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By Mary Lord and Mark Matthews

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Engineering technology steps up to TCB in the advanced manufacturing era.

Alex Muncy was still an apprentice at STIHL Inc. when the company enlisted him in revamping an automated packaging process. The package would contain the outdoor power equipment manufacturer's signature trimmer line, the colorful cord used to give lawns a precise, neat appearance. The goal: satisfy the customer while cutting production costs. Muncy's team developed a concept, designed the packaging machine, and fabricated components using advanced techniques, all while smoothly integrating robots, scanners, vision systems, and sophisticated machine controls. "He has all the ingredients to be a future leader," enthuses his boss, Andreas Garstenauer, STIHL's director of manufacturing engineering. "He's a good communicator and a great engineer with a lot of potential."

Actually, Muncy is not an engineer – at least in the eyes of many educators. After joining Virginia Beach-based STIHL right after high school, he worked full time while enrolled at Tidewater Community College, transferred to Old Dominion University, and graduated in 2012 with a bachelor's degree in mechanical engineering technology. Yet Garstenauer, who himself holds a Ph.D. in systems engineering, uses the titles "engineer" and "engineering technologist" interchangeably. On the special machine-design team to which Muncy belongs, there's "a big overlap" between the two, Garstenauer notes.

Not so in academia, where the two programs rarely share the same building and have separate accrediting criteria. The decades-old “bifurcation in the academic community” has left engineering technology education “stuck with this image problem” of being hard to define and describe, laments Ron Land, an associate professor of engineering at Pennsylvania State University, New Kensington, and chair of the ASEE Engineering Technology Council’s ET National Forum. He is one of the engineering technology faculty members who want their graduates recognized as full-fledged engineers in name, skill levels, and federal job qualifications. Their effort is becoming more persuasive as the hands-on, problem-based teaching techniques they have employed for decades gain traction in traditional engineering programs, and as employers pay less attention to specific course credits than to the attributes a graduate brings to the work environment – including effective teamwork and communication skills, a drive to keep on learning, and experience with technology and equipment that lets them hit the ground running.

Skills of students like Muncy would seem a bespoke fit for 3-D, digital, and robot-driven manufacturing, which President Obama and lawmakers of both parties hope will revive the nation’s eroded industrial base and sharpen innovation. The government has authorized a network of manufacturing institutes that enable universities, industry, and federal and state agencies to jointly pursue such challenges as additive manufacturing, power electronics, lightweight materials, and digital manufacturing and design. Obama wants to expand the network to 45 institutes. Additionally, a recent proposal would have Congress fund up to 25 “manufacturing universities,” rewarding schools with strong engineering programs that partner with industry.

Further raising engineering technology’s profile, the National Academy of Engineering is nearing the end of its first serious study of ET education since 1985. The project looks at both two-year associate’s and four-year bachelor’s degree programs, with the aim of learning whether the supply of graduates meets employers’ needs and the demands of globalization. “I was somewhat surprised that very little has been written about engineering technology,” says Greg Pearson, who is directing the study and envisions a “careful comparison” with traditional engineering programs. The study will include a survey of heads of two- and four-year engineering technology programs and of employers. “The encouraging thing is that NAE is recognizing what engineering technology is all about,” says past ASEE President Walter Buchanan, professor of Engineering Technology and Industrial Distribution at Texas A&M, who is on the study panel.

Parting Ways

In discerning what separates the two disciplines, the NAE could help resolve what study participant Jeffrey Ray, dean of the Kimmel School of Construction Management and Technology at Western Carolina University, calls engineering technology education’s “identity crisis.” The roots of that crisis stretch back to 1955, when an influential ASEE committee report – named after its chair, L. E. Grinter – underscored the need to modernize engineering education with heftier science and math curricula. Noting that industry at the time needed far more general engineers than researchers, the study recommended offering both a theory-heavy and a traditional, practice-based route to a B.S. degree. That idea fell flat, however, as the Cold War and space race poured federal funds into university labs and made science-oriented programs the norm. Today, few research-intensive institutions have ET programs; those that do typically house them in separate schools and on branch campuses. At Purdue University, for example, engineering technology comes under the College of Technology on the main campus and anchors other engineering-technology offerings around Indiana.

