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| **MATERIAL INFORMATION** |

**5.2. Strength Enhancing Processes in Steels**

In practice, it is desirable that the part used to carry a certain load is as small as possible. Therefore, it is aimed to increase the strength of the material as much as possible. Strength-enhancing processes include alloying, cold forming, reducing grain size and heat treatments.

**5.2.1. Alloying**

It is the alloying of pure metals with other elements to improve their properties. Thermal and electrical conductivity is reduced in alloying. Hardness and strength increase, ductness decreases.

**5.2.2. Reducing grain size**

As the grain size decreases in metals, hardness and strength increase, ductivity decreases. The number of grains increases with rapid cooling.

**5.2.3 Cold formatting**

The cold shape of a piece of metal changes with processes such as rolling, forging, bending. Its strength of flow and tensiles increases its hardness, while its ductivity decreases.

**5.2.4. Heat**  **treatments**

The most important of these are hardening, de-tensioning, surface hardening and re-crystallization.

**5.2.4.1. Hardening-watering**

This process occurs by heating the steels to temperatures up to 30 – 40 oC above the SK curve and cooling them rapidly. Normally, volume-centric crystal lattices that dissolve very little carbon are stretched by excessive number of carbons and easing, forming a volume-centric tetragonal crystal. This semi-ground phase is called martenzite.

**5.2.4.2. De-escalation**

It is made in order to reduce the internal tensions caused by the laying of steels. De-escalation occurs in two ways, called breeding and temperation.

Tempering : It is the de-escalation process applied at low temperatures.

Correction: It is a de-escalation process applied at high temperatures. In this process, carbon particles in martenzite crystals are separated more easily and in large quantities.

**5.2.4.3. Softening pan**

It is a pick-up process to increase the ability of steels to process cold by removing sawdust. For this, the lamelli or layered cementite and grain boundary cementite (perlite and cementite) found conjoined in the structure are broken down and transformed into spherical cementite. Thus, the resistance of the material to machining is reduced. This annealing is usuallyapplied to steels containing more than 0.5%carbon.

**5.2.4.4. Normalization concession**

It is made by heating the steel to temperatures approximately 50 oC above the GSE lineand cooling it in the air. Rough tissue or coarse krista l structure is normalized during formatting or heating such as pressing, rolling, forging at hightemperatures. In addition, crystal structure deformations formed in the cold forming process of the material are eliminated.

**5.2.4.5. Surface**  **hardening**

This process is applied in two different ways, in which the chemical composition on the surface of the material is changed or preserved. The first example is cementation and nitration, and the second is surface hardening with sample flame or induction current.

In the process of surface hardening with cementation, it is usually used in low-carbon steels. These are perched and cannot be hardened and have a carbon content below 0.2%. At the end of this process, the carbon ratio increases to 0.8-1.3%. Carbon absorption occurs through diffusion. In the carbon absorption (carburetion) process, steel isheated to a temperature of900 o C ( 900 oC) consisting of ostenite. Carburization; solid (powder), made with liquid and gas.

In the nigering process, very strong nits are formed on the steel surface. In this process, nitrogen is exchanged for steel by diffusion at high temperature. Since hardness occurs when the part is at a higher temperature, there is no need to give water.

**5.2.4.6. Re-crystallization**

Since the plastic form change capability of metals is limited, a heat treatment is applied to the part that cannot be shaped to the desired extent in this process. This process is called re-crystallization. The internal structure is rebuilt.

**5.3. Iron and Steel Standards**

Important steel standards used at international level are also used in our country.

**5.3.1. DIN steel standard**

This standard shows the material type, main composition, production method and properties, thermal processes.

1. Alloy steels
2. Alloy steels

**5.4. Non-Ferrous Metals**

Non-iron metals are divided into two groups: heavy metals and light metals according to their density. These metals are corrosion resistant, have superior properties such as lightness, acclaimed appearance, high heat and electrical conductivity.

**5.4.1. Copper and alloys**

Pure copper is soft and extendable. High heat and electrical conductivity, corrosion resistance is good.

**5.4.1.1. Copper – zinc alloys (brass)**

They are highly resistant, corrosion resistant and easy to process materials.

**5.4.1.2. Copper – tin alloys (bronze)**

It has high resistance and corrosion resistance.

**5.4.1.3. Copper – aluminum alloys**

High strength, ductivity and corrosion resistance are good.

**5.4.1.4. Copper – lead alloys**

It is used as a bed material due to its sliding feature.

**5.4.2. Zinc and alloys**

Zinc is a metal with the highest coefficient of thermal expansion and good corrosion resistance. Its resistance to salts and acids is low. It is used for covering iron and steel hair boards, wires and pipes.

**5.4.3. Tin and alloys**

Tin has very good corrosion resistance. Its resistance to acids and bases is poor. The most important alloy of the cacophony is solder. I also have lead, antimomium or cadmium in my favor.

**5.4.4. Lead and alloys**

It has a corrosion resistance, which also includes acids. Lead compounds are very toxic.

**5.4.5. Chromium and alloys**

Due to its high corrosion resistance, it is used to cover the surface of steels with stainless layer. It is also a valuable alloy element in stainless steel production.

**5.4.6. Nickel and alloys**

Nickel is silver and white in color, and the resistance to perch and corrosion is good. It's magnetic. Low heat expansion, high electrical resistance. It is used in the production of alloy steels, galvanized coating.

**5.4.7. Aluminum and alloys**

Aluminum is a light, soft, easy to process and well-resistant metal. Alloying significantly improves strength. Due to its light weight, it can be used in light construction and vehicles.

It is used as a packaging material in the food industry. The storage tank is used.