

Balance of Power

Cross-Curricular Approach, Internships Benefit Students In Penn College's On-Site Power Generation Major

By: Claude T. Witts, Instructor, Diesel Equipment Technology

The On-site Power Generation Major at Pennsylvania College of Technology, designed as a two-year program that includes a summer internship, was established in 2000 as a response to increasing industry demand for skilled technicians in diesel and electrical technology.

Discussion within the industry (via focus groups) and between two schools at the college – Natural Resources Management and Construction and Design Technologies – resulted in the creation of a “hybrid” program. Several CAT dealers (Alban, Cleveland Brothers, Ransome CAT and H.O. Penn) participated with cash and equipment donations to offset startup costs.

The cross-curricular approach provides students with a much more in-depth exploration of the on-site power generation process. Curriculum devoted to diesel engines, fuel and electronics is taught by the diesel faculty. Courses relating to power generation are taught by electrical instructors. Faculty and administration meet with advisory boards three times a year to discuss the program and determine if any changes are needed, which keeps the Major up-to-date with industry needs.

In 2009, the electrical power generation installation course was replaced with process control basics to give students more instruction on the control-panel side of the generator. Also that year, the name of the Major was changed from Electric Power Generation to On-site Power Generation to more accurately reflect its true focus.

During the first semester, students are introduced to the basic principles of electricity and the laws and formulas used to solve electrical problems. Study includes the principles of magnetism and their relationship to direct-current generators and motors and other electrical machinery. Additional laboratory work trains students to connect equipment and instruments.

In the second semester, students are introduced to alternating-current fundamentals and diesel-powered engines. Course work also includes problem-solving, current, voltage, impedance, reactance and power factor in series and parallel circuits. Diesel engine overhaul introduces students to the theory of engine operation, mechanical functions, component terminology and manufacturers' engine nomenclature. This course focuses on basic overhaul procedures necessary to service and repair diesel engines.

During the summer between the second and third semesters, the student completes an on-site power generation internship with a participating dealership. This on-the-job training enables the student to apply information gained in the first two semesters, as well as prepare students for the final two semesters. Comments from selected interns follow:

“I had my internship with Penn Power Systems in Buffalo, N.Y., working with a technician who does on-site service on standby generators. While Penn Power is an MTU/Detroit Diesel dealer, I had the

chance to see and work on every major brand that is out there and I feel this really added to my experience. I was able to participate in malfunction-diagnosing calls, preventive-maintenance services, and component replacement and repair. Having had the chance to work on generators has benefited me greatly ... in the power generation program. It makes it much easier in class having heard some of the terms already. Also I have been able to ask about things that I was exposed to that I wanted to learn more about. I feel the internship was a great asset and I am thankful to have had the opportunity.”

Kyle Norek (power generation student)

“While working for DynaTech (in Lebanon, PA) I have done such things as testing and installing generators, refurbishing generators, and rest-rapping generators to achieve a required voltage. I spent some time in the shop and some time on the road doing tech work. At DynaTech, they taught me as much as they could about generators with me only having very limited knowledge of how they worked.”

“It seems like everything I did that summer is now applying somewhere with my classes. From voltage regulators and field coils to transformers and transfer switches, my classes are filling in all the little holes that were left over the summer. Practically every day in class, I can remember something I worked on ... at DynaTech where that piece of information would have helped me to diagnose a problem or would have helped me to understand why we fixed or replaced what we did.”

Tim Funk (power generation student)

“(One of the) things that I gained from my internship that helped enhance what I learned through the PG program is being able to take apart a CAT HEUI fuel system and put it back together. Also I learned how important it is to load-bank a genset, which we will practice in ELT265, (and) how to switch a single-phase genset to a three-phase genset inside of the alternator. One last thing that was important to know at CAT was how to hook up two load-sharing gensets.”

George Bopst (power generation student)

During the third semester, students are introduced to diesel electronic fuel systems, which include the introduction to theory and operation of the different types of electronic fuel-injection systems used by the major manufacturers of diesel engines. Advanced electrical/electronic system principles, sensor types and functions, sensor testing, and schematics also are covered.

During this time, the students also are introduced to engines fueled by methane, natural gas and other gaseous fuels, with differentiation made between diesel and gaseous-fueled systems. Topics include the gaseous combustion process, types of fuels and compression ratios, fuel regulation and delivery, ignition system, temperature regulation, emission controls, preventative maintenance, and tune-up.

The third semester also includes a course in electrical motor controls. Students learn the design and development of relay logic diagrams for use in the installation, operation and maintenance of relay motor control systems for industry. The students also study the process control systems and related theories that govern the use of electronic intelligence to control a physical process. Topics cover electronic intelligence theory as applied

to microcontrollers and basic language programming, as well as the elements of the physical process, including the electronic components such as diodes, transistors, thermistors, LEDs, optical switches and operational amplifiers.

The fourth semester consists of an introduction to programmable logic control and electrical-systems analysis. Introduction to the understanding, programming and operation of programmable logic control and the utilization of such controls as an aid to effective production and quality-control processes for production line industrial control systems is highlighted. Practical application includes the programming and changes of operational programs and generated control commands.

The fourth semester also focuses on electrical-systems analysis and involves the students in a comprehensive program through laboratory experiments and report-writing to master the principle and operation of machines and devices that generate, transform and use electrical power.

"I am working at Cummins Power Systems LLC in Harrisburg as a Generator Tech. I enjoy my job and feel the PG degree from Penn College was a big help in my career. The basic generator theory and the trip to the Power Gen Expo with the classes we attended there through EGSA that the college had set up for us to attend were two points from the program that really stood out and I feel helped myself. I feel the PG program (is) a good program and I recommend it to anyone interested in the power-generation field."

Matt Forbes (former power generation student)

Caterpillar Inc. also has recognized the importance of finding skilled, entry-level technicians in the field for well over a decade. Caterpillar provides funds to the program each year for the purchase of equipment and new technology, as well as annual scholarships to on-site power generation students.

A sponsorship is a formal agreement in which the dealer provides tuition assistance and an internship site to the student. In return, the student agrees to work during school breaks, over the summer and for a specified period of time after graduation. It's a win-win situation for both the employer and the student. In fact, Penn College's research indicates that students who are sponsored by employers are less likely to withdraw, and, therefore, graduate at a higher rate than their non-sponsored peers.

"In my experience with Penn College power generation grads, they are always better-trained and more easily adaptable to the workforce than most other technical schools," said Shane Michaels, Service Supervisor for Cleveland Brothers Equipment Co.'s Power Systems Division in Milesburg, PA.

The program maintains a 100%, five-year average placement. Graduates from Penn College's on-site power generation program are working (or have worked) in areas from Antarctica to Alaska. ■



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