

Machine Setters, Operators, and Tenders—Metal and Plastic

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Significant Points

- Machine setters, operators, and tenders—metal and plastic operate powerful, high-speed machines that can be dangerous if strict safety rules are not observed.
- A few weeks of on-the-job training is sufficient for most workers to learn basic machine operations, but several years are required to become a highly skilled operator or setter.
- Overall employment growth in the various machine setter, operator, and tender occupations will be slower than average, although employment trends among these occupations will diverge over the 2002-12 period.

Nature of the Work

Consider the parts of a toaster, such as the metal or plastic housing or the lever that lowers the toast. These parts, and many other metal and plastic products, are produced by machine setters, operators, and tenders—metal and plastic. In fact, machine tool operators in the metalworking and plastics industries play a major role in producing most of the consumer products on which we rely daily.

In general, these workers can be separated into two groups—those who set up machines for operation and those who tend the machines during production. Setup workers prepare the machines *prior* to production and may adjust the machinery during its operation. Operators and tenders primarily monitor the machinery *during* its operation, sometimes loading or unloading the machine or making minor adjustments to the controls. Many workers both set up and operate equipment. Because the setup process requires an understanding of the entire production process, setters usually have more training and are more highly skilled than those who simply operate or tend machinery. As new automation simplifies the setup process, however, less skilled workers also are increasingly able to set up machines for operation.

Setters, operators, and tenders usually are identified by the type of machine with which they work. Some examples of specific titles are drilling- and boring-machine toolsetters, milling- and planing-machine tenders, and lathe- and turning-machine tool operators. Job duties usually vary with the size of the firm and the type of machine being operated. Although some workers specialize in one or two types of machinery, many are trained to set up or operate a variety of machines. Newer production techniques, such as team-oriented “lean” manufacturing, require machine operators to rotate between different machines. Rotating assignments result in more varied work, but also require workers to have a wider range of skills.

Machine setters, operators, and tenders—metal set up and tend machines that cut and form all types of metal parts. Setup workers plan and set up the sequence of operations according to blueprints, layouts, or other instructions. They adjust the speed, feed, and other

controls, choose the proper coolants and lubricants, and select the instruments or tools for each operation. Using micrometers, gauges, and other precision measuring instruments, they also may compare the completed work with the tolerance limits stated in the specifications.

Although there are many different types of metalworking machine tools that require specific knowledge and skills, most operators perform similar tasks. Whether tending grinding machines that remove excess material from the surface of machined products or presses that extrude metal through a die to form wire, operators usually perform simple, repetitive operations that can be learned quickly. Typically, these workers place metal stock in a machine on which the operating specifications have already been set. They may watch one or more machines and make minor adjustments according to their instructions. Regardless of the type of machine they operate, machine tenders usually depend on skilled setup workers for major adjustments when the machines are not functioning properly.

Machine setters, operators, and tenders—plastic set up and tend machines that transform plastic compounds—chemical-based products that can be produced in powder, pellet, or syrup form—into a wide variety of consumer goods such as toys, tubing, and auto parts.



Machine setters, operators, and tenders operate some computer-controlled machines.

These products are manufactured by various methods, of which injection molding is the most common. The injection-molding machine heats and liquefies a plastic compound and forces it into a mold. After the part has cooled and hardened, the mold opens and the part is released. Many common kitchen products are produced with this method. To produce long parts such as pipes or window frames, an extruding machine usually is employed. These machines force a plastic compound through a die that contains an opening with the desired shape of the final product. Blow molding is another common plastics working technique. Blow-molding machines force hot air into a mold that contains a plastic tube. As the air moves into the mold, the tube is inflated to the shape of the mold, and a plastic container is formed. The familiar 2-liter soft-drink bottles are produced by this method.

Workers in three distinct specialties—setters, operators, and tenders—operate injection-molding machines. Most other types of plastic machines function in a similar manner. A typical injection-molding machine may have 25 different controls that can be adjusted. Setters or technicians set up the machines prior to their operation. These workers are responsible for repairing any major problem. Operators monitor the many gauges on injection-molding machines, adjusting different inputs, pressures, and speeds to maintain quality. Tenders remove the cooled plastic from the mold, loading the product into boxes.

Working Conditions

Most machine setters, operators, and tenders—metal and plastic work in areas that are clean, well lit, and well ventilated. Nevertheless, many operators require stamina, because they are on their feet much of the day and may do moderately heavy lifting. Also, these workers operate powerful, high-speed machines that can be dangerous if strict safety rules are not observed. Most operators wear protective equipment, such as safety glasses and earplugs, to protect against flying particles of metal or plastic and against noise from the machines. However, many modern machines are enclosed, minimizing the exposure of workers to noise, dust, and lubricants used during machining. Other required safety equipment varies by work setting and machine. For example, those in the plastics industry who work near materials that emit dangerous fumes or dust must wear face masks or self-contained breathing apparatus.

