

Made In America: Machinery

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In 2012, shipments from the U.S. manufacturing sector totaled \$5.7 trillion. So, what do we make in the United States? This series of manufacturing profiles will answer that question one industry at a time. The focus of this profile is machinery.¹

Overview

Machinery manufacturing shipments totaled \$407.4 billion or 7.1 percent of all manufacturing shipments in 2012. The industry plays a significant role in nearly all sectors of the economy. According to the North American Industry Classification System (NAICS), it “creates end products that apply mechanical force, for example, the application of gears and levers, to perform work. Some important processes for the manufacture of machinery are forging, stamping, bending, forming, and machining—which are all used to shape individual pieces of metal. Processes, such as welding and assembling are used to join separate parts together.”² Many of the processes used in the machinery manufacturing industry are similar to those used in fabricated metal products manufacturing. However, machinery manufacturing uses multiple metal forming processes throughout the production of a machine and also relies on complex assembly operations.

Machinery helps create output in almost all the other sectors in the U.S. economy: some machines are used to manufacture other goods; construction machinery is used to build structures; agricultural machinery is used to harvest and process crops; and mining and oil field machinery are used to produce energy (see Box 1).³

While most people know what a tractor or a crane look like, much of the equipment that the machinery manufacturing industry produces is not familiar to people outside of an industrial setting: equipment such as dies (devices for cutting or forming materials in a press or a stamping or forging machine), molds (hollowed-out forms that are used to shape something in a molten or plastic state), and stamping machines (presses that form materials into a desired shape) are all products of this industry and serve as important capital in other manufacturing processes.





Some auto stamping presses are as big as houses and can stamp out the side of an SUV body in a single piece. Tunnel boring machines (TBMs) are used in mining and construction. They are large cylindrical machines with cutter heads and devices to remove material in order to create a tunnel. TBMs range in size from about 3 feet to over 50 feet and are used as an alternative to drilling or blasting to limit vibrations and debris when accessing raw materials under the earth's surface or constructing transportation systems.

Other machines, such as commercial HVAC units and elevators, are also produced by this industry.⁴ Because these products are not generally found on store shelves as consumer goods, it can be difficult to assess their value and impact in the manufacturing sector and the economy as a

whole. However, machinery manufacturing is a vibrant and thriving contributor to American manufacturing.

Box 1. What Types of Machines Does the United States Make?

Agricultural and food machinery includes equipment used to grow, process, package, transport, and distribute food and beverages, agricultural equipment, food processing and packaging machinery, commercial and industrial refrigeration equipment, and commercial food service equipment.

Construction machinery and related equipment includes self-propelled equipment, implements, accessories and components for use in construction, forestry, mining and utilities. Off-road diesel engines and fluid-power technology are also important components of off-road equipment.

Manufacturing machinery is used to manufacture a wide range of goods out of metal and plastic and consists of technologies that find application in many other manufacturing industries, such as automotive, aerospace and medical devices. It includes machine tools for cutting, stamping and forming metal; plastics and rubber manufacturing machinery; and a wide range of cutting tools, dies and accessories.

Industrial process machinery is used in a wide range of industries to operate and automate industrial processes. It includes basic products such as electric motors, pumps, valves and compressors and industrial controls, as well as material handling equipment. Process control systems are especially important to achieving the greatest productivity from industrial plant and equipment.