Calculus and physics requirements mark the dividing line between the two fields. “Math – that’s where the rubber hits the road,” says structural engineer Abi Aghayere, former chair of Rochester Institute of Technology’s civil and environmental engineering technology programs. He’s now a professor of structural engineering at Drexel University. Whereas engineering undergraduates must take three levels of calculus, engineering technologists typically take just one or two, and may also take statistics. Depending on their high school preparation, they may have to start with pre-calculus. “Basically they’re using algebra,” Buchanan says.

Another difference is the applicant pool, which is generally larger for engineering than for ET and thus allows engineering schools to be more selective. Pre-requisites may differ. For example, Rochester Institute of Technology requires three years of high school science for ET applicants versus four for prospective engineering undergraduates. Students in both programs must take physics, though ET majors can pursue a trigonometry and algebra-based course rather than one based on calculus. Compared with ET, engineering tends to draw students from a higher socioeconomic stratum, says Ken Burbank, a professor of electrical engineering technology who heads Purdue University’s School of Engineering Technology and chairs ASEE’s Engineering Technology Council. “Engineering students are very good, competitive students,” he says. “Will they be better engineers? It doesn’t necessarily mean that.”

Equalizing opportunities to get a foot in the door is the main thrust of a three-year effort by ET leaders to revise the federal Office of Personnel Management’s qualification standard for professional engineering jobs. Under current policy, ET graduates from accredited four-year programs can qualify to start at a GS-5 salary level with one year of related experience. Their professional engineering-science counterparts come aboard at the same grade with no experience required, while those with “superior academic achievement” can qualify for GS-7 starting pay. While only a small fraction of engineers work for the U.S. government, many contractors follow OPM guidelines. This hiring hurdle led Penn State’s Ron Land and the Engineering Technology National Forum to negotiate an update of certain provisions to better reflect ET baccalaureates’ academic preparation and engineering-work skills. OPM expects to release the revised engineering qualification standard soon, says April Davis, manager of OPM’s Classification and Assessment Policy office. It may not satisfy the ET community’s quest for parity, however, since federal agencies were unreceptive to altering the qualifications.

Outside the federal government, 17 states prohibit ET baccalaureates from taking the exam to become licensed professional engineers, reports the National Society of Professional Engineers, which points to their generally lower pass rates as an indicator of weaker preparation. In states that do license ET graduates, almost all require more than the four years of work experience demanded of engineering graduates.

Higher education also sets a different bar. Engineering technology assistant professors, on average, earn less than any engineering discipline, with a median salary of $75,195, ASEE data show. That's a whisker behind their agricultural counterparts but well below civil and environmental ($82,277), mechanical ($85,188), and electrical engineering ($89,118). Full ET professors, at $106,655, make roughly 80 percent of the college-wide median – though they outpace architectural engineering's $92,070.

Such pay gaps may shrink over time as new engineering technology faculty members arrive with credentials comparable to those of their engineering peers. A growing number have engineering Ph.D.'s. At Penn State, once separate faculty advancement policies within the College of Engineering are now the same for engineering and engineering technology faculty. For ET faculty, that trend inevitably means more emphasis on traditional engineering research and less on pedagogical scholarship and teaching. "Requirements are gradually going up," says Alok Verma, Old Dominion University's engineering technology chair, a graduate of the Indian Institute of Technology Kanpur who earned a Ph.D. from ODU. Faculty now can expect to spend three hours on research for every eight hours of teaching and one hour of service, he says.