Most workers in the occupation put in a 40-hour week, but overtime is common during periods of increased production. Because many metalworking and plastics working shops operate more than one shift daily, some operators work nights and weekends.

Employment

Machine setters, operators, and tenders—metal and plastic held about 1.3 million jobs in 2002. Approximately 9 of 10 jobs were found in manufacturing. About 38 percent of all employment was in these manufacturing industries: transportation equipment manufacturing, plastics and rubber products manufacturing, and machinery manufacturing. The following tabulation shows the distribution of em-

ployment of machine setters, operators, and tenders—metal and plastic by detailed occupation.

Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	283,000
Molding, coremaking, and casting machine setters, operators, and tenders, metal and plastic	151,000
Grinding, lapping, polishing, and buffing machine tool setters, operators, and tenders, metal and plastic	104,000
Multiple machine tool setters, operators, and tenders, metal and plastic	99,000
Extruding and drawing machine setters, operators, and tenders, metal and plastic	98,000
Lathe and turning machine tool setters, operators, and tenders, metal and plastic	75,000
Drilling and boring machine tool setters, operators, and tenders, metal and plastic	53,000
Forging machine setters, operators, and tenders, metal and plastic	45,000
Rolling machine setters, operators, and tenders, metal and plastic	44,000
Plating and coating machine setters, operators, and tenders, metal and plastic	44,000
Milling and planing machine setters, operators, and tenders, metal and plastic	31,000
Heat treating equipment setters, operators, and tenders, metal and plastic	29,000
Tool grinders, filers, and sharpeners	26,000
Foundry mold and coremakers	23,000
Metal-refining furnace operators and tenders	18,000
Pourers and casters, metal	13,000
Lay-out workers, metal and plastic	13,000
Model makers, metal and plastic	8,500
Patternmakers, metal and plastic	6,500
All other metal workers and plastic workers	104,000

Training, Other Qualifications, and Advancement

Machine setters, operators, and tenders—metal and plastic learn their skills on the job. Trainees begin by observing and assisting experienced workers, sometimes in formal training programs. Under supervision, they may start as tenders, supplying materials, starting and stopping the machine, or removing finished products from it. Then they advance to the more difficult tasks performed by operators, such as adjusting feed speeds, changing cutting tools, or inspecting a finished product for defects. Eventually, they become responsible for their own machines.

The complexity of the equipment largely determines the time required to become an operator. Most operators learn the basic machine operations and functions in a few weeks, but they may need a year to become skilled operators or to advance to the more highly skilled job of setter. Although many operators learn on the job, some community colleges and other educational institutions offer courses and certifications in operating metal and plastics machines. In addition to providing on-the-job training, some employers send promising machine tenders to operator classes. Other employers prefer to hire workers who have completed, or currently are enrolled in, a training program.

Setters or technicians normally need a thorough knowledge of the machinery and of the products being manufactured, because they often plan the sequence of work, make the first production run, and determine which adjustments need to be made. Strong analytical abilities are particularly important for this job. Some

companies have formal training programs for operators and setters; often, the programs combine classroom instruction with on-the-job training.

Although no special education is required for many jobs in the occupation, employers prefer to hire applicants with good basic skills. Many require employees to have a high school education and to read, write, and speak English. Because machinery is becoming more complex and shop-floor organization is changing, employers increasingly look for persons with good communication and interpersonal skills. Mechanical aptitude, manual dexterity, and experience working with machinery also are helpful. Those interested in becoming machine setters, operators, and tenders can improve their employment opportunities by completing high school courses in shop and blueprint reading and by gaining a working knowledge of the properties of metals and plastics. A solid math background, including courses in algebra, geometry, trigonometry, and basic statistics, also is useful.

Job opportunities and advancement can be enhanced as well by becoming certified in a particular machining skill. The National Institute for Metalworking Skills has developed standards for machine setters, operators, and tenders—metal. After taking a course approved by the organization and passing a written exam and performance requirement, the worker is issued a credential that signifies competence in a specific machining operation. The Society of Plastics Industry, the national trade association representing plastics manufacturers, also certifies workers in that industry. To achieve machine-operator certification, 2 years of experience operating a plastics-processing machine is recommended, and one must pass a computer-based exam.

Advancement for operators usually takes the form of higher pay, although there are some limited opportunities for operators to advance to new positions as well. For example, they can become multiple-machine operators, setup operators, or trainees for the more highly skilled position of machinist, tool and die maker, or computer-control programmer or operator. Some setup workers may advance to supervisory positions. (See the statements on machinists, computer-control programmers and operators, and tool and die makers elsewhere in the *Handbook*.)

