

how it works

BY BARBARA DONOHUE

Best

Hiring Practices:

Finding the employees
you need.

Finding and hiring good people has always been a challenge. With so many skilled machinists aging toward retirement and fewer youngsters interested in entering the machining trade, it will only get more difficult. “Manufacturers are waking up to the idea that there are no skilled craftsmen [walking in off] the street. Many are now in their 50s and 60s,” points out Ken Barton, apprenticeship administra-

tor for the Rockford (IL) Tooling & Machining Association (RTMA).

There are plenty of people out there, but they don’t all have the makings of a machinist. How do you select new hires that have the “stuff” to make it in this business? Or, better, where can you find people who already have some training or experience?

The right stuff for cutting metal

Besides the usual job application, interview and reference checks, you need to know if a job candidate is capable of learning how to deal with machines and metalworking. There are many tests of various kinds—personality inventories, attitude surveys, tests for mechanical aptitude, manual dexterity, cognitive abilities and many more characteristics, qualities, skills and knowledge. These are available from test publishers and from consultants who offer to put together a testing program for any need.

Fortunately, among this bewildering array of tests are a few that aim specifically at predicting performance or assessing skills necessary in the machining business.

NTMA Employee Selection System

One way to make sure you have the staff you need is to “grow your own.” Many shops like to bring in entry-level employees who will have the capacity to learn and grow into increasingly responsible and skilled jobs. How do you know if the person has the mechanical aptitude, the reasoning ability and the good work ethic needed to be successful? Nobody can tell for sure, but the National Tooling and Machining Association (NTMA, www.ntma.org) has put together a battery of four pencil-and-paper tests that give an indication of a person’s ability to learn mechanically oriented tasks and to succeed in the manufacturing environment.

Assessing and testing and trig. Oh, my!

After I’d spent many hours interviewing people about these tests of mechanical aptitude and math, Chad Schron at Tooling University offered to let me try out their online basic assessment test on math, print-reading and inspection. I said, “Sure.” And he sent me a user ID. Fifty-four multiple-choice questions. No time limit. No problem.

At 10:00 I click onto the www.toolingu.com web site. Fortunately, I take the time to read the “before you begin” instructions. The first challenge: some questions will use trigonometric functions. Well, the last time I used trig functions was about five calculators ago, so I need to find trig tables. The very largest handbook on my shelf has them. Twenty-two pages of them. By degrees and by minutes.

I start up the Windows calculator, grab some scrap paper and sharpen my pencil. Ready.

Diving in
Click “start test.”

Here we go. Adding fractions. I can do that. Let’s see, least common denominator. I do the calculation and come up with a very odd result, $\frac{23}{24}$. I must have that wrong. But I scroll down to the answer choices, and much to my surprise, there it is. The cursor turns into a graphic

of a yellow pencil as I mouse toward my chosen answer. Click.

This one looks like a strange trigonometry problem. But no, it’s our old friend Pythagoras. The square of the hypotenuse equals the sum of the squares of the other two sides. Click.

Ah, algebra. I used to love these simultaneous equations. “Find x ,” the instructions say.

OK, solve the first equation for “ y ” then plug that value into the second equation. Add. Multiply. Subtract. Divide. $2x$ plus $3y$... Here’s my answer, 2.42 . Cool. Easy. But scroll down to the answers and, oh, dear, they’re all whole numbers. No decimals. Try it again. A different number with two decimal places. Hmmmm. I think I’ll skip that question.

Using the appropriate trig ratio, solve for the angle on this right triangle. Let’s see. It gives the long side and the one next to the angle. So that’s adjacent over the hypotenuse. Is that the sine or cosine? I forget. Muttering the mnemonic I learned in high school, “Tommy’s old aunt sat on her coffin and hollered,” I remember. That would be cosine. Look it up the value in the book’s twenty-two pages of tables. Click on the corresponding angle...

Convert centimeters to mil-

limeters. Distinguish precision from accuracy. Define calibration. Average some numbers. Easy. Click, click, click. Click.

Moment of truth. Or guess.

Yikes, geometric dimensioning and tolerancing. It was hard when I learned it in engineering school, and I haven’t used it since my first job. Oh well, here it goes. Click.

Thread specs? Hoo, boy, it’s been a long time since I looked at this. But I’m pretty sure that one particular part of the designation indicates the fit, so I’ll choose the third answer because that’s the only one that includes fit. Click.

Here is a drawing of a bolt and the question is: What kind of thread specification is this? Pictorial? Simplified? I have no idea; I don’t recall ever hearing those names. Best guess. Click.