Learning in context

Still, "teaching is the main focus," Verma stresses. And it's teaching with a real-world, industrial foundation. Though not required by ABET, many schools expect incoming ET faculty to have experience in industry and point to that with pride as an added value for students, from freshmen on up. At Texas A&M, lower-level labs contain open-ended problems and "opportunities for students to create something that actually works," says Joseph Morgan, a professor of engineering technology and industrial distribution and co-creator with Jay Porter of the department's two-semester senior capstone course. "It's critical to being successful in the real world." For their capstone, student teams select a project and, with the help of faculty and private-sector mentors, set their leadership roles. They also must identify $10,000 to fund it. "Each member knows every task, including the labor required, and they've planned the project from start to finish," delivering 30-minute status reports each week, says Porter, noting that "the private sector needs to have not just technically qualified engineers but also engineers with a practical understanding of project-management skills," such as time, cost, and risk. The final evaluation focuses on the successful completion of the project-management plan and development of a functioning prototype, which is required to graduate.

"If you have never put together a building yourself, the only way to teach how to design a building is to teach according to the book," notes Drexel's Aghayere, who uses a blend of theory and practice to convey key content in both traditional and ET courses. For example, he has students summarize and critique research papers related to what was covered in class. This enhances their understanding of the science and gets them thinking about future breakthroughs.

Along with industry experience, engineering technology programs tout their collaboration with local industries. At ODU, the curriculum is assessed every year against industry needs, says Mileta Tomovic, a professor of engineering technology. Next year, for example, four or five courses will incorporate product life-cycle management, an information-driven analysis stretching from initial design to ultimate disposal. Shipbuilders and nearby naval installations, meanwhile, drive a busy research agenda at the school's Marine Institute that ranges from robotic boats to directed-energy weapons.

While unabashedly career-focused, engineering technology programs don't ignore the environmental and social service pursuits capturing the imaginations of young engineers across the country. ODU's combined College of Engineering and Technology is one of 120 schools nationwide participating in the Grand Challenge Scholars effort backed by the NAE (October 2014 Prism cover story). ET students are included, says Dean Oktay Baysal. Located along a coast threatened by rising seas and threatening storm surges, ODU has a class in such sustainable building practices as elevating structures six to eight feet above ground.

Who Needs Calculus?

Are graduates handicapped by not having mastered advanced math and physical science? "There are very thoughtful people who question the need for Calculus III and high-level physics" in engineering, the NAE's Pearson says. Penn State's Land, who spent 23 years in industry, adds: "I can count on both hands the number of times I needed differential equations to solve a problem." Buchanan, at Texas A&M, says technology graduates may not be as well equipped for high-end design, but generally, "engineers used to need calculus a lot more than now."

Tomovic recounts a call from an engineer-businessman who wanted to use a slow period during an economic downturn to upgrade his employees' skills. What, the man wanted to know, made ET different from engineering? Do you remember taking Calculus III as an undergraduate? Tomovic asked him. Yes, the engineer replied. "I liked it so much that I had to take it a couple of times." And do you use that knowledge in your work? Never, the man said. That, Tomovic told him, was the whole point of engineering technology: to impart the essential knowledge and skills required by the vast majority of companies. "Employers are hiring for function," underscores Western Carolina's Ray. "They're not hiring for the degree."

Where theoretical knowledge is essential, ET faculty must devise ways to ease the transition from applications- based learning. It can be a struggle for these students, says Michael Johnson, an associate professor and coordinator of the manufacturing and mechanical engineering technology program at Texas A&M. "What I like to do is set up the theory with an application and use examples," such as in a machine design course. "The key thing is that they understand the importance of theory."

Lesser math and science demands may make ET an easier and quicker pathway to a degree for returning Iran and Afghan war veterans who acquired technical skills but little theory overseas. Nontraditional students generally, from community colleges as well as underrepresented groups, often find ET a better match than engineering, Burbank says.

