CHAPCO

METAL FABRICATION • ASSEMBLY • PRODUCT ENGINEERING

101 SERIES

CNC Machining

CNC Machining Overview

Gone are the days of humans working the levers, buttons, and wheels; CNC machines with their computer programed components act as the live operator. Computer numerical control machining, most often referred to simply as CNC machining, is the result of a long evolutionary process in manufacturing technology. Replacing most human interaction with automated, software-driven equipment, CNC techniques facilitate the operation of complex tools and machinery on the factory floor.

How Does CNC Programming Work?

Programmers use various computer-aided manufacturing applications to develop “G-code,” a programming language that dictates how an automated machine tool will operate on a workpiece. From tooling geometry to speeds and feeds settings, G-code commands machine equipment in the same way a conductor leads an orchestra.

Industrial CNC Machining Applications

Subtractive manufacturing is the most common machining method used in manufacturing applications, employing tools to remove material from a work piece. This technique is often used in CNC applications, from grinding to milling, to remove material from metals.

CNC programming methods control the tooling that ultimately shapes the workpiece. CNC machining is widely used to create parts from raw materials or fabricate metals into components. A range of industries, including the automotive, aerospace, power generation, marine, and transportation sectors, use CNC machining technology to bring about increased precision, efficiency, and quality.

Types of CNC Machines

CNC tools are employed for milling, turning, drilling, boring, routing, grinding, and so on. Let's take a closer look:

- Mills - in CNC milling applications, drilling and cutting are dictated by the CNC control equipment, providing the necessary steps and machine performance settings to achieve successful operations on metals, polymers, and other materials.
- Lathes - CNC lathes use a computer program to dictate the turning operations of the workpiece, regulating machine performance, coolant feeds, speeds, tool offsets, and more on metals, woods, and plastics.
- Plasma Cutters - with high-temperature plasma cutters, a CNC program communicates with the equipment to move the plasma cutting head along 2D space, regulating cutting, plasma output, position, and more.

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- Routers - routers use CNC technology to perform various tasks such as the carving, cutting, and trimming of materials into 3D shapes, all dictated by the G-code instructions interpreted through the CNC equipment.
- Laser Cutters - similar to plasma cutters, CNC laser cutters automate the cutting process along 2D shapes, regulating the equipment for optimal performance.

CNC Automated Processes

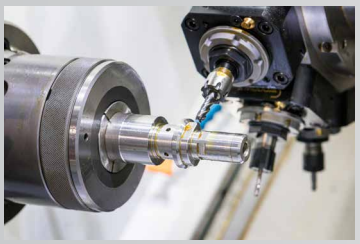
Milling - is a very universal fabrication method with great accuracy and tolerances. Milling is suitable for a variety of materials and is also very quick. The ability to manufacture a wide range of complex parts is a great advantage.

Milling operations include:

• End milling • Chamfer milling • Face milling • Drilling, boring, tapping, etc.

Turning - while the two are often called just CNC machining, turning and milling have distinct differences. Turning is pretty much the opposite of milling. This means that instead of the cutting tool, the workpiece is rotating. For example, CNC turning is commonly used for producing shafts.

Grinding - CNC grinding machines use a rotating grinding wheel to remove material. The objective is to give a high precision finish to a metal part. The achievable surface quality is very high. Therefore, it is used as a finishing operation rather than creating the final piece from raw materials.



Routing - CNC routers are seemingly similar to CNC milling machines. Here also the rotating piece is the cutting head. The main difference lies with the materials suitable for cutting. Routers are a perfect fit for cutting softer materials (not metals) that do not require very high accuracy. The reason for that is its lesser output power. At the same time, routers are quicker. Therefore, they are able to produce the parts in less time.

Drilling - While milling equipment can also produce holes, drills are meant for only that job. The difference? While milling tools use cutting edges around the cutting head's periphery, drills use the tip of the tool to produce a hole. CNC drilling machines are commonly used to automate this job, provide better accuracy and a more cost-effective solution.

The Value of CNC Machining

The use of CNC equipment across industry has helped to optimize a huge range of manufacturing capabilities, ensuring repeated precision on mass-produced parts and equipment. In fact, the universal machining language can be incorporated into virtually any type of heavy machine tool. Software-driven machining helps maintain superior accuracy, high production quality, and reliable consistency for various products and components. It also lowers costs and allows factories to meet higher production demands.

As companies increasingly embrace industrial automation, CNC machining tools are being used to help reduce costs and increase production tempo. Plus, highly precise tolerances can be repeatedly achieved with CNC machining, helping small and large businesses alike compete and allowing the flexibility to work with almost any material.

Applications

Versatile, reliable, and highly efficient, CNC machining is used across a huge range of industries and applications, allowing for precise, repeatable parts. For these reasons, superior CNC machined parts and components are employed in a range of industries, including:

- **Automotive** - Used to bring about enhanced assembly-line efficiency and quality control
- **Medical** - Allows for production of complex, durable, and long-lasting custom jobs
- **Transportation** - Allows for accurate machining on train and subway components
- **Aerospace** - Used for high-tolerance machining on aerospace-grade materials
- **Marine** - Used for machining of spare parts on tankers and other large vessels

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We invite you to contact Chapco today to inquire about our advanced CNC turning and milling capabilities or to learn more about our other service offerings, including: metal fabrication, assembly, engineering, contract manufacturing, welding, finishing and turn-key end-to-end services.

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