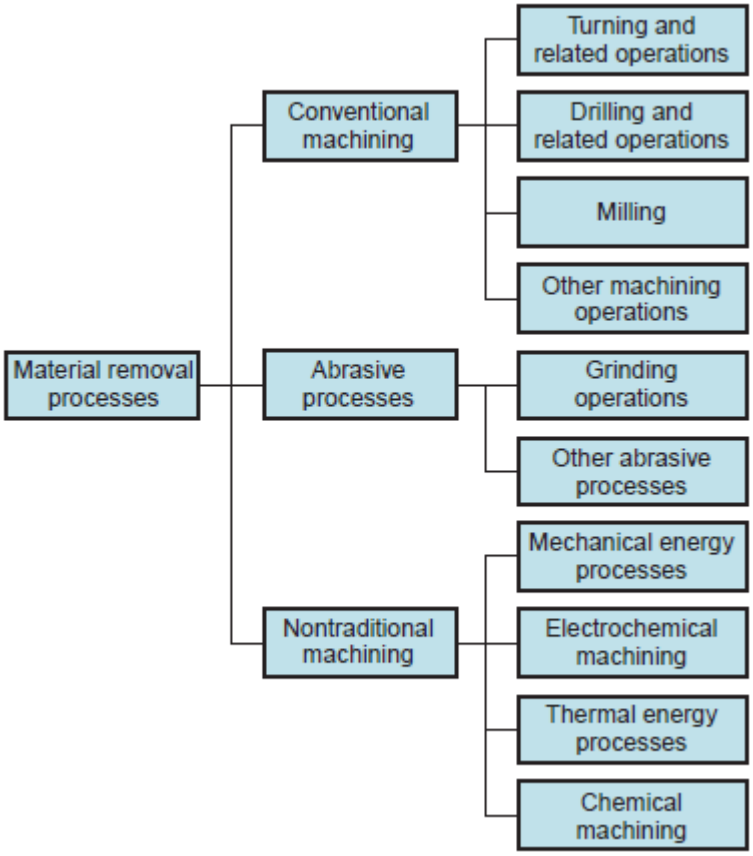
The material removal processes:

are a family of shaping operations in which excess material is removed from a starting workpart so that what remains is the desired final geometry.

Machining:

is a manufacturing process in which a sharp cutting tool is used to cut away material to leave the desired part shape. The predominant cutting action in machining involves shear deformation of the work material to form a chip; as the chip is removed, a new surface is exposed. Machining is most frequently applied to shape metals.



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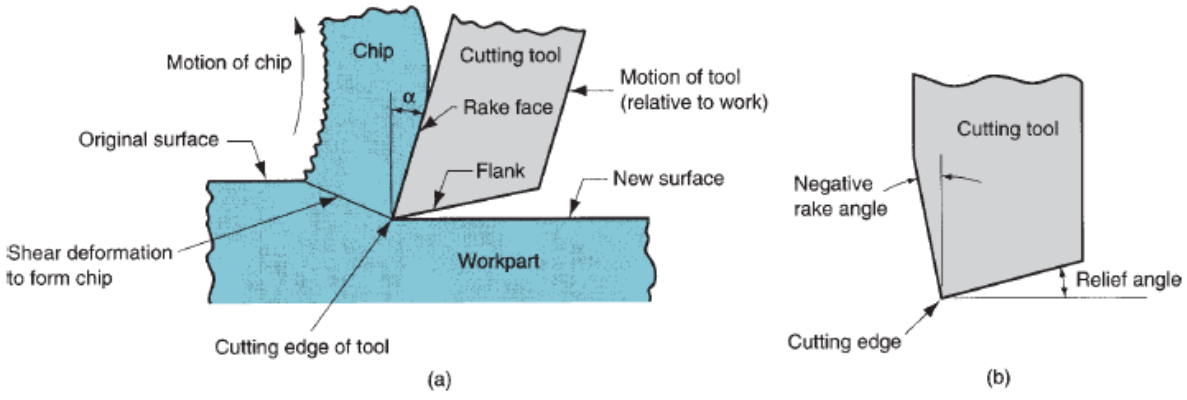
Machining is one of the most important manufacturing processes. The Industrial Revolution and the growth of the manufacturing-based economies of the world can be traced largely to the development of the various machining operations.
Machining is important commercially and technologically for several reasons:

1-Variety of work materials. Machining can be applied to a wide variety of work materials. Virtually all solid metals can be machined. Plastics and plastic composites
can also be cut by machining. Ceramics pose difficulties because of their high hardness and brittleness; however, most ceramics can be successfully cut by the abrasive

2-Variety of part shapes and geometric features: Machining can be used to create any regular geometries, such as flat planes, round holes, and cylinders. By introducing variations in tool shapes and tool paths, irregular geometries can be created, such as screw threads and T-slots. By combining several machining operations in sequence, shapes of almost unlimited complexity and variety can be produced.

