rack in a manufacturing line goes down—gathering a lot of info quickly is important. A flexible system of different measuring capabilities that you could quickly set up on the fly for a specific situation would be valuable.

For example, our department supports Manufacturing, where they have refrigerator-sized test racks specialized for a manufacturing product stage. There may be several kinds of these on the floor. One has a large table-like test area with a fixture on top, a printed circuit board (PCB) under the fixture block, and off-the-shelf scopes, meters, power supplies, and control computer in the rest of the rack.

The PCB, which has much of the switching and control circuitry, is attached underneath the test fixture block and is not removable. It's not feasible to try to dismount the whole assembly from the rack for a variety of reasons, so you are forced to lay on your back, with the bottom cover off, reaching up into the bottom of the "tabletop" to probe, attach meters, etc. It's a position we (not very) affectionately call "changing the oil." You might need to observe some other points elsewhere in the rack, which gets challenging to put both meters in your view down on the floor where you crane your neck sideways to look at them while laying on your back. With the Fluke wireless system, we could attach the modules on the PCB and other places and look at the results while standing next to it.

Often, we want to do data logging over various amounts of time; we have a few types of data loggers we use for that. They tend to be somewhat specialized, so they aren't as flexible as a typical DVM or current meter. The Fluke wireless system would allow us to measure a wide voltage range, moderately high currents, and temperature in a single system. And, with the battery life of the modules, we could use them for long-term measuring situations where a normal meter would not work.

For reporting, we like to display data logged info in various Excel graphs. Having one consistent data format instead of two or three that we have to convert and input would simplify and speed up reporting.

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Use Study

Electrical applications

Name: Bill Wedge

Title: President

Company:
Wedge Electric, Inc.

"The Fluke wireless system modules could be connected to potentially dangerous voltage, safely guarded behind closed panel doors, and easily monitored wirelessly with vastly reduced exposure to hazardous conditions. This is a win win!"

"What would I use a wireless measurement system for?"

It's like having a virtual second or third man on site at all times

To troubleshoot an intermittent motor overload condition—providing the motor is not faulty—I would connect the wireless voltage module of the Fluke wireless system to the motor starter within the motor control center (MCC), the wireless current module in the field disconnect switch adjacent to the motor, and the temperature module at the motor. I could then verify and view the supply voltage, current, and temperature all on the central multimeter while it was operating. Further evaluation would be required to isolate cause of problem, but one person could narrow the variables down quickly. The modules could be left in place and periodically viewed and logged by one person or multiple personnel within different shifts, and/or modules left in place auto logging data and downloaded later for review.

To commission an air handler unit, you would connect the voltage module to the supply fan overcurrent protective device, the current module to the supply fan "T" leads at the variable frequency drive (VFD), and secure the temperature module in the discharge air plenum or adjacent to the discharge air sensor. Multiple operation parameters could be simultaneously verified, simplifying calibrating the 0–10 V dc analog input signal from the discharge air sensor to the VFD for supply fan speed reference.

And, to troubleshoot a sporadic extruder barrel heater zone where multiple control enclosures are located on different floors of a three-level platform, you would connect the voltage module to the silicon controlled rectifier (SCR) for the suspect zone, the current module to the heater load conductors, and the temperature module to the barrel zone heater. Since measurements could be obtained at any level of the platform, one person, instead of two or three, could collect them.

The personal protective equipment (PPE) required by modern safety standards, while important, inherently add risk through loss of dexterity and color impairment from the yellow shield, which requires a flashlight to distinguish between blue and green "conductors." And while power should always be de-energized with lock-out/tag-out provisions, it's not always permissible. The Fluke wireless system modules could be connected to potentially dangerous voltage, safely guarded behind closed panel doors, and easily monitored wirelessly with vastly reduced exposure to hazardous conditions. This is a win win!

Basic voltage, current, and temperature wireless modules cover many testing and troubleshooting scenarios, and imagine the possibilities of additional modules such as thermal imaging, video, or programmable camera to capture potential future electrical failures and hazards. The Fluke wireless system would enable one person to perform multiple tasks safely with modules placed in separate enclosures and readings obtained anywhere in the general vicinity. It's like having a virtual second or third man on site at all times.

