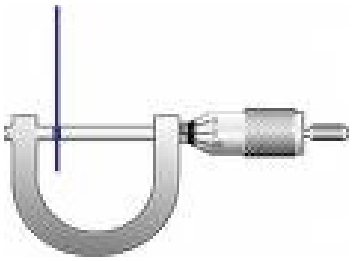
Material processing

Measuring of materials

Mechanical parts need to be measured during the manufacturing process to ensure the accuracy of the prescribed measurements. There are various measuring devices such as steel rule, carpenter's rule, calliper, micrometer and so on. Measuring is one of the most important acts during manufacturing process because many faulty products are the result of inaccurate measuring.

Steel rule has a printed scale with an accuracy of 1 or 0,5 millimeters. Some steel rules have both metric and imperial units printed on them.

Calliper measures outside and inside dimensions as well as depth of cavities with an accuracy of 0,1, 0,05 and 0,02 mm.



Micrometer is used for precise measurements of very small objects. It can measure the outside dimensions as well as depth with an accuracy of 10 μm with further estimation of 5 μm.

Sawing materials

A saw is a tool that uses a hard blade or wire with an abrasive edge to cut through softer materials. The cutting edge of a saw is either a serrated blade or an abrasive wire. A saw may be worked by hand, or powered by electricity, steam or other means. Sawing is a process of separating material by removing splinters using a saw.

The blade of the saw is stretched in a frame. The teeth on the blade have triangular shape and protrude left and right so that the saw cut is wider than the blade width. The blade has to be adequately stretched otherwise it could break if no stretched enough or snap if stretched too much.

The blade is selected depending on the material that is to be cut. For softer materials (e.g. aluminum, wood) a blade with 10 to 16 teeth per inch is used. Harder materials (e.g. steel) require blade with 16 to 25 teeth per inch. Cutting thin materials (e.g. sheet metal, pipes) requires blade with 25 to 32 teeth per inch. The blade is attached to the frame such that the teeth are pointing forward.

Note: The word **to cut** is often used interchangeably for sawing, shearing, and other separation processes.

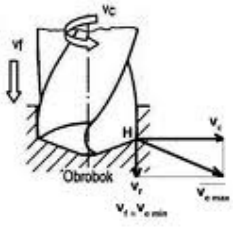
Filing materials

Filing is shaping of material by removing splinters with the help of a tool called file. File is made from a hardened steel bar with a series of sharp, parallel ridges, called teeth. The type of file we use depends on the material, its shape and thickness of the layer that needs to be removed.

Shearing materials

Shearing is the separation of a physical object, or a portion of a physical object, into two portions, through the application of an acutely directed force. During shearing two sharp edges are sliding against each other. No splinters are removed from the material when shearing.

Drilling



Drilling is a cutting process that uses a drill bit to cut or enlarge a hole in solid materials. By drilling, the material is cut in layers by the drill which rotates around its axis and is simultaneously moving in the direction of the axis.

Drill bit is a cutting tool used to create cylindrical holes. It cuts by applying pressure and rotation to the workpiece, which forms splinters at the cutting edge.

During drilling rotating drill bit removes material in layers while being pushed in forward direction. Both the rotating and the forward motion can be powered by man or by a machine.

The drill bit can be categorized as follows:

- Twist bit –used most frequently
- Gun bit – used for drilling of deep holes
- Center bit – used for drilling of lathe center holes
- Spade bit – used for rough boring in wood

Joining materials

Joining is a process of mechanically binding two or more objects together into one functioning whole. Joints can either be fixed – the components cannot be rearranged anymore or flexible – the components can be taken apart and rearranged. Joints can also be dismountable – the components can be separated without breaking the joint (e.g. screw joint) or solid – the joint cannot be dismantled and rearranged (e.g. weld joint)

Material bonding production methods:

- welding,
- riveting,
- gluing,
- soldering,
- fastening.

VOCABULARY

measuring – meranie
manufacturing – priemyselná výroba
welding – zváranie
riveting – nitovanie
gluing – lepenie
soldering – spájkovanie
fastening – upevňovanie
bonding – spájanie
functioning – fungovanie
production method – technológia
interchangeably - zameniteľný
inaccurate – nepresný
result – výsledok
cavity – dutina
blade – čepeľ, pilový list
serrated blade – zúbkovaná čepeľ
wire – drôt
abrasive – brúsny, drsný
edge – hrana, roh, okraj
hard – tvrdý
soft – mäkký
dismantled – demontovaný
rearranged – prerobený
solid – pevný
simultaneously – zároveň, súčasne
layer – vrstva
sawing – pílenie
drilling – vŕtanie
cutting – rezanie
shearing – stríhanie
filing – pilovanie
joining – spájanie
separating – oddeľovanie
removing – odstránenie
sliding – kĺzanie
steel rule – oceľové meradlo
carpenter's rule – tesárske meradlo
caliper – posúvne meradlo
printed – tlačený
scale – stupnica
metric unit – metrická sústava (mier a váh)
imperial unit – anglická sústava (mier a váh)
splinter – trieska, úlomok
stretched – napnutý
bar – tyč
sharp – ostrý
drill bit – vrták
twist bit – skrutkový vrták
gun bit – delový vrták
center bit – strediaci vrták
spade bit – kópijovitý vrták
rotates around its axis – otáča okolo svojej osi