

## Standardizing on clamp meters for HVAC service

### Application Note



### Testing Functions Case Study

MacDonald-Miller Facility Solutions is a leading construction, engineering, control systems and building services firm headquartered in Seattle, WA. The company's Building Services group is the largest commercial HVAC service company in the Northwest, with offices located throughout Western Washington and into Oregon. They provide maintenance, repair, overhaul, and installation of everything from centrifugal and reciprocating refrigeration systems to electronic building control systems. They also perform air balancing, chemical treatment of water systems, plumbing, and electrical services and have extensive experience with specialized applications such as clean rooms, computer rooms, research labs, and medical and testing facilities.

Eric Sundby is a service foreman in the Everett, WA office; he supervises ten field technicians who work on all aspects of HVAC, doing heating, cooling and associated measurements, electrical test on motors pumps, compressors, electric boilers, furnaces and flame signals and the list goes on.

The facilities cover "pretty much everything commercial," says Sundby, from retail strip malls to light commercial structures to high-rises to biotech facilities, including hospitals, medical facilities and clean rooms used in research and development. They also work on cell sites, cell towers, switch stations and telecommunication hubs.

MacDonald-Miller has standardized on the Fluke 902 Clamp Meter for daily maintenance work, using 80 of the instruments for the day-in, day-out voltage, current and temperature readings. "For the day-to-day stuff the Fluke 902 is pretty much our workhorse," says Sundby.

In addition to a 902, each technician carries his or her choice of personal instruments; Sundby carries Fluke Model 77 and 23 Digital Multimeters, and a 52 temperature probe "for doing other things, when I need to get a little more technical." Several technicians also have calibrators that make it possible to test 4 mA to 20 mA and low voltage 0 V to 10 V dc, 2 V dc to 10 V dc signals. The company also has some Fluke 789 meters in service for control work and trouble shooting.

**Tools:** Fluke 902 True-rms HVAC Clamp Meter

**Tester:** Eric Sundby is a service foreman, MacDonald-Miller Facility Solutions

**Tests:** Voltage and current tests, phase imbalances in both voltage and current, and surface temperature

Checking temperature differences across the exchanger, very verify chiller barrel performance.





Liquid line temperature measurements for subcooling.

### Picking a meter

MacDonald-Miller didn't choose the 902 on a whim. They did their research, looking for a utilitarian meter that would make the measurements needed, that would be reliable ("these guys trust the meters with their lives," says Sundby), that would handle the day-to-day banging around common to field maintenance, and that would handle the environment. While not the deciding factor, cost was important as well, considering the number of meters involved.

### All in a day's work

While it would be difficult to define a typical day for Sundby's crew—"Nothing is ever really typical, because we're so well versed," he explains—a typical job with rotating equipment involves using the 902 to do voltage and current tests, and phase imbalances in both voltage and current. Measurements on the rest of an HVAC system include temperatures on pressure, suction, discharge and liquid refrigerant lines. "We do delta Ts across the evaporator coils and across the condenser

coils, and we check suction temperature, discharge and liquid temperatures," Sundby explains. "We use the 902 for that, too, because it's our all-in one; they just switch a lead and they can change to their temperature and they got surface probes they use and off they go."

### Knowledge is power

The regularity of maintenance work is the source of much of its effectiveness. As technicians work on motors, says Sundby, they make records of the reading they take and enter them into a database for predictive maintenance purposes. "We try to trend it, we try to keep a running log on what equipment looks like, and if we start seeing failures we're trying to predict failures," he explains.

They would like to implement a full asset management system that would collect equipment history and also connect to the accounting software and construction departments, and have been working at it for several years. There's still a ways to go to gaining that edge, but predictive maintenance goes on all the

same. "For the most part the guys are consistent on their workload," he explains. "They kind of remember and they know what's been going on; they start watching for that trend of motors going downhill and that type of thing."

### Good work takes training

Maintenance work on commercial and industrial HVAC equipment is not a trivial task, and making sure the people who do it are up to the task involves more than just providing them with the proper test instruments. Most newly-hired technicians are graduates of a two-year associate's degree program at a community college or tech school, Sundby explains. When they're hired by MacDonald-Miller or another union contractor they enter a union apprenticeship program that lasts for four years—or five, for those who don't have that associate's degree. And even after six years the training doesn't stop. The company maintains a large training facility in Seattle. "We put on three-hour classes twice a week," says Sundby. "The guys come in at night and get fed and get to learn about new products and testing and programming, whatever it happens to be," from refrigeration to safety. In addition, suppliers conduct classes on everything from meters to variable frequency drives.

You'd think that union wages, a solid company and a job that can't be outsourced overseas would attract lots of applicants, but Sundby reports that it's getting more and more difficult to find qualified people. He'd like to see more encouragement for young people to consider alternatives to a four-year college program. As he says, "not everybody's going to be happy with a desk job."

After all, Sundby says, part of what's made this country great "is manpower, and labor, and quality work."

**Safety first**

Safety is an area of increasing concern for everyone involved in electrical work. Sundby cites increasing emphasis on the requirements of the NFPA 70E Standard for Electrical Safety in the Workplace. The standard covers electrical safety requirements for employees involved in the installation of electric conductors, electric equipment, signaling and communications conductors and equipment, and raceways. A big part of it is concerned with protection against Arc-Flash. While the standard has been around since 1996, Sundby says, it has moved to the forefront, starting with a change in clothing. Polyester is out, and flame retardant cotton is

in, along with the proper gloves. Lockout/Tagout is getting more attention as well, but the work that the MacDonald-Miller field techs do involves live equipment: "You can't do too much testing on equipment that's sitting there," he says.

**Summary**

MacDonald-Miller's servicing operation must handle a wide variety of tasks on different types of equipment. By standardizing on just a few Fluke instruments and by providing its people with strong training and support the company has been able to increase the effectiveness of its operations and cut costs at the same time. All in all, it's a win-win situation.



Taking current measurements at a 480 V chiller control, looking for phase imbalances.

**Growing green facilities**

MacDonald-Miller has another, greener arm of the business. Led by Perry England, the sustainable, eco-friendly Building Performance group helps customers plan, build, retrofit, and maintain building environmental systems for maximum efficiency and reliability.

Following LEED, Green Globes, Lean Design, and other practices, the group has built a uniquely integrated understanding of green building automation technologies. Some classic reliability practices transfer over, such as preventive maintenance and equipment modernization. What's different is the layer of documentation and highly networked tools for data analysis and trending. England says the change makes good business sense.

Customers are demanding green building efficiency and changes in financial lending models increasingly support it.

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