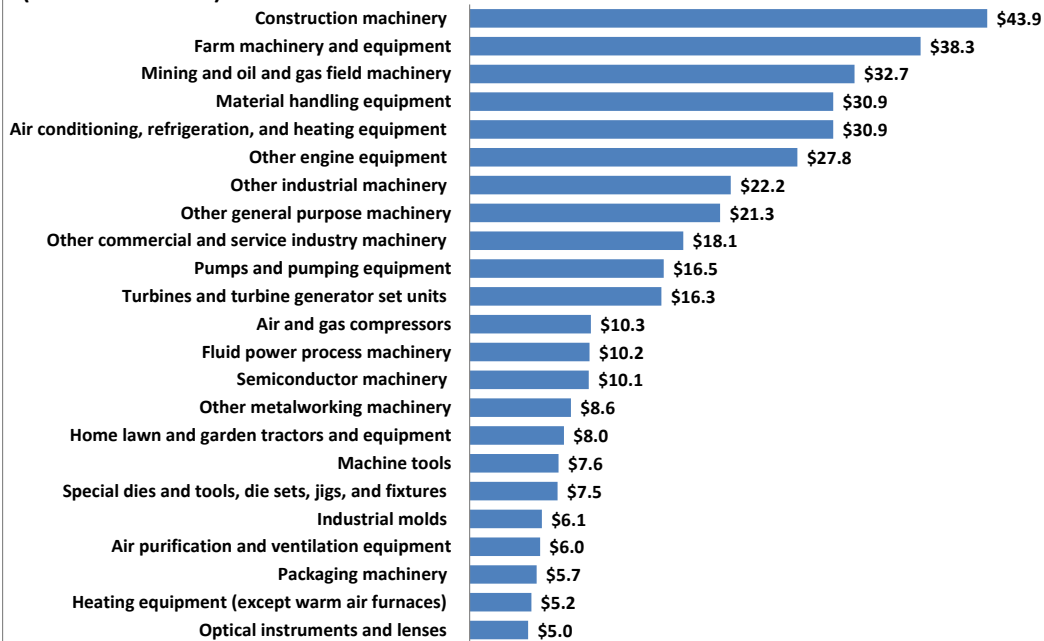
Power and energy equipment includes machinery for generating, transmitting and distributing electric power as well as machinery used for oil and gas exploration and production. Major categories include turbines, power transmission equipment and internal combustion engines (except automotive gasoline and aircraft) for electric utility and industrial applications. This group also includes oil and gas field machinery.

Source: Department of Commerce, SelectUSA. Available at: <http://selectusa.commerce.gov/industry-snapshots/machinery-and-equipment-industry-united-states>

Shipments

Figure 1. Shipments in Machinery Manufacturing, 2012

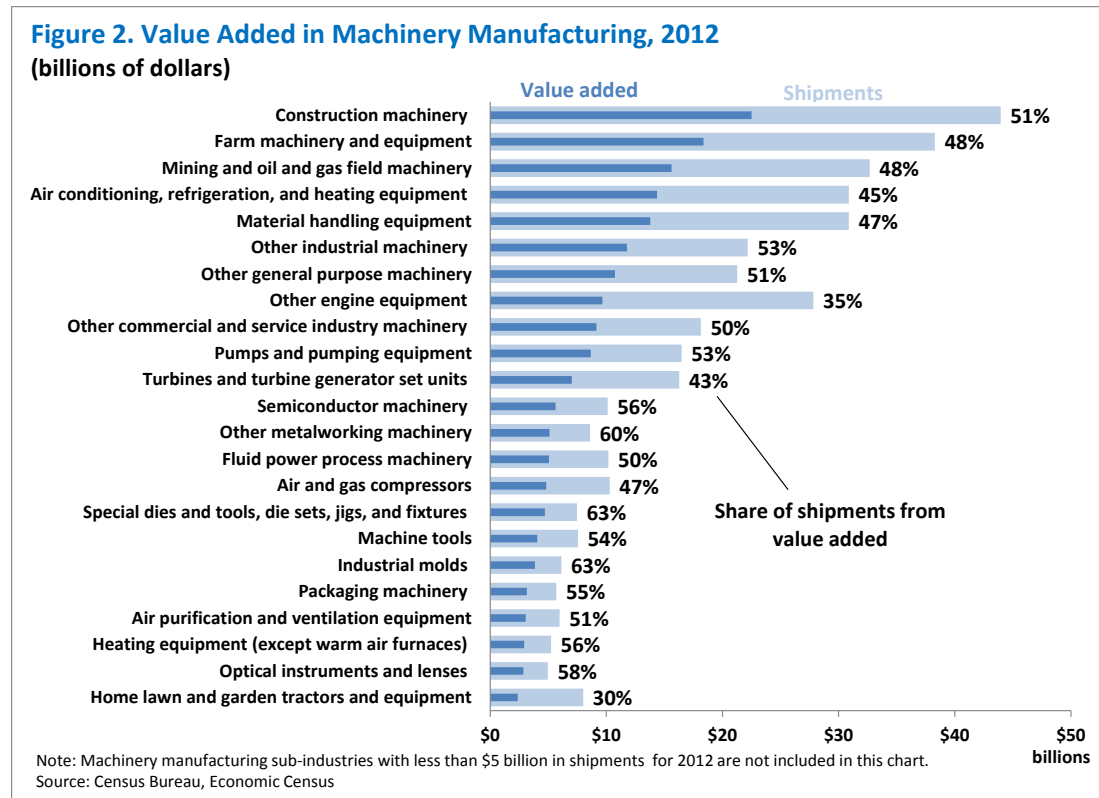
(billions of dollars)



