EXPERIMENTAL RESEARCHES REGARDING TO THE INFLUENCE OF SOME TECHNOLOGICAL PARAMETERS OF THREADING THROUGH PLASTIC DEFORMATION ABOUT THE QUALITY OF THE THREAD

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ABSTRACT
In this paper it is follow to put in evidence the influence of some technological factors such as: the deformation speed, the length of thread, the threading moment and the temperature developed in time of threading, about the quality of thread made by cold working and the correlations that are made between them.

1. INTRODUCTION

The special literature prove that if we keep a close check above all the technological parameters under control are very important for avoiding premature wear of tools and degradation of quality's and dimensional parameters of threads.

The quality of the thread that we obtain trough plastic deformation is determined, into a large size, by the correct choose of nominal diameter of the hole of thread, as well as the tolerance of this.

If the diameter of the hole is smaller that it is necessary, then at the threading with tap borer with open inside diameter, the interior diameter of the deformed thread will be reduced in comparation with the nominal one. More, by decreasing of the diameter of semi-product hole, leads to the consistent grow of the torsion moment necessary to threading.

An other important parameter of the technological product is threading velocity which represent in fact, the periphery speed of the tap, which is significant influencing the quality of the thread.

The choice of threading velocity is made in accordance with the thread dimensions, with physics-mechanical properties of the material and with the liquid used for lubricate-cooling.

The choice of the gear for processing of thread with taps for deformation is also an important factor of the process, it depends widely, of the tap dimensions, part configuration and fabrication series.

Practical above, the interior threading process through plastic deformation has significant importance by following factors: deformation speed, the length of thread, threading moment and increasing temperature during the threading.

2. EXPERIMENTAL RESULTS

For testing the interdependence between the factors above mentioned, keeping account by a series of data from special literature, it was threaded through cold plastic deformation a tap M12 from high speed steel RP3, in series of four sets of bolt nut from CuZn20. The number of bolt nuts from each set, was 20 pieces, and it has the length of: 40, 50, 60 and 70 mm.

Threading process took place to a lathe SN 320 and a threading machine MFIV 16. It was used as speed: 160, 250 and 350 rot/min. Corresponding to these, the threading speeds where: 6, 9.42 and 14.17 m/min.

During the trials it was measured the temperature of threading zone. The heat of tap was accompanied by the growing of his dimensions, and as a result, the medium diameter of thread grows.

The deviation of medium diameter of bolt nut after the heating of tap with $?t$ can be calculated with the relation:

$$?d_2 \; ? \; 2p? \, tgK? \, t \qquad (1)$$

where: p – coarse thread;

? - the linear dilatation coefficient of the material;

K – the attack angle of the tap;

If it is known that the heating temperature of tap $?t$, we can calculate the grow of medium diameter of bolt nut and we can also make correlations about the medium diameter of tap.

For the determination of temperature in the reformatted zone, were made special experimental attempts. The temperature was measured through conventional thermocouple method. The weld point of thermocouple was put in contact between the tap and the bolt nut, in the threading process.

The tap was isolated from the principal ax through a textolite bushing, fixed inside the pin tongs, and the part which has to be deformed was isolated by the machine mass with textolite plaques. The stability of the contact resistance during the slide, and the elimination of the influence of some parasite currents, was assured with the help of the current collector, to the intermedium of contact arc made from copper graphitized which constitute the collector brush. The alimentation conductors are the screened ones, and the potentiometer of the micrometer was connected with a pole at the tap and the other one at product.

During the forming process of thread, at the contact place between the tap and the half-finished product, owing to the heat, it appears an electromotive tension. For the temperature measuring, the mycroampermeter is initially calibrated into an electric furnace.

The experimental trials put in evidence the interdependence between the medium temperature from deformed area and a series of constructive and technological factors, like: coarse thread, number of edges, relieving and tap diameter, material deformability. At the same time, with temperature measuring it was measured the threading moment. The initial dimensions of threading boring were carefully controlled, with dabber calibers. The measure installation for the threading moment is made from a device with a central ax of torsion on which we fix resistive transducers, and a digital thermocouple. The preliminary calibration of the installation was made using a dynamometric key with the division value of 1.2 Nm.

The experimental results are given in the tables 1 and 2.

Table 1

Threading speed [m/min]	L = 40 mm		L = 50 mm		L = 60 mm		L = 70 mm	
	Mom. [N/m]	Temp. [^{0}C]	Mom. [N/m]	Temp. [^{0}C]	Mom. [N/m]	Temp. [^{0}C]	Mom. [N/m]	Temp. [^{0}C]
6	64	47.5	65	71.7	70	95.7	74.5	115.2
9.42	65	54.2	66.5	80.5	72	104.3	76	118
14.17	66.5	62.2	69	87.8	74	117.1	77	120.1

Table 2

Length [mm]	V = 6 m/min		V = 9.42 m/min		V = 14.17 m/min	
	Mom. [N/m]	Temp. [^{0}C]	Mom. [N/m]	Temp. [^{0}C]	Mom. [N/m]	Temp. [^{0}C]
40	64	47.5	65	56.2	67.5	62.2
50	65	71.7	67.5	80.5	69	87.8
60	70	95.7	72	104.3	74	117.1
70	74.5	114.2	76	118	77	120.1

For the study of the influence of coarse on temperature, it was used trilobite taps with the heat of relieving K = 0.62 mm and the attack angle of 60^0.