Well, after 50 minutes, I get to the end. I’ve filled up five sheets of scrap paper with scrawly numbers and drawings. The test gives me the option of going back and changing my answers. I go back to those pesky simultaneous equations. Third time is the charm, right? Wrong. Same old two-decimal-places as before. Time for brute force. I select one of the nice, whole numbers from the multiple

choices. Plug it into the equations. Voilà, it works. Click.

Not feeling very bright, but at least I am done. Click on “submit test.”

The next day I receive my results from Mr. Schron. He says I did very well, 48 out of 54 correct, for a score of 88.89 percent. I was hoping for 90.

The test results are also given for two subsets of questions: those relating to inspection (I answered 21 of 25 correctly) and those relating to “shop essentials,” which must be the math and maybe print reading, on which I got 27 of 29. The report recommends a selection of five beginning and intermediate classes to improve and extend my skills.

Would this test be valuable for evaluating prospective employees? It’s not an aptitude test. It checks what people know and what they can do with math. I think it might be useful to verify that an applicant has had some experience in the shop; it seems a high score would indicate they know a little bit about reading prints, a little bit about inspection, and quite a bit of basic math.

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Intended for pre-employment screening, these tests provide a “predictive test of aptitude for learning machining and other technology,” says Dick Walker, director of education at the National Tooling & Machining Association, Ft. Washington, MD. “Part of the issue is on the intake end if you’ve got X number of slots. Who do you choose?” he says.

The NTMA selection tests rate mathematical ability, mechanical aptitude, verbal skills and also provide a psychological profile, says Walker. The set of tests, taken together, is designed to measure a person’s potential for success. Walker says that the NTMA has offered the tests for about 25 years, and companies have used them with thousands of job applicants.

A complete testing package, \$55 from NTMA, includes the four test booklets, 25 answer sheets and an instruction manual for administering the tests.

You administer the tests to a prospective employee and then send the answer sheet to NTMA for scoring. Purchase of the test package and the scoring service are available to both NTMA member companies and non-members. Scoring is \$25 for each applicant, with results mailed; for an additional fee they can be faxed.

The raw score on each test is converted to a scaled score of 1 – 9. So the score on the 4-test battery ranges from 4 to 36. “Add up the scores, and [anyone with a score of] 16 and above should be successful,” Walker says, though a very low score on the math test might indicate a potential problem. All four tests used together give a good picture of the applicant’s aptitude and attitude, he says.

Assessment testing from Tooling U.

For more advanced and experienced applicants, you may want to determine their skill and knowledge using assessment tests specifically aimed at the machining industry. Tooling University, Cleveland, OH, offers online classes for workers in the industry. It also had a series of assessment tests that companies use to determine the training needs of their staff. When asked whether an assessment test might be used in the hiring process, Chad Schron, Tooling U.’s vice president of technology operations, says that a company might use a test to determine if an experienced applicant is knowledgeable in a certain area.

A basic assessment test covers shop math, blueprint reading, and geometric dimensioning and tolerancing (see sidebar). It is available online and costs \$27.50 per administration. Tooling U. has a range of assessment tests and classes available and can also provide customized testing and classes if needed.

Invent your own

Experts in the psychology and technology of aptitude testing would cringe at the very idea, but if you can’t find the kind of testing that does what you need, you might need to invent your own.

For the Machine Operator Skills Training program (see below), none of the available mechanical aptitude tests seemed to do the job, according to Ted Bauer, machining project coordinator, Massachusetts Manufacturing Extension Partnership, Worcester, MA.

The pilot program, funded by a grant from the Department of Labor, recruits its students from a wide spectrum of people who want job training. The paper and pencil tests weren’t sufficient to demonstrate real-time mechanical reasoning and manipulation, and commercially available hands-on tests were overkill. So, says Bauer, “We invented our own mechanical aptitude test.”

It consists of a variety of nuts and bolts and a selection of hand tools. The test is to undo the fasteners from holes on one side of a board and refasten them on the other. There are more tools than needed, and some of the holes are too small for some of the bolts. It’s a timed test. Most people complete the task in under four minutes, Bauer says. Some take less than three. Someone who takes more than five minutes might have problems with the training program.

“Put something in their hands and observe them,” counsels Bauer.

In addition to taking the mechanical tests, prospective students take standard reading comprehension and math tests.