Note: Machinery manufacturing sub-industries with less than \$5 billion in shipments for 2012 are not included in this chart.
Source: Census Bureau, Economic Census

- In 2012, the construction machinery, farm machinery and equipment, and mining and oil and gas field machinery industries led machinery manufacturing with \$43.9 billion in shipments (11 percent of all machinery shipments), \$38.3 billion (9 percent), and \$32.7 billion in shipments (8 percent), respectively.
- The machines produced by these three industries are used primarily by the construction sector, the agricultural sector, and the mining and oil and gas extraction sectors. Most of the other machinery manufacturing industries produce general purpose machinery employed by a variety of sectors.
- In 2012, businesses purchased 96 percent of all of machinery sold for consumption or private investment in the United States.

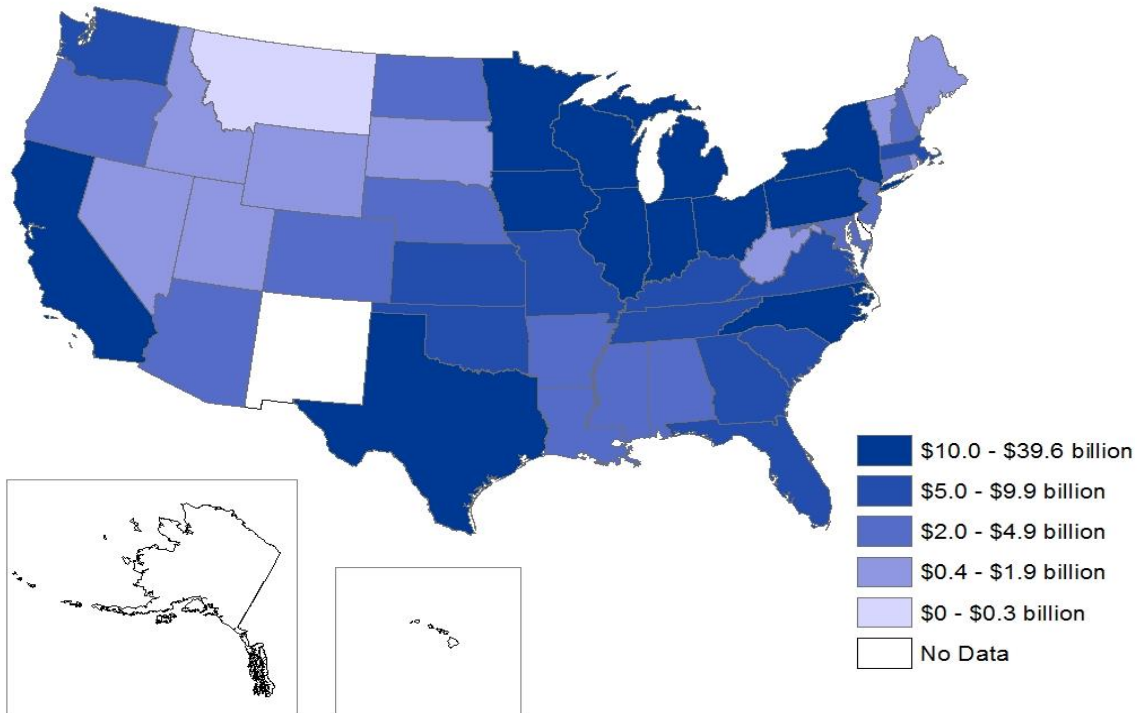
Value added



- In 2012, value added accounted for 49 percent of the total value of machinery shipments. For some machinery industries, such as industrial molds and other metalworking machinery, the share is much higher.⁵
- Compensation of employees, or labor, accounted for 60 percent of value added in 2012.⁶ Returns to capital accounted for another 38 percent, while taxes on production and imports less subsidies made up the remaining 2 percent.
- Overall, the median hourly wage (as of May 2013) in the industry was \$20.07, an 11 percent premium over the manufacturing sector as a whole (\$18.12). The most common jobs in the industry are metal and plastic workers (27 percent of total employment), assemblers and fabricators (17 percent), and engineers (7 percent).⁷
- Metal and plastic machine workers set up and operate machines that cut, shape, and form metal and plastic materials or pieces.⁸ They use blueprints to set up, monitor, and insert materials into machines, remove finished products, smooth edges and imperfections, and test finished pieces to specifications. Assemblers and fabricators use tools, machines, and their hands to assemble finished products and the parts that go into them according to schematics and blueprints, often working closely with engineers in product development.

