



Is That A Tingle She Feels?

A lesson in data logging from down on the farm

Our thanks to Fluke Corp for allowing us to reprint the following article.

The next time you get frustrated because you can't find the source of some stray transients that are playing havoc with your electrical system, think of the dairy cow in Minnesota that right this minute is snuggling up to a digital multimeter (DMM).

Stray voltage, it turns out, can seriously stress dairy cows, inhibiting a herd's milk production. Dairy farmers for years have been on the hunt for places within barns that could produce unwanted stray voltage, from improperly grounded equipment to the metal stanchions at the cows' feeding stations. The results of the damage have been clear - injured or stressed cows at worst, reduced milk production at best - but most of the research so far has been academic, and a controlled research project in a university lab just doesn't adequately measure conditions on a real dairy farm.

That's why Chuck and Wanda Untiedt of Lakefield, Minn., for the last year have been using Fluke Corporation 89-IV digital multimeters and a Fluke software program that turns the DMM readings into graphs and charts to find out exactly what impact the farm's power supply system is having on their herd of 350 dairy cows.

"We're in the real world out here on the dairy farm," Chuck Untiedt says. "It's not a controlled situation."

The Untiedts have more in common with electrical technicians than you might think. If a DMM strapped to the edge of a dairy cow's milk stanchion can handle the cold and damp of a Minnesota dairy farm, it is sure to provide the level of sensitivity and ruggedness to troubleshoot your operations. Yours don't typically involve large farm animals, but the data logging techniques the Untiedt's are using come straight from the frontlines of power supply troubleshooting.

"In fact, we're taking our lead directly from industry," Chuck Untiedt says. "We're just now doing what electrical technicians have been doing for years."

Untiedt remembers the day his veterinarian saw firsthand what was happening on his farm. "Five cows were drinking from a plastic, insulated water tank," he says. "The instant the water started to flow in, the cows pulled back. They wouldn't return until the tank was full."

"We had tested those tanks many times and had found no electricity. Then one day we put a probe in the water

and another to the concrete floor where the cows stood. We found we were getting electrical shock when the water flowed into the tank."

By using Fluke DMMs to test any number of locations around the farm, the Untiedt's have found unexpected areas of electrical activity from concrete pads to areas around transformers that have registered readings strong enough for the cows to feel it. "We first take voltage readings to find potential problem areas," Untiedt says. "We then test using a 470 ohm resistor, to simulate a cow's resistance factor."

The philosophy for years has been to even out any stray voltage so that it impacts all cow contact points equally, Untiedt says. "This is the 'bird on a wire' approach. We're taking a radically different approach," he says. "We want to keep current away from our cows altogether. They don't like it, even in very small quantities."

The couple started Untiedt's Udder Chaos in 1959 with one calf. They take their responsibility to their animals seriously enough to decide that if they can't create a safe environment for their herd, they'll be forced to leave the business. The Untiedt's are rewiring substantial portions of their farm and now are zeroing in on the toughest issues of all, the basic power quality being supplied to the farm by the local utility company. While they, other dairy farmers and farm industry experts work to raise awareness among utilities about the critical nature of incoming power quality, the Untiedt's are continuing to test their entire operation for refinements they can make onsite to protect the herd from the effects of hidden current. Logging DMM readings over extended periods of time, they analyze the sessions using FlukeView®Forms software, which allows them to display the results of up to eight extended logging sessions on one printout.

"You can set the DMMs up all over the farm," Chuck Untiedt said. "You can let them record up to three days. That means you can look at three days of data about what's been happening on your farm. At this point, we've done thousands of readings, collected hundreds of pages of analysis."

Dairy farmers traditionally have been told that as long as their farms are wired to comply with the electrical code, they have nothing to worry about. That's no longer true.

The Untiedts' measurements have proven that any place there are two contact points - places cows come in contact with potential conductors, such as water, metal or concrete - there's a measurable chance for trouble.

"Our message is, if dairy farmers are assuming their cows are not getting current and they're not measuring, they simply don't know," Untiedt said.

Interestingly, the Untiedts have found no problem in some of the most obvious places. They've worked closely with the manufacturers of their milking machines, for example, and found no problems there. It's the unexpected places, the damp concrete standing pads, the water tank and other surprising places that have been pinpointed by the DMM readings.

"We're looking at minute amounts," Untiedt says. "What we're finding is that it matters a lot. We're including not only safety for cows, but for humans as well."

In the case of the Untiedt farm, a condition on the utility secondary distribution was inducing voltage on the neutral. They're changing to a four-wire system and running a separate neutral and ground back to the voltage source, allowing more of the neutral current to return to the transformer.

"We've got a few more changes to make and then we're going to go back, re-measure and see what differences we find."

They're now monitoring the power supply at the transformer to see what quality of power is coming onto the farm. They've recorded significant voltage sags and swells, which make Untiedt leery.

Even before getting to the power quality questions, the Untiedts have spent thousands of dollars rewiring their farm to make it as safe and comfortable for their herd as possible. They hope to alert others in their own and similar industries to something electrical technicians have known from Day 1: stray voltage, enough to do damage, can lurk in the most unlikely places.

That's why these days, on behalf of his cows, Untiedt takes nothing for granted, and he's urging others to check the safety of their environments as well. "Luckily, you don't have to be a rocket scientist to use these meters," he says. "If you can turn a dial and punch a couple of buttons, you're set. With the Fluke DMMs and with FlukeView Forms, anyone can log and printout accurate measurements."

Troubleshooting tips from a dairy farm

DMMs and software provide the readings and analysis capabilities to solve stubborn troubleshooting problems

The testing system at the Untiedt Udder Chaos Farm uses Fluke digital multimeters and FlukeView Forms, a software package that allows users to take readings from Fluke test meters and graphically view them on a Windows PC. While the measurements themselves yield valuable information, it is the ability to chart and analyze the results of multiple data logging sessions that is turning the farm's electrical system from a minefield of stray voltage into a safer environment for humans and animals.

FlukeView Forms works with a range of Fluke meters and thermometers, including the powerful 187 and 189 DMM models. FlukeView Forms Version 2, recently released, displays data taken over time from up to eight meters on a single form, allowing troubleshooters to easily compare comprehensive data that then can be printed for further analysis, if required.

The capability to view and analyze data logged over time is particularly valuable for commercial and electrical contractors, plant maintenance engineers, and electronic and R&D engineers who need to document measurements over a period of time. FlukeView Forms makes it possible to log data as events, which then are easily uploaded to a PC – either from a meter's memory or real-time from the meter itself – and automatically displayed in graphs and tables.

That ability to incorporate information from multiple meters allows easy graphical comparison on the same form of data taken at different times, particularly important when performing extended tests from various locations. Time stamps record elapsed times of logged readings. And because users set the parameters of significant and insignificant readings recorded during any logging session, data is more valuable without the "noise" of irrelevant fluctuations.

FlukeView Forms can be set to automatically upload data from memory or can log data from a meter in real time while it is connected to a PC. Graphs and tables automatically adjust to correctly display the type of readings required. The software includes many pre-defined forms from which to choose or allows users to build customized forms using the FlukeView Forms Designer tool, which is included.