For the study of influence of relieving on temperature were used taps with K = (0.1-0.6)mm. From the diagram presented in figure 1, we can observe that the growing value of the relieving temperature is declined. Also, the growing of threading speed produced a growing of the moment and also of the temperature (fig. 2).

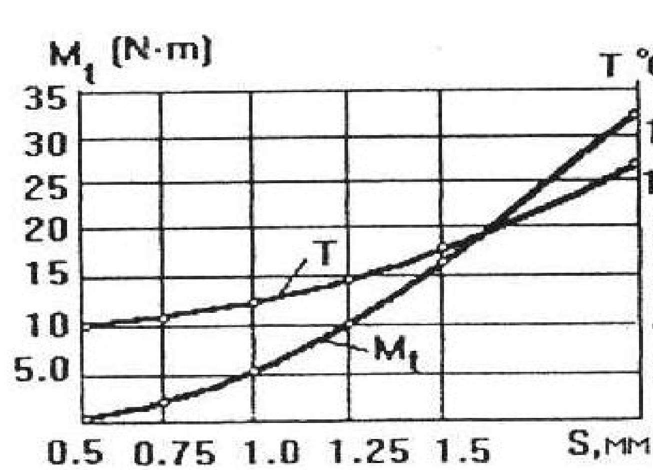

Fig. 1 Temperature and threading moment versus of thread coarse.

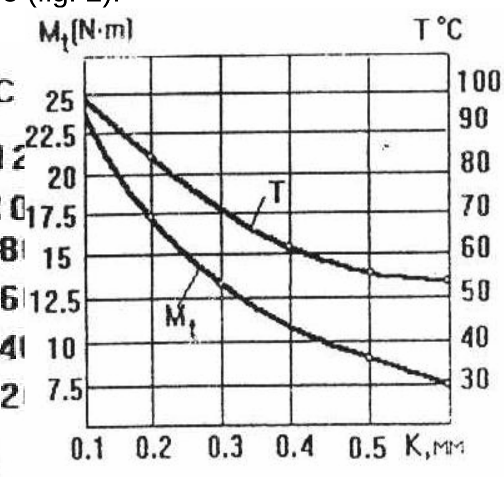

Fig. 2 Temperature and threading moment versus of relieving value.

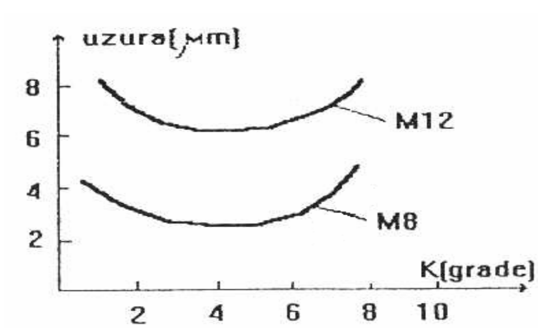

Fig. 3 Tap wears versus of attack angle.

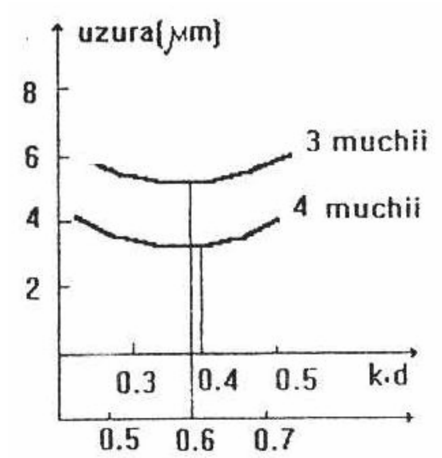

Fig. 4 Tap wears versus of relieving value.

By analyzing of experimental data it results that the heating of tap during the threading process depends on the constructive parameters of tools and the technological factors. Thus, the temperature in the deformed area at threads processing can be approximately 100^0C for non-ferrous materials, and approximately 200^0C for steels.

Thus the deviation value of medium diameter of the bolt nut *(? d_2)* threaded at cold plastic deformation with taps M12 is 0.008 at temperature of 100^0C and 0.018 at temperature of 200^0C.

3. CONCLUSIONS

The quality of threads obtained through plastic deformation depends largely, from the character of service parameters. Regarding to the threading speed, the choice is made in function of thread dimensions and physical-mechanical characteristics of the material submissive to the threading.

The threading process is influenced positively by the correct choice of lubricate – cooling liquids.

Because the decreasing of tool wear by using special additives in lubricate – cooling liquids oils, represents a supplementary costs factor, it will be used only in hard processing technologies.

Experimental trials put in evidence the interdependences between the medium temperature from plastic deformation area and a large series of constructive and technological factors like: thread coarse, number of edges, tap diameter and his relieving, deformability of material.

The experimental values presented in diagrams from fig. 3 and fig. 4, as well as the value of the medium diameter and the bolt nuts, leads to the idea that the medium diameter of the tap must be smaller with the respectively values, or it must be reduced the tolerance execution process.

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