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FLUKE®

Use Study

Industrial applications

Name: Tim Rao

Title: Senior Control Specialist

Company: University utility plant

"The system has great advantages in dirty areas. Instead of running equipment with the panel open, hang the module on the panel, close it, and run the equipment at a safe distance while it is going through start up or procedures, so the control or junction box doesn't get filled with contaminants."

"What would I use a wireless measurement system for?"

Clean, safe measurements

In our case there are a number of things a Fluke wireless system would be useful for:

Using two voltage wireless modules, connect one to a boiler feed water valve controller output to the feed water valve positioner, and connect the second voltage module to the feed water valves feedback to the controller. Now you can monitor the feed water valve command and its position feedback signal at the same time when calibrating the feed water valve positioner. The remote reading means you can connect these modules at the controller and have the display at the valve where you would make the adjustments.

Using two voltage wireless modules, connect one to a boiler force draft fan damper command and the second voltage module to the minimum airflow switch. Now you can find the minimum damper position to meet the minimum airflow without having to be on top of the boiler, a ladder, or a lift.

The system has great advantages in dirty areas. Instead of running equipment with the panel open, hang the module on the panel, close it, and run the equipment at a safe distance while it is going through start up or procedures, so the control or junction box doesn't get filled with contaminants. For example, a coal fired power plant where there is soot around the equipment, a plating process, or any wet locations. You can use a mixture of modules to monitor the status of the equipment by connecting them to the circuit, closing the cover, resealing it from the environment.

A lot of times there are intermittent issues. To troubleshoot them you would put the module on the panel, and if it's within 20 meters, take the DMM to the shop and monitor it as it goes through the operations. Let's say in a manufacturing plant there is a robotic arm that has an intermittent fault. You can't connect a standard meter to it and let it operate because it will be moving about and can hit you. With the Fluke system you could monitor multiple readings by attaching the modules to the arm and stand a safe distance from its movements.

It would also work well for safely monitoring multiple voltage readings. Attach the modules while the equipment is off, close it, energize it, and watch it as it runs. You can monitor all three phases remotely and simultaneously and you don't need to worry about arc flash or wearing protective gear. Let's say you have a 408 vac 200 HP motor wye-delta start. I can disconnect power and open the motor control center (MCC) cabinet without needing personal protective equipment (PPE). Then connect three hard jaw clamp amp modules—one per phase—to measure three-phase current. Or, connect three voltage modules or a combination of them. Close the MCC cabinet, re-apply power and start the motor. Now I can take all the measurements without needing PPE.

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FLUKE®

Use Study

Industrial applications

Name: Rick Ramirez

Title: Power Station Electrician

Company: Utility company

"By taking simultaneous measurements, the Fluke system would give us a complete picture of the event"

"What would I use a wireless measurement system for?"

Simultaneous readings on two different floors

With the Fluke wireless system, we could do load surveys on various panels. We would attach current and voltage probes on both phases and the neutral, let them take readings over time, and look at the measurements to see if the load is balanced.

The voltage on our 480 V feeders drops quite a bit when the 5000HP 480 V boiler feed pump starts up. The UPS pulls from the motor control center (MCC) in the room below, so we would put voltage and current modules on the UPS panel, the MCC where the power comes in and wiring going to the bucket to determine if the problem is in the bucket, the wiring to the bucket, or the UPS. With the Fluke wireless system we could take simultaneous readings on two floors and compare values in real time.

In case of a system blackout with loss of auxiliary power, we employ an emergency backup lube oil pump (EBOP), which we test every year to measure the start up time. The EBOP is set to start when the pressure drops to 10 pounds-per-square-inch (psi) and not let the pressure drop below 2 psi to prevent loss of oil pressure on the bearings, which would wipe them out. With the Fluke wireless system, we would measure the feed current going to the motor, voltage at the motor and voltage at the battery bank with the chargers turned off to check how fast the EBOP comes up. We'd then run it another 30 minutes to confirm that the dc batteries last long enough to allow the turbine to spin down without losing oil pressure. By taking simultaneous measurements, the Fluke system would give us a complete picture of the event.