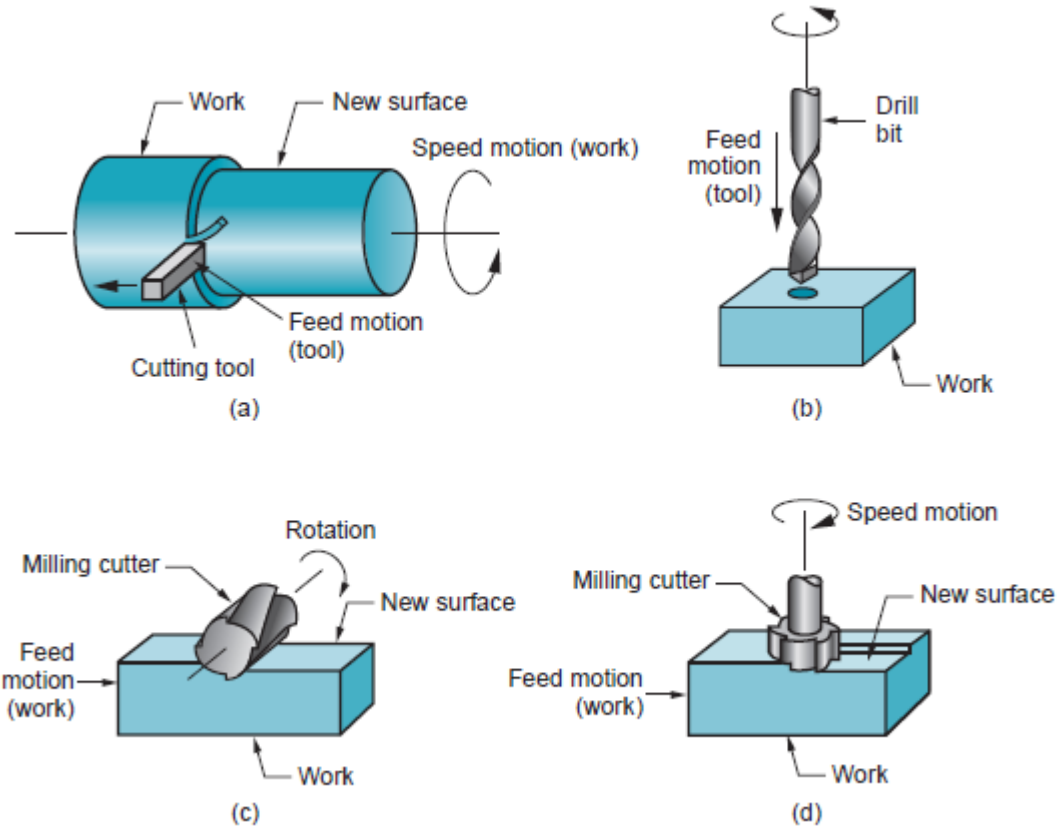
3-Dimensional accuracy: Machining can produce dimensions to very close tolerances. Some machining processes can achieve tolerances of _0.025 mm (_0.001 in), much more accurate than most other processes.

4-Good surface finishes: Machining is capable of creating very smooth surface finishes. Roughness values less than 0.4 microns (16 m-in.) can be achieved in conventional machining operations. Some abrasive processes can achieve even better finishes.



Types of Machining Operations:

There are many kinds of machining operations, each of which is capable of generating a certain part geometry and surface texture.


Work
New surface
Speed motion (work)
Feed motion (tool)
Cutting tool
(a)
Drill bit
Feed motion (tool)
Work
(b)
Rotation
Milling cutter
New surface
Feed motion (work)
Work
(c)
Speed motion
Milling cutter
New surface
Feed motion (work)
Work
(d)