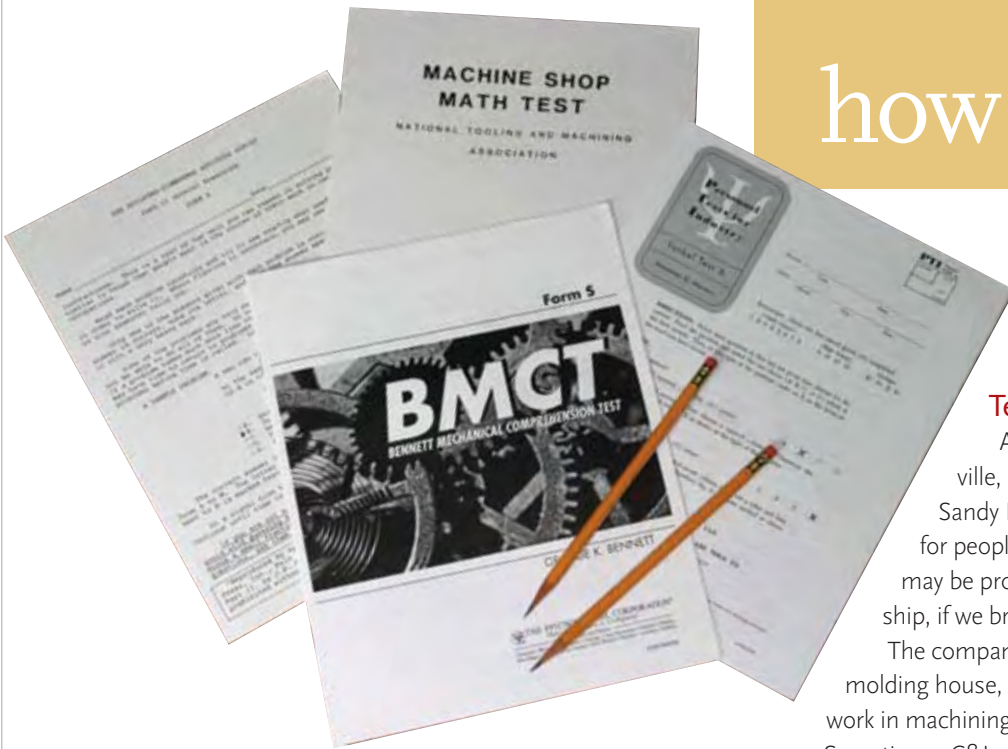
How do companies use testing and other techniques to find people who will fit in, do the job, learn, grow and become the machinists and metalworkers they need? Every shop, large, small or in-between, has its own way of evaluating job candidates and finding employees who can take on new responsibilities.

Agency screens job candidates

A large provider of fluid system products and services to many different industries, Swagelok Manufacturing Company, Solon, OH, uses commercially available tests to screen prospective applicants, according to Tim Dodd, director of China operations.

“Everyone [is tested], whether a skilled CNC operator or

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Above: A sampling of NTMA test booklets.

someone who has had no exposure to manufacturing... We use a temporary employment agency to do screening and bring people in on a temp-to-perm basis," he says.

The agency tests aptitudes and abilities, including "mental alertness, general knowledge... cognitive abilities, mechanical aptitude," says Dodd. Applicants also complete a personality profile. With the results in hand, the company can match people with positions. "We have a matrix [on which] we plot out where we want people to be for different jobs. Are you better suited for machining, a quality type of role or assembly?"

Three months to try each other out

"Usually, if we bring someone in, we can tell pretty quickly if they know what they're doing," says Abbie Moran, general manager of Robert J. Moran, Inc., a small contract machine shop in Littleton, MA. During the interviews for machinists, "we show them a blueprint and ask them how they would approach it."

Moran's company makes use of a three-month tryout period. "We feel each other out, to see if you like us and we like you. We say, 'It's for you as well as for us.'" If the new employee works out for those three months, he or she comes fully on board, with benefits. Then, how far employees go is up to them. "Some people just want to be operators, and some strive for more," says Moran. "They write their own ticket on how much effort they want to put in and the progress they make on the job."

Testing for promotion

At C & J Industries in Meadville, PA, human resources director Sandy Hurban uses the NTMA tests for people who are already in place and may be promoted. "Also for apprenticeship, if we bring someone up," she says.

The company is primarily an injection molding house, and 20 of the 250 employees work in machining.

Sometimes, C&J uses only the mechanical aptitude test. People for the apprenticeship program take all 4 tests. "Apprentices usually come from the voc/tech schools, and we [also] put promising people from the floor into the apprenticeship program," Hurban says. She administers the tests, sends the answer sheets to NTMA and receives grades back in a week, or sooner by fax, if she needs them quickly.

