


	Current Number of Workers 2006	Projected Number of Workers 2016	% Change to 2016	Average Annual Openings	 <b>Machinists</b> <b>SOC # 51-4041</b>	
<b>Regional</b>	300	300	0.00%	10		
<b>Texas</b>	29,000	35,500	22.40%	1100		
<b>Education/ Training Time</b>	<b>Is License Required?</b>	<b>Wage Rate S/Hr. 2008 Regionally</b>	<b>Percent Female</b>	<b>Average Age</b>	<b>Job Turnover</b>	<b>Why Most Job Openings Occur</b>
<b>1+ years OR Apprentice</b>	<b>Industry Certificate</b>	\$17.76	3.7%	40.4	Average	<b>Equal Growth/ Replacement</b>

#### JOB DESCRIPTION

Set up and operate a variety of machine tools to produce precision parts and instruments. Include precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, shop mathematics, metal properties, layout, and machining procedures.

#### WHERE DO WORKERS FIND JOBS?

Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing  
Agriculture, Construction, and Mining Machinery Manufacturing  
Other General Purpose Machinery Manufacturing  
Aerospace Product and Parts Manufacturing  
Other Fabricated Metal Product Manufacturing  
Machinery, Equipment, and Supplies Merchant Wholesalers  
Employment Services  
Navigational, Measuring, Electromedical, and Control Instruments Manufacturing  
Architectural and Structural Metals Manufacturing  
Metalworking Machinery Manufacturing

#### RELATED COLLEGE PROGRAMS

CIP 480501 Machine Tool Technology/Machinist  
CIP 480503 Machine Shop Technology/Assistant

#### IMPORTANT KNOWLEDGE

##### ARTS AND HUMANITIES

\* English Language

##### ENGINEERING AND TECHNOLOGY

\* Design \* Mechanical

\* Engineering and Technology

##### MANUFACTURING AND PRODUCTION

\* Production and Processing

##### MATHEMATICS AND SCIENCE

\* Mathematics

#### IMPORTANT SKILLS

##### COMPLEX PROBLEM SOLVING SKILLS

\* Complex Problem Solving

##### CONTENT

\* Active Listening \* Speaking

##### PROCESS

\* Critical Thinking \* Monitoring

##### RESOURCE MANAGEMENT SKILLS

\* Time Management

##### SOCIAL SKILLS

\* Coordination

##### SYSTEMS SKILLS

\* Judgment and Decision Making

##### TECHNICAL SKILLS

\* Equipment Maintenance

\* Operation Monitoring \* Operation and Control

\* Quality Control Analysis

#### IMPORTANT ABILITIES

##### ATTENTIVENESS

##### CONTROL MOVEMENT ABILITIES

##### FINE MANIPULATIVE ABILITIES

##### IDEA GENERATION AND REASONING ABILITIES

##### REACTION TIME AND SPEED ABILITIES

##### VERBAL ABILITIES

##### VISUAL ABILITIES

## **NATURE OF THE WORK: Machinists**

Machinists use machine tools, such as lathes, milling machines, and machining centers, to produce precision metal parts. Although they may produce large quantities of one part, precision machinists often produce small batches or one-of-a-kind items. They use their knowledge of the working properties of metals and their skill with machine tools to plan and carry out the operations needed to make machined products that meet precise specifications.

Before they machine a part, machinists must carefully plan and prepare the operation. These workers first review electronic or written blueprints or specifications for a job. Next, they calculate where to cut or bore into the workpiece (the piece of steel, aluminum, titanium, plastic, silicon or any other material that is being shaped), how fast to feed the workpiece into the machine, and how much material to remove. They then select tools and materials for the job, plan the sequence of cutting and finishing operations, and mark the workpiece to show where cuts should be made.

After this layout work is completed, machinists perform the necessary machining operations. They position the workpiece on the machine tool--drill press, lathe, milling machine, or other type of machine--set the controls, and make the cuts. During the machining process, they must constantly monitor the feed rate and speed of the machine. Machinists also ensure that the workpiece is being properly lubricated and cooled, because the machining of metal products generates a significant amount of heat. The temperature of the workpiece is a key concern because most metals expand when heated; machinists must adjust the size of their cuts relative to the temperature. Some rare but increasingly popular metals, such as titanium, are machined at extremely high temperatures.

Machinists detect some problems by listening for specific sounds--for example, a dull cutting tool or excessive vibration. Dull cutting tools are removed and replaced. Cutting speeds are adjusted to compensate for harmonic vibrations, which can decrease the accuracy of cuts, particularly on newer high-speed spindles and lathes. After the work is completed, machinists use both simple and highly sophisticated measuring tools to check the accuracy of their work against blueprints.

Some machinists, often called production machinists, may produce large quantities of one part, especially parts requiring the use of complex operations and great precision. Many modern machine tools are computer numerically controlled (CNC). CNC machines, following a computer program, control the cutting tool speed, change dull tools, and perform all of the necessary cuts to create a part. Frequently, machinists work with computer control programmers to determine how the automated equipment will cut a part. The programmer may determine the path of the cut, while the machinist determines the type of cutting tool, the speed of the cutting tool, and the feed rate. Because most machinists train in CNC programming, they may write basic programs themselves and often set offsets (modify programs) in response to problems encountered during test runs. After the production process is designed, relatively simple and repetitive operations normally are performed by machine setters, operators, and tenders.

Some manufacturing techniques employ automated parts loaders, automatic tool changers, and computer controls, allowing machine tools to operate without anyone present. One production machinist, working 8 hours a day, might monitor equipment, replace worn cutting tools, check the accuracy of parts being produced, adjust offsets, and perform other tasks on several CNC machines that operate 24 hours a day (lights-out manufacturing). During lights-out manufacturing, a factory may need only a few machinists to monitor the entire factory.

Other machinists do maintenance work--repairing or making new parts for existing machinery. To repair a broken part, maintenance machinists may refer to blueprints and perform the same machining operations that were needed to create the original part.

Because the technology of machining is changing rapidly, machinists must learn to operate a wide range of machines. Along with operating machines that use metal cutting tools to shape workpieces, machinists operate machines that cut with lasers, water jets, or electrified wires. While some of the computer controls may be similar, machinists must understand the unique cutting properties of these different machines. As engineers create new types of machine tools and new materials to machine, machinists must constantly learn new machining properties and techniques.