Industrial Strength

Each year, some 7,000 ET baccalaureates fill positions from quality assurance to product development and rubber engineering. In a 2010 survey of 200 diverse engineering companies, the ET National Forum committee found that most hired both technologists and engineers, with 70 percent drawing no distinction in capabilities. Reporting the findings in the Journal of Engineering Technology, Penn State's Land noted that when firms did differentiate, "they were not viewed as accommodations to inferior or inadequate engineering skills but simply as preparation for equally valuable, yet different, engineering roles." Indeed, many of the surveyed employers praised ET graduates as better able to "dig in and get the job done" without requiring lots of supervision. For Land, these results reinforced the notion that the split in engineer¬ing baccalaureate programs has "outlived its usefulness," a sentiment echoed by the ETC's tagline: "The degree is engineering technology; the career is engineering."

If advanced manufacturing fulfills policymakers' hopes and U.S. production proves more cost-effective than outsourcing, that career could answer intriguing questions. What, for instance, is the difference between conventional metal and metal from a 3-D printer, and what benefit might additive manufacturing hold for the U.S. Navy? Or, how can industry wring the most productivity from knowledge-based, mechanized robots? "With advanced manufacturing, you will need continuous learning," says ODU's Tomovic.

For engineering technologists, postgraduate learning usually means an MBA or a master's in engineering management; entry into a research field requires more science. But Tomovic thinks certificate-based professional development will take hold.

Maureen Fang, at Purdue, is among the relative handful pursuing a third option: an engineering technology Ph.D. She might have opted for a doctorate in mechanical engineering, since she holds two degrees in the discipline. In fact, Burbank warned her that if she wanted to enter academe, "you understand that you limit your choices" with an ET degree. She's unfazed: "I realized as a technologist I can solve problems that exist right now and know whether a method or solution works." Her industrial background – she spent seven years as a design and manufacturing engineer at Pratt &Whitney – helped land her a fellowship in a crucible of advanced manufacturing research and development: the America Makes headquarters in Youngstown, Ohio, the first nationwide institute devoted to additive manufacturing.

Fang, who likes big factories, nonetheless thinks manufacturing's future may lie in small and medium-size enterprises. She sees a time when a design engineer could draft and upload plans for a car part to the cloud, with dealerships able to download the design, print and then install the part – eliminating the need for inventory.

Based on their academic preparation, Fang, Burbank, and a number of colleagues could have pursued a career in traditional engineering, but were drawn to ET because of their experience in industry. Johnson, who earned a Ph.D. in mechanical engineering at MIT, rose from summer intern to senior product development engineer over a decade at 3M before joining Texas A&M. The focus on application "was definitely someplace I wanted to be," he says, seeing the growing enthusiasm for project-based learning as a validation of the way engineering technology is taught. "The whole excitement around experiential learning, maker spaces, hands on….Engineering technology has been doing this for a long time."

New Models

On some campuses, the programmatic boundaries are blurring. At ODU, where ET occupies a department within the College of Engineering and Technology, both sets of students work in the same state-of-the-art labs and project-based teaching studios, indistinguishable by discipline. Responding to local demand for talent, the ET program has expanded to include such vibrant areas as marine and nuclear engineering technology, sustainable construction, and advanced manufacturing. Today, technologists make up half of ODU's engineering graduates.

Other campuses are seeing more collaboration between programs. At Texas A&M, ET students work on projects in the engineering innovation center and participate in Aggies Invent – a 48-hour flurry during which students must come up with an alpha prototype for sponsor-assigned projects. One team produced a utility tool for emergency responders.

The transformation of Purdue's College of Technology into a polytechnic institute may serve as a possible model for ET education elsewhere. Currently a pilot program but expected to expand, the institute combines industry- sponsored projects, the humanities, and entrepreneurship to produce the T-shaped engineers many employers say they want. Hallmarks of the reinvented ET program, which was launched this past fall with 35 students, include senior capstone experiences, certifications, expanded project-based learning, new degrees targeted at Indiana businesses, and an emphasis on innovation. "We want to create the 21st -century version of the polytechnic," explains the College of Technology's dean, Gary Bertoline. "You learn your passion because you're learning in context," he says. This includes non-technical subjects, such as an English instructor helping students prepare the report for a design review, or a communications coach sharpening oral presentation skills.