Which States Make Machinery?

Figure 3. Machinery Manufacturing Shipments, 2011
(billions of dollars)

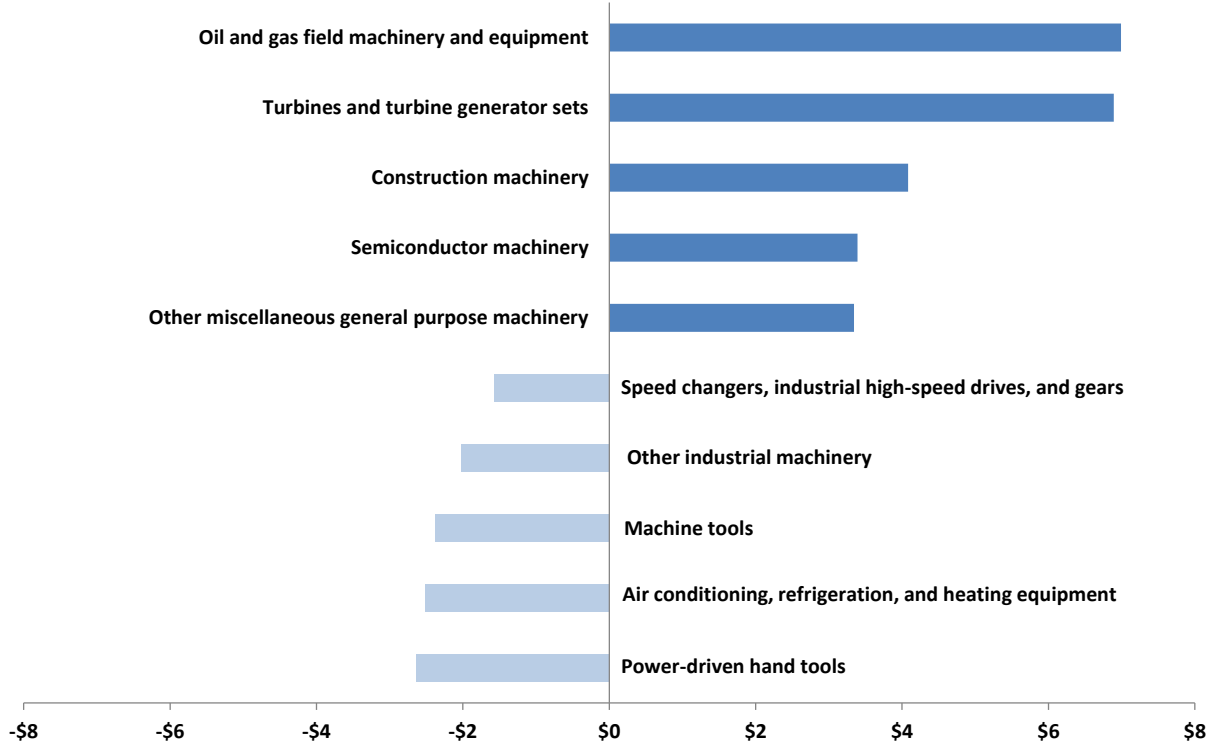


Source: Census Bureau, Annual Survey of Manufactures

- Machinery manufacturing is widespread throughout the United States, but is concentrated around the Great Lakes region, an area known for industrial manufacturing.⁹
- Nine states—Illinois, Wisconsin, Ohio, Michigan, Iowa, Pennsylvania, New York, Indiana, and Minnesota—accounted for 44 percent of the \$365.0 billion in U.S. machinery manufacturing shipments in 2011.¹⁰ Machinery manufacturers in Texas had the highest value of shipments at \$39.6 billion. Texas, California, and North Carolina combined to account for another 20 percent of total U.S. machinery shipments.
- For the United States overall, machinery shipments accounted for 7 percent of total manufacturing shipments in 2011. In some states, machinery made up a much larger share of total manufacturing activity; particularly noteworthy are North Dakota (22 percent), Iowa (16 percent), New Hampshire (15 percent), and Oklahoma (14 percent).

