INCREASING THEIR HARDNESS AND CORROSION RESISTANCE THROUGH THERMAL PROCESSING OF THE MATERIALS USED FOR THE MANUFACTURE OF GEAR TRANSMISSIONS

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Abstract: The article discusses one of the ways to increase the hardness and corrosion resistance of gear joints. One of the methods of influencing the composition of gear joints and its properties is thermodynamic processing. Through this method, it is possible to significantly increase the workability, service life, hardness and corrosion resistance of gears. This is the reason for the reliable and long-term service of gears widely used in the field of mechanical engineering.

Key words: Gears, hardness, machining, mechanical engineering, gear wheel, steel, thermodynamics, cast iron, non-ferrous metal.

As we know, gears are widely used in various aspects of mechanical engineering, and many environmental factors regularly affect their wear and service life.

Gear wheels are made of steel, cast iron, non-ferrous metals and non-metallic materials. It is used for low-load and noise-free transmission in kinematic pairs made of non-metallic materials. These are mainly materials such as textolite, kapron. These types of gears are also recommended for use in cases where it is difficult to accurately ensure the positioning of the shafts, because the inaccuracies will not have a significant effect on the work due to their low precision [1-2] .

Large-diameter, slow-moving open gear wheels are mainly made of cast iron. These materials are resistant to wear and tear. It is relatively cheap, and can be processed well on lathes. Wheels are mainly made of porous materials**.**

These materials are divided into two groups according to their hardness.

In the first group of materials: tooth surface hardness ≤ 350 NV. 40, 45, 50 g carbon and 40x, 45x, 45xN alloy steel materials are used as materials. After the wheel teeth are cut, they are thermally processed. Such thermally processed gears fit together well during processing, additional dynamic loads are relatively small.

It is recommended to increase the stiffness of the driving gears (25 h - 50) to NV to ensure that the tooth wear of the driving and driven gears in the transmission is uniform.

In the second group of materials: tooth surface hardness N>45HRCe (N>350HV).

Hardness is measured in HRCe when tooth surface hardness is >350 NV. Such hardness of tooth surfaces is achieved due to saturation with carbon, nitrogen [3-4].

Problem statement and research method. Carbon saturation. In order to reduce the weight of the gears, the tooth surfaces of the wheel are saturated with carbon and hardened. In this case, the depth of the surface saturated with carbon is 0.1-0.15 mm of the tooth thickness, the hardness can be 59-64 HRCe. After the thermal processing of the wheel teeth, the irregularities formed on the working surface are polished. 20X, 12XN3A, 18XGT steel materials are recommended for gears.

Nitrogen fertilization. In such thermal processing, tooth surfaces are not polished after thermal processing. The thickness of the surface saturated with nitrogen is 0.2-0.5 mm. Nitrogen-impregnated gears were not used in impact gears (because the thin coated surface could crack and move) and in environmentally contaminated gears (the gear teeth would eat away quickly). 38X2MYuA, 40XNMA branded p o iat materials are used as material [5-6].

It is recommended to choose the materials for the drive and driven wheels in gears as follows.

1. The same 40x, 40xm, 35xm grade steel materials are recommended for the driving and driven gears, the hardness of the tooth surface is 45-50 NRCe when using Yu.Ch.T to improve thermal processing.

2. Drive gear wheels 40x, 40xm, 35xm brand materials are selected. Thermal processing is improved and obtained with the help of U.Ch.T, in which the hardness of the tooth surface is 45-50 NRCe;

The drive and driven gears are made of the same 20x, 20xnm, 18xgt brand steel materials, the heat treatment is the same improvement, carbonization and quenching using Yu.Ch.T, the tooth surface hardness is 56-63 NRCe. The higher the hardness of the tooth surface, the greater the contact and bending stress resistance and wear resistance of the gears [7-8]..

The main problems encountered in gear wheels and their causes.

1. The wheel can wear out due to wear of the tooth surface. There are two types of confusion. The first type of wear is caused by inaccuracies in wheel teeth made of metals with a tooth surface size of NV<350, and during operation, these irregularities are smoothed out due to wear and crushing.

2. Etching of the surface of the teeth. The surface of the teeth can be eaten in three different conditions: in an environment with abrasive particles, during the period of adaptation of the teeth to each other, and during the start and stop of the loaded gear.

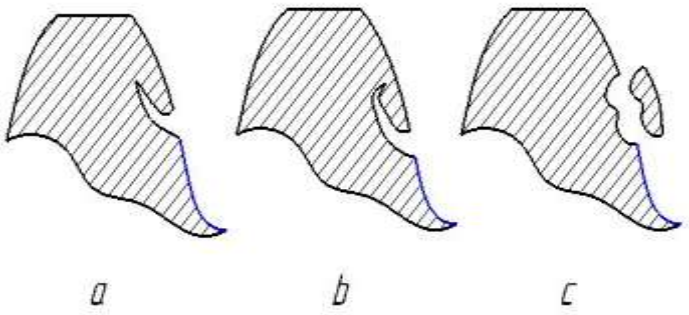

Figure 1. Corrosions and fractures in gears.

Currently, a lot of research and studies are being conducted to increase the hardness and corrosion resistance of gear wheels.

Depending on the type of food, this process can be repeated several times. After processing, the tooth surfaces are cleaned, which further increases the strength of the dentures. This tool can be widely used in production. We can see the increase in the hardness and wear resistance of the teeth in the example of the graph below.

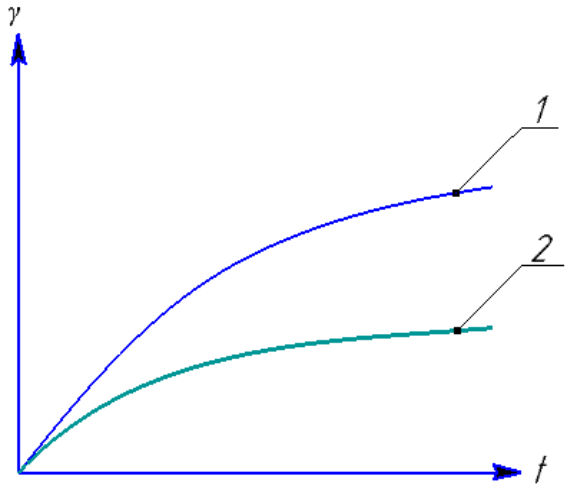

Figure 2. A graph of gear wear vs. time obtained using a heat tool.
1) gear wear 2) post-gear wear

Experiments and conducted work show that this method effectively ensures uniform wear of all mating surfaces of gears and significantly increases the hardness and ductility of tooth surfaces by 35-40%. This enables the reliable service of gear couplings, which are widely used in mechanical engineering, and gives an economic effect in its place [9-12].

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