The initiative enjoys strong faculty support across the college, says Bertoline. Students already have bought in. Applications – all 725 incoming freshmen will enter the polytechnic program – soared by 50 percent over last year, and deposits are up by 30 percent. Part of a recent $40 million grant from the Lilly Endowment will go toward constructing the Innovation Design Center, a cross-disciplinary, learn-by-doing facility shared by engineering and technology students. Another $3.5 million is devoted to overhauling curricula. ET faculty teamed with peers from liberal arts and education and libraries to develop a new Bachelor of Science in Transdisciplinary Studies in Technology degree, now awaiting state approval.

“My hope is that ET is identified as another educational path to the engineering profession, a path that suits some learners better than the traditional engineering curricula,” says Burbank. “The nation needs this type of diversity as much as the visible diversity of sex and race.”

Forging pathways between two- and four-year ET programs could help diversify engineering’s ranks. Many community colleges across the country have articulation agreements with nearby universities intended to smooth the way. But at Prince George’s Community College in Largo, Md., just outside of Washington, D.C., where the majority of students are African-American, Hispanic, and often the first generation in their family to attend college, many are satisfied with an associate’s degree or enough course work to secure an industry- approved certificate. And so are local employers, argues ET program coordinator William Lauffer. In 1979, when he began teaching at PGCC, some 30 ET graduates met the calculus requirement to be eligible to enroll in an engineering bachelor’s program. Now just about six do. Emphasizing “labs that aren’t step by step” and requiring students to figure out for themselves why something doesn’t work, PGCC’s engineering technology program teaches how to design secure information systems, analyze circuits, and program computers. To earn an associate’s degree, students must successfully complete a capstone design project. Even that, however, may be more than is required to be hired by nearby Goddard Space Flight Center and its contractors. “The big thing I see is, industry certification has become vital,” says Lauffer, a licensed professional engineer with a master’s degree in engineering and industry experience. “Many people come here thinking they need to get a degree. No, you just need industry certification. Microsoft, Cisco, CompTIA… that’s more important than any piece of paper the college can provide.’’

By adding to the engineering mosaic, certificates and innovations like Purdue’s Polytechnic Institute may complicate the field’s identity. And these are not the only bold ideas out there. Enrique Barbieri, professor and chair of engineering technology at the University of North Texas, offered another paradigm in a 2009 paper, one that he still thinks could increase enrollment and retention. He proposed placing both mechanical engineering and mechanical engineering technology within the Conceive, Design, Implement, and Operate (CDIO) professional engineering spectrum, creating a logical, viable pathway to mechanical engineering degrees and careers. All engineering-bound students would first complete two years of a M.E.T. program, gaining the benefit of the experiential, hands-on learning that ET does well. Those interested in the conceive-design side of engineering could, with mentoring, transfer and complete a mechanical engineering degree in two to four years. Their implementation-operational classmates would spend the next two years earning a B.S.-M.E.T. degree. Barbieri, then at the University of Houston, put on a forum that drew deans, chairs, and professors from across Texas. “Everybody thought it was a great idea and said, ‘It will never be implemented at my institution,’ ” he recalls.

Applied Engineering

Similar resistance is encountered by the movement among many in the ET community to change the name of their discipline to “applied engineering.” Colorado State University and the University of Colorado, Boulder recently proposed a joint applied mechanical engineering program, but ABET was unable to accept the application for review by ABET’s Engineering Technology Commission (ETAC). Current ABET policy requires programs named “engineering” (without “technology”) to be reviewed by ABET’s Engineering Accreditation Commission (EAC). As configured, the proposed program did not meet EAC accreditation criteria.

