cover story

➤ BY SUSAN WOODS, FEATURES EDITOR

Colleges are working to increase the number of women entering the engineering profession.

Purdue University, College of Technology

Working in a Man's World

Women face some obvious and not-so-obvious barriers when working in the world of manufacturing.

Harvard University President Lawrence H. Summers sparked outrage last summer by saying innate differences between men and women might be one reason fewer women succeed in math and science careers. That type of thinking makes it hard for women to succeed in manufacturing, whether they are engineers or machinists.

"It's amazing that sort of thing just slips out from someone in a leadership position," said Betty Shanahan, executive director of The Society of Women Engineers (SWE). "That person's underlying assumption about women actually has an impact on decisions that are made. I do believe most people in leadership want to do the right thing. But the right thing in their minds may hinder the advancement of women."

Despite any underlying prejudices against them, Shanahan does believe that women are in high demand, at least at larger organizations. "Employers—be they corporations, universities or the government—are desperately trying to have a diverse workforce," she said. "One of the things I think is well-recognized is the value of diversity. When you are trying to solve a tough problem or innovate, you want different ideas that are going to challenge the status quo."

In other words, a woman's point of view might just be what is needed.

Sparking Interest

While some companies may be looking to diversify and hire more women, a major challenge is getting young women interested in manufacturing in the first place.

Linda Thomas is a systems safety engineer for The Boeing Co. and presi-

TNT Manufacturing

Nicole Muller is production manager at TNT Manufacturing, a job shop in Massachusetts.

dent of SWE, Pacific Northwest section. She believes the challenge is keeping young women engaged. "Today there are more opportunities [for women], but it is not always apparent what the benefits of going into a math or science field are," she said. "We need to make young women aware that going into science, engineering, technology and mathematics professions is viable and offers a great deal of career flexibility and marketability."

Sandy Patterson, owner of Sirius Tools Inc., Duarte, Calif., which manufactures special cutting tools, believes teachers and schools don't push young women to consider a manufacturing career. "There is a vocational-tech school nearby, but they don't ask women to take the classes," she said. "They don't approach women and ask them if they have ever thought about manufacturing. That is a big frustration."

Some of Patterson's operators had signed up for a class, but it was canceled because of lack of interest. "So why didn't they go to the high schools and ask girls to sign up for the class?" she asked.

John Cockrell, a machining instructor at Hinds Community College, Raymond, Miss., said young women—and men—at the high school level aren't made aware of the opportunities that exist in manufacturing. "My experience in the last 22 years or so—I'm talking about my trade in particular, the machine shop and tool and die manufacturing—is that most people don't know what a machinist or a tool and die maker does because the products we make are sold at a retailer and the public in general does not deal directly with a machine shop," he said.

Cockrell's most recent female student graduated about 2 or 3 years ago. "Employment is pretty good right now, so there's no reason for it," he said. "I would say that in most vocational-training programs there are few women enrolled because [the jobs are] considered dirty and hot. Manufacturing has changed greatly, but it still has a stigma."

Ken McCreight, program manager of Associates of Applied Science in Technologies at Cuyahoga Community College, Cleveland, also believes women are not aware of the opportunities in manufacturing. McCreight has about a dozen women in his machining apprenticeship program. "But that is out of 140 students, which isn't very good," he said. "Still, when I started the program 20 years ago, we had zero."

Family Ties

While their teachers might not have pushed them toward the field, most women who work in machine shops do so because they were inspired by family members.

Cuyahoga Community College

Carrie Estep, a student in the machining apprenticeship program at Cuyahoga Community College, gets ready to machine a part.

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Nicole Muller is production manager for TNT Manufacturing LLC, a job shop in Westfield, Mass., that mills mostly aluminum parts. Her father owns the shop, so Muller has been aware of what machining is all about her entire life. She does a little bit of everything, from quoting to scheduling the work to setting up and running jobs.

Muller went to college, majoring in Russian and English, and from there went to work in the marketing department of a toy manufacturer.

"When my father bought his first CNC milling center," said Muller, "I started out helping him on the weekends. I really enjoyed it, so when he started getting bigger and wanted to hire someone, I asked if I could have the job."

Tanya DiSalvo, president of Criterion Tool & Die Inc., Brook Park, Ohio, is another woman whose family ties led her to machining. Her grandfather started the business and, more recently, her mother was company president. "She retired in 2005 and I took over," DiSalvo said. "I have had the opportunity to do many jobs in the shop, from receiving inspection through shop operations and, now, management."

DiSalvo learned by what she calls "looking after" the machines. "I just planted myself by the operators and setup guys and watched and learned how things are made," she said. "I learned what parts look like when they come off the machines and what it sounds like when the tools are cutting well and when they're getting dull."

DiSalvo thinks it is "cool to see how things are made that make the world go round." She said she disliked math "until I saw it used here in a practical application—and then the light bulb went on."

Carrie Estep's interest in manufacturing began with family as well. She is in the apprenticeship program at Cuyahoga Community College and works at General Motors. "My father, uncle, grandfather and sister are all die makers, so I knew about the program and the industry," she said.

'Boy's Club' Mentality

While the women who work as engineers and machinists enjoy and appreciate their careers, they do face some discrimination working in a man's world.

