

Diese Texte können den Auszubildenden zusammen mit Material 1 ausgehändigt werden, sodass die Übersicht über die Fertigungsverfahren (Zeile 3 und 5) von den Auszubildenden vervollständigt werden kann. Es wird eine Bearbeitung der Texte in Gruppen empfohlen.

[These texts can be handed out to students in connection with material 1 to enable them to complete the overview in material 1 \(line 3 and 5\). It is recommended to work on the texts in groups.](#)

### **Primary Shaping**

Primary shaping describes a process in which a workpiece is created from shapeless material. Examples of shapeless materials can include gases, liquids, powder, granulate material and molten substances.

During primary shaping, particle cohesion is usually created to produce a solid body. The manufacturing processes used during primary shaping are determined by the state of matter of the feedstock. For example, Liquid substances are used in casting, malleable feedstock is used in injection moulding, and powdery or granular substances are used in sintering.

### **Forming**

Forming describes manufacturing processes in which an existing, simple, metallic workpiece is purposely transformed into a more complex, metallic workpiece. Neither the mass nor the material composition of the workpiece is altered as a result of this process. The transformation is achieved through the application of pressure on the material, which results in plastic deformation. During the process, cohesion among particles is retained.

There are two basic kinds of forming processes, hot forming and cold forming.

### **Machining and Cutting**

During machining and cutting, material is removed from the original workpiece, which alters its shape as a result. Particle cohesion in the feedstock is reduced or destroyed as particles are cut from it to create the desired geometric shape. The volume and the number of particles in the finished workpiece are lower than the volume and the number of particles in the feedstock. Machining and cutting processes are used when tight tolerances on dimensions and finishes are required.

### **Joining and Fastening**

During joining and fastening processes, two or more individual workpieces are joined together to form a new workpiece with a new shape. This can either be done by joining geometrically shaped bodies or by joining workpieces with a shapeless material.

Particle cohesion is increased during these processes. Joints can be either permanent or temporary. Permanent joints cannot be loosened without destroying or damaging the workpiece. Temporary joints can be loosened at a later point without destroying or damaging the workpiece.

### **Coating**

Coating is a manufacturing process in which an adhesive covering is applied to the surface of an object (the substrate). The aim of coating processes is usually to improve the surface properties of the object, for example, by providing corrosion or scratch resistance. The shape of the workpiece is not altered during the coating process. Coatings may be applied in liquid, gas or solid form.

Particle cohesion increases during coating processes.

### **Changing Material Properties**

During the process of changing material properties, the material properties of a workpiece are purposely changed in order for the material to acquire more desirable characteristics. In these processes the shape of the workpiece is not changed. The most common properties that treatment processes want to influence are ductility, strength, hardness, toughness and resistance to corrosion.

Most processes that change material properties are performed before or after direct metalworking processes like forming, machining or cutting.