“This discussion, while interesting, is not brand new and it’s not mature,” says Joseph Sussman, ABET’s managing director for accreditation and chief information officer. He cites a lack of consensus even among ET educators as to what applied engineering represents, and no active dialogue between them and engineering faculty. EAC has accredited four applied engineering programs at Saudi Arabia’s King Fahd University of Petroleum and Minerals – as well as “engineering” programs in the same disciplines – but none so far in the United States. When schools apply, “the first thing I do is ask them to send their curriculum,” says Sussman. Often, upon examination, “it can’t be accredited by EAC,” and not just due to questions involving calculus-based physics and engineering science. “Generally, ET programs offer a different kind of integrated design experience,” he explains. Outside the ET community, he adds, the term applied engineering causes people to scratch their heads. “The concern is, how do you explain to the man in the street the difference between applied engineering and engineering? . . . I think the question has an answer, but I don’t know what the answer is.”

While the title “applied engineering” may confuse the public, the distinction between graduates of two- and four- year ET programs as technicians, technologists, and engineers already does, contends Texas A&M’s Jay Porter, professor of engineering technology and industrial distribution and coordinator of the Electronic Systems Engineering.

Even as it struggles for wider appreciation, engineering technology education can’t stop evolving on its own, some ET educators say. While ET offers the “right strategy” to prepare students for industry, says Purdue’s Fang, “the delivery is still lacking” in undergraduate programs, with instructors – often doctoral students like her – spread too thin. “Technology is moving so fast. The way we implement the curriculum has to come up to speed.” Texas A&M’s Johnson sees a need for improved computer-aided design and design-tool education. “It’s more than CAD – it’s the entire computer-aided monopoly of tools,” he says. He doubts current “cookbook” teaching methods show students how to use them properly. He also would like more education research in ET and plans to contribute. Drexel’s Aghayere agrees. ET programs “can make their niche” by “investigating great teaching practices,” he says. “Most engineering research focuses on the scholarship of discovery; engineering technology faculty, we do the scholarship of teaching and build from there.”

Alex Muncy’s decision to build a career in manufacturing puts him in the company of, among others, Wilbert W. (Wil) James, Jr., who graduated from ODU in 1978 with a degree in mechanical engineering technology and is now president of Toyota’s manufacturing operation in Georgetown, Kentucky, makers of the

Camry. Muncy himself is being encouraged by his boss to return to ODU and pursue a master's degree in mechanical engineering (the school doesn't offer a graduate program in mechanical engineering technology). This will require taking additional math courses that he missed as a technologist. But then no one will dispute that he's an engineer.

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Susquehanna Sluggers

By Mark Bocchetti

An engineering tech program in Pennsylvania draws cheers from industry.

Williamsport, Pa. – As befits a class held in the birthplace of Little League baseball, arc welding at Pennsylvania College of Technology resembles a team sport requiring protective gear. Donning goggles and leather gloves, a pair of students guide their torches around a vertical pipe, welding both sides simultaneously to keep the steel hot. “Buddy welding,” which improves productivity, typifies the shop-floor experience gained in Penn College’s seven engineering-technology programs. Together with practice on industry-donated equipment, two job fairs a year, and the school’s close links to the private sector, this kind of training all but guarantees graduates a job.

Students get the message. Fall 2014 enrollment at the engineering technology school surged to 1,369, up 8.5 percent from 2013-14, even as Penn College’s overall enrollment dipped. The school offers four-year bachelor’s and two-year associate’s degrees in automated manufacturing technology, electronics and computer engineering technology, engineering design, information technology, plastics and polymer engineering, welding, and electrical technology. Of these, information technology takes first place with more than 400 students, but demand for welding is hot. The 2014 welding class grew from 60 the year before to 100.

