

Building a sustainable hardwood industry one tree at a time

Application Note



Testing Functions Case Study

20 percent troubleshooting and 80 percent preventive maintenance

Typically we hear about industrial customers having to troubleshoot a variety of parameters on three-phase power. The volts or amps might be high or low. Or they might find harmonics on the neutral. Or maybe they find a voltage drop or a short. In this case, the customer had to first turn single-phase power into three-phase power...and you think you have challenges!

In 2007, Ben Deumling at the age of 25 decided to build a sustainable sawmill in the midst of Zena Forest in Rickreall, Oregon, just north of Salem. The forest has been managed by the Deumling family since 1985, and continues under the supervision of Ben's mother, Sarah.

The forest includes one of the largest blocks of mixed conifers in the central Willamette Valley. It also encompasses large areas of endangered oak savannah and oak woodland and habitats for a variety of threatened and endangered animal species. A conservation easement prohibits any development and stipulates that the forest will remain a working forest in perpetuity, abiding by strict harvest levels.

A small but mighty oak producer

The sawmill operation, called Zena Forest Products, produces approximately 50,000 board feet of lumber per year—mostly Oregon white oak and western big leaf maple, along with some Douglas fir. That is about as much as the large traditional mills in the area cut by lunchtime each day. However, Deumling is targeting a more specialized market.

"I'm selling to a particular segment of the industry that's looking for very high quality wood products that come from a local forest that is being managed for the long term," says Deumling. "I'm basically working to build a small, vibrant hardwood industry on the West Coast, one tree at a time."

Tools: Fluke 87V Digital Multimeter and Fluke 62 Infrared Thermometer

Operator: Ben Deumling, Zena Forest Products

Applications: Test capacitors, check bearing temperature

The Fluke 62 MAX+ is Ben's go-to tool for checking the internal temperature of the custom-made dry kin. If the heat is too high the wood will dry too fast and cup, split, or warp.





Ben Deumling designed and built all the buildings and mechanical systems at the mill. Since three-phase power ends five miles down the road, Ben uses the single-phase power on the property, running it through the rotary phase converter for the three-phase-powered equipment, such as the saw. Ben uses the Fluke 87V for preventive maintenance on each of the capacitors to keep the equipment running.



One of Zena Forests Products' dry kilns has a problem with fuses blowing. When this happens, Ben grabs his Fluke 87V DMM, powers down the kiln, and checks the fuse bank for the blown fuse.

The Zena mill's capacity is sized to match the capacity of the forest. A majority of the logs in the mill come from his family's forest and the rest come from neighboring forests. "If we were to increase the capacity of the mill we would be overtaxing this forest," says Deumling. "Going forward, as the health and quality of the forest increases, that capacity should go up a little bit."

The lumber in the warehouse on any given day was likely cut more than a year earlier. In the interim it's gone through the sawing, drying, and milling process, which takes about seven to nine months. The operation also includes a lumber drying kiln, which produces lumber to sell to furniture and cabinet makers.

Turning single-phase power to three-phase power

Deumling and his two employees share all the lumber production tasks. Deumling alone is in charge of equipment maintenance and repair. He set up all of the equipment and performs preventive maintenance and troubleshooting. Of course, his first challenge was getting industrial strength electrical service.

The Zena sawmill is located in the middle of the forest and is the last meter on the power line. Getting three-phase power direct from the power company isn't an option. But three-phase power is a necessity because all of the mill equipment runs on three-phase motors.

The solution was to set up a rotary phase converter that turns standard power into three-phase power. The converter consists of a big motor and a bank of about 50 capacitors to produce the third electrical leg. Once the converter was set up, everything went along fine for a year or so, and then one day, several of the capacitors in the start circuit exploded.

Since the phase converter is critical to keeping the saws, planer, and kiln running, and those are critical to keeping the mill in business, Deumling had to act fast. "I knew that some of the capacitors had exploded but I didn't know why," says Deumling. To solve the first problem, he quickly ordered replacement capacitors. To find out why, he purchased a Fluke 87V Digital Multimeter.

Deumling knew about Fluke tools from a childhood friend who grew up to become an electrical engineer. "He was the one who told me that I needed a digital multimeter that could test capacitance. I did some research and found that the Fluke 87V had that capability," says Deumling.

Before he replaced the capacitors he checked all the existing capacitors in the phase converter and found that several had failed in addition to the ones that had exploded. All of the ones that had failed were in the start circuit. "That led me to test the centrifugal switch—first manually, and then I ran a continuity test with the 87V," says Deumling.

The centrifugal switch is supposed to open once it reaches a certain RPM and then cut power to half of the capacitors. The test showed that the switch wasn't opening, so the power remained at full throttle, overcharging the capacitors until they exploded.

Deumling fixed the switch, replaced the capacitors, and rechecked them with the 87V. He now tests the capacitors and the switch with the 87V about once a year.

A truly multi-use multimeter

Over the years, Deumling has gotten a lot of use out of the 87V, using it to:

- Periodically check voltages on the lines from the phase converter to make sure they're in balance
- Test complex control wiring on the dry kilns he built and other new equipment as it is brought online
- Perform routine electrical diagnostic work, such as checking continuity on motor circuits, testing fuses in motor control circuits, and checking all kinds of batteries.

Because Zena Forest Products serves such a niche market, customer service and on-time delivery are critical to its success. To help ensure that, Deumling pays close attention to maintaining his equipment, sometimes on a daily basis, to ensure optimum performance. He estimates that the time required to maintain his equipment averages about 20 percent troubleshooting and 80 percent preventive maintenance.

One of his most common daily tasks is to check the bearings on his big two-wheel, hydraulic-controlled band saw with the Fluke 62 Infrared Thermometer. Before running this daily check, Deumling was replacing bearings every three or four months. At about \$300 a bearing, that got expensive.

Typically he runs the saw for a couple of hours and then checks the bearing temperature with the Fluke 62 to see if they're running too hot. If they are he applies some grease. He uses the same process to check the bearings in his other woodworking machines—although less frequently because that equipment is used less often.

"Being able to properly maintain them has definitely extended bearing life dramatically. I've kept the same bearings going for about four years now," says Deumling.

The same philosophy seems to guide Deumling's approach to keeping both his woodworking equipment and his lumber business healthy. That philosophy is sustainability.

"Our goal is to maintain the forest for future generations, so that some of the trees I have planted will someday be sawed up by my grandchildren," says Deumling.

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