

# THE DEARBORN Engineer

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**FRONT COVER:**

DTE Energy Chairman and CEO Anthony Earley and DTE President Robert Buckler dedicate the new DTE Energy Power Electronics and Electric Drives Laboratory

## DTE ENERGY FUNDS PREMIER POWER ELECTRONICS LAB



*UM-D Chancellor Daniel Little, DTE President Robert Buckler, DTE Chairman and CEO Anthony Earley, and Dean Subrata Sengupta*

The power electronics laboratory in the College of Engineering and Computer Science has been undergoing a major overhaul over the past two years, thanks in large part to a generous donation of \$150,000 from the DTE Energy Foundation and a matching grant from the National Science Foundation (NSF). To honor DTE Energy and the foundation, and to dedicate the renovated facility, the lab was officially renamed the DTE Energy Power Electronics and Electric Drives Laboratory at a ceremony this past summer.

DTE Energy chairman and CEO Anthony Earley cut the ribbon marking the official opening of the lab, and Robert Buckler, president of DTE Energy Distribution, unveiled a plaque honoring the occasion. Dr. Nirmal Singh, dielectric scientist at DTE and a strong advocate of the lab, also represented DTE at this event. Remarks by Earley and UM-D Chancellor Daniel Little were followed by an overview of the lab by John Shen, associate professor of electrical and computer engineering. UM-D Provost Robert Simpson presented mementos to mark the special occasion.

"We have been fortunate to have DTE's support over the years," says Subrata Sengupta, dean of the college. "There is a close alliance between the

power and automobile industries. With these new improvements, the DTE power electronics laboratory will serve the needs of both."

Enhancements to the lab include complete infrastructural renovations to the facility and the acquisition of new equipment, including 1/3-3/4 hp induction and DC motors, 1-5 KW universal power converter modules, DSPACE real-time control systems, power meters, digital oscilloscopes, voltage and current probes, and accessory testing equipment. Plug Power, a leading manufacturer of fuel cells with an agreement for the distribution of fuel cells by DTE Energy Technologies, a subsidiary of DTE Energy, for several mid-western states has also donated a hydrogen fuel cell for research and education uses.

"Part of the lab's purpose is to allow us to pursue power electronics for alternate sources of energy," says Sengupta, "including fuel cells and hybrid vehicles." The college is currently working with DTE on the continued development of a hydrogen fuel cell lab, which has already begun with the fuel cell donation.

Student enrollment in power electronics courses has grown significantly over the past three years, reflecting the increasing public interest in energy conservation and environment protection. The lab

will allow the electrical and computer engineering department to deepen its curriculum and strengthen it through additional educational and research projects. In anticipation of the expanded lab, a faculty team has developed several research concepts and proposals addressing electric motor control with industrial and automotive applications, power factor correction strategies for industrial and utility systems, a study of battery charging stations on load distribution (which will be especially useful when electric vehicles become more commonplace), regenerative braking, and solar cells and their applications.

"We started using the upgraded lab earlier this year," says John Shen, co-director of the lab along with Assistant Professor Chris Mi. "We've already got a number of projects going in various research areas, including prognostic systems for electric vehicle inverter modules (sponsored by Ford Motor Company), super junction power semiconductor devices (funded by NSF), low-voltage high-frequency power MOSFETs for DC/DC converters, automotive power semiconductor devices, a windmill generator simulation, a hybrid electric drivetrain study, and motor control teaching labs." The lab is also being used to facilitate student senior design projects, including electric bikes and golf carts.

"Power electronics is about efficiently controlling the flow of electrical energy," says Shen. "It's an enabling technology behind almost every aspect of

our daily life, from computers and communication equipment to consumer products to electrical vehicles to our electric utility grids."

But in spite of the importance of this technology, 90 percent of power electronics engineers working in the industry today were actually self-taught. "This is significant," says Shen. "We want to use this lab to prepare the future employees of the power industry with a base of knowledge that they're not likely to acquire otherwise."

Nirmal Singh believes the college now has an outstanding facility. "There aren't many university power electronics labs in the United States," he says. "Certainly, no other university in Michigan has a lab with these kinds of capabilities. And the professors who run it are capable, young, aggressive, just dynamite. Our people are very happy to see the lab come to fruition." Singh is also excited about the potential of this lab in the emerging distributed generation area, including improvements in the reliability of the electrical grid in the U.S. After all, power electronics is indispensable to the control of electronic power flow in modern utility networks.

Singh worked closely with Dean Sengupta; Phil Snyder, the college's development director; and the DTE Foundation to arrange for the funding for the lab. "At DTE, we want to hire good engineers," he says. "So we want to support schools that produce good engineers, which UM-Dearborn does. We do

hire people from Dearborn; they're very valuable to us. Our motive is not entirely selfish, however. Education is the crown jewel of the United States; our future depends on it. It is incumbent on every individual here to support education in whatever way we can."

To that end, the DTE Energy Foundation recently announced the award of an additional \$40,000 to continue the development of the college's power electronics laboratory.

*John Shen, co-director of the lab, describes its capabilities*