C&J has used the NTMA tests for a long time, but "testing is only one indicator," Hurban cautions. "You want someone who has the will to work and who wants to learn. And that's what is really hard to find right now."

Confidence in their capability

Joyce Richey's job title is staff accountant, but she is also the person who administers the NTMA tests to prospective employees at Schmiede Corporation in Tullahoma, TN. This 115 employee company does CNC machining, grinding and EDM, Richey says.

In general, the company requires the tests of less experienced applicants who have only two or three years of work experience or have come from a machine shop course at school. "It seems to help," she says. The company started to use the NTMA testing about six years ago, and Richey has administered the tests to 144 applicants since then.

"The supervisors like it," she says. "If you don't know a person... that test gives them a little insight before they talk to them."

Applicants must score 20 or above on the tests before they can go on to an interview, Richey says. At

Schmiede, the cutoff score is 20, rather than 16, which the NTMA suggests. "Most folks score above 20," she says. Schmiede also uses the tests to help select employees who might do well filling supervisor or lead positions that open up. "If they show an interest we give them a test," she says.

Remember apprenticeships? They're still one of the best ways to develop exactly the kind of expertise you want and need.

Grow your own skilled machinists

The Rockford, IL, chapter of the NTMA, arranges for a local community college to administer the NTMA Employee Selection tests to individuals interested in entering an ap-

prentice program at a local company, according to Ken Barton, apprenticeship administrator for the RTMA. When the scores come back, the names of those who meet or surpass the national cutoff score (16) are sent to local companies that have apprenticeship programs.

Barton says that the RTMA apprenticeship program was started in 1957, and since then, thousands of apprentices have trained in it. Many of them now run businesses of their own. Apprentice tool and die makers receive 10,000 hours or 5 years of on-the-job training. Precision machinist and CNC operator apprentices train on the job for 8,000 hours or 4 years. Under the Rockford program, the apprentices are also required to take related classroom training.

A few years ago, the need for skilled machinists seemed to have dropped down to where there were only two apprentices who started one year. Last year, there were 25, and Barton expects 25 this year, as well.

Fast-track training for machine operators

Because of the need for skilled staff at machine shops all across the country, the Federal Department of Labor has initiated a pilot program to train machine operators. The pilot Machine Operator Skills Training (MOST) is being run in the six New England states.

According to machining project coordinator Ted Bauer, participants are recruited from "One-Stop Career Centers," in areas where the trainings are scheduled. Many are unemployed and seeking training for a new career. After careful screening, which includes interviews and tests of reading comprehension, math and mechanical aptitude (see "Invent your own," above), the participants intensively study machining principles and practice for two weeks, they then go to companies for two months on-the-job training. In the few months the program has been in existence, most of the participants have been hired by the companies where they received their on-the-job training.

In the next couple of decades, we'll need droves of younger up-and-comers to replace the master machinists who are reaching retirement age. Where will these new machinists come from? Lots of different places. They'll be home grown through apprenticeship, brought up through the ranks, taught in vocational/technical high schools or community colleges, trained in other publicly-funded programs. They're out there somewhere. The trick is to find them and then give them the opportunity to become the best.



NIMS Certification What is it?

The National Institute for Metalworking Skills (NIMS) is the nation's only ANSI (American National Standards Institute)-accredited developer of precision manufacturing skill standards and competency assessments. NIMS certifies the level of individuals' skills in different types of metalworking, including machining, stamping and CNC setup/programming. Certification is based on industry-developed standards. NIMS also accredits training programs in high schools, community colleges, companies and other venues.

Certification requires both theory and practice, explains Stephen Mandes, executive director of NIMS, Fairfax, VA. The individual must demonstrate a particular set of skills in practice, by turning a part perfectly, for example, and also must demonstrate on an exam that he or she understands the theory behind the particular process. Over 10,000 credentials have been issued, Mandes says,

and the credentialing rate is increasing 20 percent annually.

One of the innovative features of NIMS is a new approach to apprenticeship, launched three years ago, that is based on competencies rather than time. Instead of an apprentice receiving journeyman status after a set length of time or number of work hours, under the NIMS competency-based apprenticeship system, an individual receives credentials after demonstrating practical skill and a certain level of understanding of the applicable metalworking processes.

As it becomes more widespread, NIMS certification should prove useful to companies hiring machinists, as the prospective employee's credentials should offer a clear indication of his or her competence in different metalworking processes.

For more information, see www.nims-skills.org.