Near-certain employment prospects and the school’s learn-by-doing approach have won recognition from the National Science Foundation, which is providing $616,000 over five years to help hard-pressed students cover up to $10,000 of annual tuition. Those ineligible for the subsidy pay a hefty price. With the state contributing just about 11.5 percent of the school’s budget, in-state students pay tuition of $15,450. Room and board, if needed, bring the bill to $28,886 in 2014-15. Almost 80 percent of students receive financial aid, but the average annual award is just $1,500. Many students depend on loans to fill the gap.

Penn College’s curriculum appeals to tactile, or kinesthetic, learners, who need to hear and see and feel the technique to tie it all together, explains Dave Cotner, dean of the School of Industrial, Computing and Engineering Technologies: “They don’t want to be in an office standing behind a desk.” he says.

Some students have transferred here from traditional engineering programs. Nate Eckstein spent three semesters as a mechanical engineering major at the University of Pittsburgh before enrolling at Penn College. “I decided I didn’t want to be in a classroom,’’ says the 21-year-old junior from Cambridge Springs, Pa. “I wanted to be hands-on, and learn hands-on.” Clinton Bettner, a 27-year-old veteran from the Pittsburgh area, also started out in a four-year engineering program. But the high-level math took a toll, and he dropped out to join the Army National Guard. Penn College is his sixth stop on the college tour, but he’s found a home: “This is exactly what I wanted to be doing the whole time.” Besides the sophisticated equipment available to students, the way

Penn College sequences the curriculum earns his praise. It starts with mastery of basic machining skills in the first two years, then gradually adds more sophisticated courses like engineering economics and product design.

Eckstein, Bettner, and 12 teammates put in late nights this spring designing and building a Baja racer for a Society of Automotive Engineers competition. Eckstein, who worked in a machine shop in high school, was the team's go-to expert on a variety of components. Bettner focused on redesign of the racer's tubular frame to save weight; this in turn required reworking of the brakes and suspension.

Teammate James DePasquale, a 21-year-old junior from Simsbury, Conn., arrived at Penn College to study welding, but fell in love with automated manufacturing. After the Baja competition, he will spend the summer on an internship with a producer of laser equipment. Students in the four-year program typically serve an internship in a company between the third and fourth years, and many of these lead to job offers. Cotner says that overall job placement is at least 94 percent. Welders and plastic and polymer grads are even more successful, the latter having been trained to run sophisticated equipment and understand the science that goes into it. Each job fair draws more than 200 employers, including major national companies such as Chicago Bridge and Iron.

The school seeks to keep employers coming by adapting curricula to industry trends. Cotner says it added an associate's degree in mechatronics, an emerging field that integrates electrical, mechanical and controls engineering with information technology, when the Marcellus Shale natural gas boom increased demand for instrumentation technicians. Besides degrees, it offers noncredit certifications, meeting the requirements of the American Welding Society, the Cisco Networking Academy, and other organizations. Last year, 32 companies used Penn College's Workforce Development Division to obtain training for their employees through the engineering technology school.

Penn College grads rapidly master any vendor's technology because they are drilled in general principles, says Shaun Campbell, a project engineer at Ecosave Automation in Philadelphia, and they understand how to make various systems work together to achieve design specifications. Campbell, himself a 2004 graduate of Penn College's building automation program, has also hired several graduates. So has Alex Witter, director of engineering at Keystone Friction Hinge in Williamsport, who finds they quickly master his firm's computer numerical control manufacturing technology.

An exception to the general rule that technology programs don't conduct research is the Plastics Innovation and Resource Center (PIRC), which provides not only customized training in manufacturing techniques like injection molding and thermoforming but also product and process development. Roger C. Kipp, a longtime plastics industry executive, says it enables graduates to enter the workforce with real-world R&D knowledge as well as technical skills.

Campbell, for one, thinks Penn College could increase its class size by at least 150 percent and graduates – more than 6 percent of them veterans – would still find jobs.

For the young sluggers of Williamsport, the future holds promise.

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