

MagCap Engineering article in Industrial Maintenance & Plant Operations Magazine.

Field Report: September 2002

Perkin Elmer Corp. is a Norwalk, CT-based manufacturer of life-science systems and analytical instruments. Among other products, the company's Optoelectronics business produces thyratrons, fast acting, high-energy switches capable of operations up to 20 kA and 75 kV. They are typically used in applications such as gas laser, radar, and other modulator applications.

Before they leave the factory, all Perkin Elmer Optoelectronic thyratrons undergo a testing and burn-in or "aging" procedure to ensure that they will hold their rated voltage. In this process, the unit is started at relatively low anode and heater voltages, which are gradually increased over a period of time until full ratings are attained. This aging process smoothes microscopic pits and protrusions on the electrode surfaces, removes trace contaminants, and burns off any cathode coating that may have condensed on insulators or electrodes. Testing follows to ensure that the thyatron performs to specified parameters.

To carry out this testing and aging, the company employs 15 different modulator kits. Some are the size of a small room, measuring up to 16 x 8 x 8 ft. The modulator kits are designed for the company's range of thyratrons of different capacities and sizes. When any of the modulator kits goes offline, production is delayed.

A critical component of each modulator kit is its charging choke, a large metal case or "can" that holds inductors, which are large coils of heavy wire wrapped around a fiberglass tube. The inside of the can is filled with insulating oil to prevent arcing between the inductor to the case. Charging chokes, which can be the size of a refrigerator and weigh some 500 lbs., limit the current coming out of the power supply.

Last year, a problem developed in one of four modulator kits. Senior engineer David O'Brien speculates that the faulty choke may have been an original unit, "meaning it would be more than 40 years old," he says. "The kit would occasionally shut itself down automatically. Sometimes after it cooled off, it would work again, but over time it got worse until it wouldn't run anymore. Under the constant stress of 30,000 volts, it was arcing and shorting out. We realized that it was at the end of its useful life. Not only had the insulating properties of the PCB oil broken down, 13 gallons of that toxic waste presented us with a disposal problem."

The company initially planned to replace the choke. Because the original manufacturer was no longer in business, Perkin Elmer Optoelectronics obtained a competitor's quote for a new unit matching the original specifications. It would cost more than \$50,000. Compounding this expense would have been 16 weeks of lead-time, while thyatron production would be cut 25%, with only three of the four modulator kits in operation.

O'Brien considered alternatives. He had previously done business with MagCap Engineering, LLC, a Canton, MA-based designer, manufacturer and repair facility of magnetics of all sizes for the broadcast, telecommunication, microwave, military and defense industries. O'Brien called MagCap's president Chris Lagadinos to explain their situation. Lagadinos asked O'Brien to make an engineering drawing and send him the original manufacturer's part number.

After reviewing the drawing and the original specifications for the choke, Lagadinos suggested rebuilding the original unit at a fraction of the cost of a new one. O'Brien agreed to the retrofit solution.

The old unit was shipped to MagCap Engineering's Massachusetts headquarters. There, technicians opened the case, cleaned out the PCB oil and disposed of it in an environmentally safe manner. They then rebuilt the inductors, put everything back together, filled it with non-toxic oil, painted the case, and returned it as good as new at a cost of \$5,600.

"MagCap's quick-turnaround solution saved us a lot of money and minimized our production downtime," says O'Brien. "It brought the unit back online in five days rather than four months, for about one-tenth the cost of a new unit."

Three reasons contributed to the cost savings. First, rebuilding rather than replacing eliminated the expense of custom building the large, thick steel case. A second saving was eliminating the need for new ceramic bushings. These can cost up to \$2,000 each and the ceramic industry typically needs two or three months of turnaround time. And third, the quick turnaround minimized production downtime, which would have been substantial during the four months required for a new unit.

"The modulator kit is back in operation testing thytrons and helping us to maintain our productivity and budget," says O'Brien. "If you didn't know better, you'd think it was new unit."

MagCap Engineering, LLC, 222 Bolivar St., Canton, MA 02021; 781-821-2300.