Job Outlook

Overall employment growth in the various machine setter, operator, and tender occupations will be slower than average, although employment trends among these occupations will diverge over the 2002-12 period. In general, employment of workers in the occupation will be affected by the rate of technological implementation, the demand for the goods they produce, the effects of trade, and the reorganization of production processes. Employment of multiple-machine-tool operators; molding, coremaking, and casting-machine operators, metal and plastic; and a number of miscellaneous operating occupations is expected to grow. A decline in employment, however, is projected for some machine tool operators, including metal-refining furnace operators and tenders and pourers and casters, metal. Despite differing rates of employment change, a large number of machine setter, operator, and tender jobs will become available due to an expected surge in retirements as some baby boomers become eligible for retirement by the end of the decade.

One of the most important factors influencing employment change in this occupation is the implementation of labor-saving

machinery. In order to remain competitive by improving quality and lowering production costs, many firms are adopting new technologies, such as computer-controlled machine tools and robots. Computer-controlled equipment allows operators to tend a greater number of machines simultaneously and often makes setup easier, thereby reducing the amount of time setup workers spend on each machine. Robots are being used to load and unload parts from machines. The lower skilled manual machine tool operators and tenders are more likely to be eliminated by these new technologies, because the functions they perform are more easily automated.

The demand for machine setters, operators, and tenders—metal and plastic largely mirrors the demand for the parts they produce. The consumption of plastic products has grown as they have been substituted for metal goods in many consumer and manufactured products in recent years. The process is likely to continue and should result in stronger demand for machine operators in plastics than in metal.

Both the plastics and metal industries, however, face stiff foreign competition that is limiting the demand for domestically produced parts. One way in which larger U.S. producers have responded to this competition is by moving production operations to other countries where labor costs are lower. These moves are likely to continue and will further reduce employment opportunities for many machine operators, setters, and tenders—metal and plastic in the United States. Another way domestic manufacturers compete with low-wage foreign competition is by increasing their use of automated systems, which can make manufacturing establishments more competitive by improving their productivity. However, increased automation also limits employment growth.

Workers with a thorough background in machine operations, exposure to a variety of machines, and a good working knowledge of the properties of metals and plastics will be best able to adjust to the changing environment. In addition, new shop-floor arrangements will reward workers with good basic mathematics and reading skills, good communication skills, and the ability and willingness to learn new tasks. As workers adapt to team-oriented production methods and operate more machines, the number of multiple-machine-tool operators, setters, and tenders—metal and plastic will continue to rise.

Earnings

Earnings for machine operators can vary by size of the company, union or nonunion status, industry, and skill level and experience of the operator. Also, temporary employees, who are being hired in greater numbers, usually get paid less than company-employed workers. The median hourly earnings in 2002 for a variety of machine setters, operators, and tenders—metal and plastic were as follows:

Model makers, metal and plastic	\$18.27
Patternmakers, metal and plastic	16.09
Metal-refining furnace operators and tenders	14.79
Lay-out workers, metal and plastic	14.79
Lathe and turning machine tool setters, operators, and tenders, metal and plastic	14.55
Tool grinders, filers, and sharpeners	14.14
Milling and planing machine setters, operators, and tenders, metal and plastic	14.04
Multiple machine tool setters, operators, and tenders, metal and plastic	13.79
Rolling machine setters, operators, and tenders, metal and plastic	13.62
Heat treating equipment setters, operators, and tenders, metal and plastic	13.56
Pourers and casters, metal	13.40
Drilling and boring machine tool setters, operators, and tenders, metal and plastic	13.23
Forging machine setters, operators, and tenders, metal and plastic	12.64
Grinding, lapping, polishing, and buffing machine tool setters, operators, and tenders, metal and plastic	12.56
Foundry mold and coremakers	12.55
Extruding and drawing machine setters, operators, and tenders, metal and plastic	12.44
Plating and coating machine setters, operators, and tenders, metal and plastic	12.22
Cutting, punching, and press machine setters, operators, and tenders, metal and plastic	11.81
Molding, coremaking, and casting machine setters, operators, and tenders, metal and plastic	11.17
All other metal workers and plastic workers	13.65

Related Occupations

Workers in occupations closely related to machine setters, operators, and tenders—metal and plastic include machinists; tool and die makers; assemblers and fabricators; computer-control programmers and operators; and welding, soldering, and brazing workers. Often, machine operators are responsible for checking the quality of parts being produced, work similar to that of inspectors, testers, sorters, samplers, and weighers.

Sources of Additional Information

For general information about metal machine setters, operators, and tenders, contact any of the following organizations:

- ▶ National Tooling and Machining Association, 9300 Livingston Rd., Fort Washington, MD 20744. Internet: <http://www.ntma.org>
- ▶ Precision Metalforming Association Educational Foundation, 6363 Oak Tree Blvd., Independence, OH 44131. Internet: <http://www.pmaef.org>
- ▶ Precision Machine Products Association, 6700 West Snowville Rd., Brecksville, OH 44141-3292. Internet: <http://www.pmpa.org>

For information on schools and employers with training programs in plastics, contact

- ▶ Society of Plastics Industry, 1801 K St. NW., Suite 600K, Washington, DC 20006-1301. Internet: <http://www.socplas.org>