Satisfying Demand for Machinery Here and Abroad

Figure 4. Top Five Surpluses and Deficits in U.S. Machinery Trade (billions of dollars)



Source: Census Bureau, USA Trade Online

- The machines that America produces help the U.S. economy produce other goods and perform a variety of services, but they are also an important U.S. export. In 2013, the United States exported \$142.1 billion of machinery, 12 percent of total exports of manufactured goods. By contrast, machinery makes up only 7 percent of total manufacturing shipments, indicating the outside role this industry plays in international trade.
- The United States imported \$142.3 billion of machinery in 2013, resulting in a trade deficit of \$0.2 billion. While this is a small deficit, the overall manufacturing trade deficit was much larger at \$680.4 billion, providing another indication of the strength of U.S. machinery manufacturing.
- The United States ran trade surpluses of \$7.0 billion for oil and gas field machinery and equipment and \$6.9 billion for turbines and turbine generator sets in 2013. The largest trade deficits were much smaller, around \$2.5 billion dollars each for power-driven hand tools and air conditioning, refrigeration, and heating equipment.
- More than half of all the machinery purchased by U.S. consumers and businesses in 2012 was domestically made.¹¹

Endnotes

1. For additional information about how to measure what is made in America and for further explanation of concepts used in this report, see Economics and Statistics Administration, “What is Made in America?” available at: <http://www.esa.doc.gov/Reports/what-made-america>.
2. The machinery manufacturing subsector is categorized by the North American Industry Classification System (NAICS) as NAICS 333. Industry definition available at: <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=333&search=2012%20NAICS%20Search>. For full classification structure, see: <http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2012>.
3. Also see International Trade Administration’s machinery industry snapshots available at: http://trade.gov/mas/manufacturing/OAAI/tg_oaai_003830.asp and U.S. machinery reports available at http://trade.gov/mas/manufacturing/OAAI/tg_oaai_003653.asp.
4. Household appliances are products of the electrical equipment, appliance, and component manufacturing industry (NAICS 335).
5. Value added considers only the new production completed at each stage of the manufacturing process—i.e., the labor and capital applied by each firm to the purchased inputs produced elsewhere. This measure of manufacturing activity is derived in the Economic Census by subtracting the cost of materials, supplies, containers, fuel, purchased electricity, and contract work from the value of shipments (products manufactured plus receipts for services rendered). The result of this calculation is adjusted by the addition of value added by merchandising operations (i.e., the difference between the sales value and the cost of merchandise sold without further manufacture, processing, or assembly) plus the net change in finished goods and work-in-process between the beginning and end of year inventories.
6. Bureau of Economic Analysis industry data available from: www.bea.gov. For more information on these concepts, see “Measuring the Nation’s Economy: An Industry Perspective. A Primer on BEA’s Industry Accounts.” Bureau of Economic Analysis. Available at: http://bea.gov/industry/pdf/industry_primer.pdf.
7. For more detail on the occupations and wages in the machinery manufacturing industry, refer to the Occupational Employment Statistics program of the Bureau of Labor Statistics. Available at: http://www.bls.gov/oes/current/naics3_333000.htm.
8. Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2014-15 Edition*, Metal and Plastic Machine Workers. Available at: <http://www.bls.gov/ooh/production/metal-and-plastic-machine-workers.htm>.
9. Susan Helper, Timothy Krueger, and Howard Wial. “Locating American Manufacturing: Trends in the Geography of Production.” Brookings Institute. April 2012. Available at: http://www.brookings.edu/~media/research/files/reports/2012/5/09%20locating%20american%20manufacturing%20wialh/0509_locating_american_manufacturing_report.pdf.
10. For more detailed geographic information about machinery manufacturing, see Harvard Business School’s and the Economic Development Administration’s U.S. Cluster Mapping project available at: <http://clustermapping.us/cluster>. See specifically information on metalworking machinery subclusters (http://clustermapping.us/cluster/metalworking_technology/subclusters), machine tools and accessories subclusters (http://clustermapping.us/cluster/metalworking_technology/subclusters), and production technology and heavy machinery subclusters (http://clustermapping.us/cluster/production_technology_and_heavy_machinery/subclusters).

11. Economics and Statistics Administration, "What is Made in America?"