Muller noted that she isn't always treated with respect. "Most of our customers, at this point, are familiar enough with me to understand that I know what I'm doing and I can talk with them about the jobs," she said. "But I've had salesmen come in and see me setting up a job or inspecting a part and ask, 'Is anyone here?,' as if I'm nobody. It's unbelievable to me."

She thinks smart salesmen should recognize that they don't always know who they are talking to. "I have a lot of input into what machines and inspection equipment we put in here," Muller said. "There's more than one salesperson who did not get an order from this shop because of how they treated me. Everyone deserves the same amount of respect."

Sirius's Patterson faces obstacles in working with men all the time. "It is a constant. I call it the Big Boy Club," she said. "They don't want a woman coming in because men are supposed to make inserts and boring bars. Men are supposed to know how to do the mechanics. The biggest compliment any women can have is when one of the Big Boy companies says, 'You are affecting us.' Then you know you've made it. I'm a threat to their ego and I love it. And the only reason

The following organizations contributed to this report:

The Boeing Co.
(312) 544-2000
www.boeing.com

Criterion Tool & Die Inc.
(800) 616-0001
www.criteriontool.com

Cuyahoga Community College
(800) 954-8742
www.tri-c.edu

Hinds Community College
(800) HINDSCC
www.hindscc.edu

Sirius Tools Inc.
(800) 814-5899
www.siriustools.com

The Society of Women Engineers
(312) 596-5223
www.swe.org

TNT Manufacturing LLC
(413) 562-0690

Selected nontraditional occupations for women in 2005 (numbers in thousands)*

Occupation	Employed both sexes	Employed female	Percent female
Computer software engineers	832	182	21.9
First-line supervisors, managers of production and operating workers	868	181	20.9
Molders and molding machine setters, operators, tenders; metal and plastic	60	12	20.3
Engineering technicians, except drafters	410	83	20.2
Industrial production managers	310	53	17.2
Cutting, punching, press machine operators, setters, tenders; metal and plastic	123	19	15.7
Industrial engineers, including health and safety	189	28	14.9
Computer control programmers and operators	51	6	11.2
Grinding, lapping, polishing and buffing machine tool setters, operators and tenders; metal and plastic	60	6	10.3
Engineering managers	97	9	9.5
Precision instrument and equipment repairers	69	5	7.7
Machinists	420	29	6.8
Mechanical engineers	318	18	5.8
Sheet metal workers	147	5	3.6
Tool and die makers	90	1	1.1

*Source: U.S. Department of Labor, Bureau of Labor Statistics. *Nontraditional occupations are those in which women comprise 25 percent or less of the total employed.*

Bill Kennedy

Tanya DiSalvo, president of Criterion Tool & Die Inc., took over the family business from her mother.

is, I'm a girl."

Carolyn Lewis faced some discrimination when she joined the apprenticeship program at Cuyahoga Community College. "You have those who feel a woman shouldn't be doing the job or feel a woman can't do the job," she said. "I think I have overcome most of it, but you still have those diehards who can't accept it no matter what you do or how well you do it."

Cuyahoga's McCreight said smaller companies are reluctant to hire women. He believes smaller companies with male machinists might think women, especially young women, might be a distraction. And, on the practical side, a company has to have a separate bathroom for women and most job shops have only one.

SWE's Shanahan summed it up this way, "Every day there is something that happens that reminds you that are different. That isolation is a challenge women face."

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Physical Aspects

Some men feel women are limited in their ability to perform machining work because it can involve heavy lifting. But, there are ways around that.

McCreight noted that with today's technology, physical limitations are not an issue. "Anything over 50 lbs. you lift with a crane anyway," he said.

Estep said she does work with some heavy dies, but even some of her male co-workers struggle with them. "We have had to cut them in half to work with them," she said, adding that some of the men blame the women for making this step necessary. "I think it is just a heavy workpiece and no one should be lifting it."

Even though women do face obstacles, there are benefits to working in a man's world. Most of the women enjoy working with their hands and making things, but a big incentive is the pay.

"I try to bring more women into the manufacturing arena because it is an opportunity for them to earn quite a bit more money than if they were in an office," said McCreight. "It is a nontraditional career, but they can make between $55,000 and $70,000 a year."

Estep said the higher pay definitely was an incentive for her. "I originally went to school for teaching, but when I saw I could make twice as much in a trade, it was enticing."

Take Some Advice

All of the women interviewed offered advice to women trying to succeed in the manufacturing world, including the importance of being confident, finding a mentor and keeping an open mind.

Boeing's Thomas recommends they never stop learning. "Continuous learning has kept me engaged in my career," she said. "It has helped me to expand the breadth of my experience. I have changed careers about three times at Boeing, and it has reaped personal and professional rewards for me. If I could do it all over again, I would definitely choose engineering as a career. It has satisfied my quest for troubleshooting and problem solving."

Shanahan believes women should learn how to communicate effectively and network with other women.

While there are laws on the books about equality in the workplace, transition takes time. Breaking down barriers is not easy. But as the manufacturing industry struggles to find skilled, smart, dedicated workers, it needs to stop overlooking an entire segment of the population. △