We are presently looking at a way of testing the temperature at the exhaust end of our peaking unit engines. The rear vibration probes do not last long and we feel it might be heat—which may exceed 1000 °F—causing the problem. We would place the temperature module next to the vibration probe to read the temperature after a run. Since we never know when the unit will run, we would log data from the sensors, wait until the unit runs—normally the unit goes to full load (135 MW) and then goes down to 10-20 MW load running as a spinning reserve until shut down—then retrieve the data from the modules for analysis.

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Use Study

Industrial applications

Name: Leigh Copp

Title: Engineering and Business Unit Manager

Company: Linamar Advanced Systems Group

"The Fluke system would be a very cost effective way to measure four points of variables either in real time or by logging the data."

"What would I use a wireless measurement system for?"

A very cost effective way to measure four variables simultaneously

Very frequently we're taking multiple measurements to validate equipment. A Fluke system that could wirelessly measure and/or log data from multiple sources simultaneously would be phenomenal.

The best applications for this system would be in process control. Any system with a reference signal needs to have that signal validated to make sure it's doing what it should be. It could be a valve and I want to measure temperature and flow, or with an induction power supply I would want to monitor the inputs and outputs simultaneously to see what they are doing. We would monitor the 0–10 V or 4–20 mA dc reference signal with the base unit, while monitoring the power feedback with another dc input, and ac output voltage and/or current (this is 800 VAC RMS, 3–30 kHz in this case).

Data recorders have limited input capability, and unless you spend a lot of money, they also have limited memory and you might have to put on additional signal conditioning. Correlating the data can also be difficult. The Fluke system would be a very cost effective way to measure four points of variables either in real time or by logging the data. I could place ac current and voltage modules on the incoming and output lines and process all at the same time to very quickly validate where my problems are.

We had an induction power supply that consistently indicated it was running at 65 percent output, when, intermittently it was actually making 32 percent. It took us a year to figure out the problem and it only happened because a technician was standing next to it when it did three cycles in a row. He actually took a picture of the screen with his camera-phone to document it. The Fluke wireless system would have nailed it in short order.

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FLUKE®

Use Study

Industrial applications

Name: Dave Buhrmester

Title: Owner

Company: Element

"I see the Fluke wireless system as a digital clipboard, interrogating running equipment and taking readings from the installed modules. The wireless interface would speed up walkthroughs and inspections in multiple locations."

"What would I use a wireless measurement system for?"

Speeding up walkthroughs and inspections

In an industrial environment, you usually have building rounds consisting of a technician walking around with a clipboard taking readings, checking equipment, etc. I see the Fluke wireless system as a digital clipboard, interrogating running equipment and taking readings from the installed modules. The wireless interface would speed up walkthroughs and inspections in multiple locations.

We have installed a new walk-in chamber and we plan on loading and unloading product at various times. Without getting too technical and using ambient temperature intrusion load calculations, I want to know what kind of temperature rise I will have with the door open for a set amount of time, so I can install an alarm if the temperature gets too warm. I would place temperature modules at the back of the evaporator bank, a module suspended in the center of the room, and one near the chamber door. Attachment points are a pipe wrap at the evaporator, a hook off of one of the lights for the center of the room, and a magnetic pad for near the door. With the DMM in the Fluke wireless system, I would set up the parameters for the study, start the data logging function on the modules, and then monitor the readings with the door open over time.

I have a pump motor that occasionally blows a fuse and I am not able to determine an obvious cause. I would set up the current module in an electrical disconnect to monitor the amps and see what causes the event—or at least the timing of the event. I would secure the module to the side of the disconnect and feed the module wires through a ½-inch knock-out. By the next morning, I would have the answer.

I have a critical piece of cooling equipment and through an unknown cause some of the refrigerant was lost and required charging. I was going to go out of range and needed to correct the situation immediately. All of my manifold gages were in use, so what can I do? With the Fluke wireless system, I would put a current module (flex clamp) on the compressor feed line off the disconnect, a temperature module on the suction line, and a temperature module on the discharge line. I would then take a lone refrigerant hose connected to a refrigerant container and start the charge. Using the amp readings on the compressor and temperature readings I would be able to put a correct charge in the system.

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