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AUTOMATICALLY MEASURING SYSTEM OF THE TEMPERATURE AT FULL RECTIFICATION OF THE LARGE PITCH THREADS

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Abstract : An automatically measuring draft of the temperature at full rectification of the large pitch threads is presented. The experimental results acquired for different splintering speeds are also presented.

key words : temperature, automatic system, thermistor, full grinding of the threads.

1. Introduction.

As a conclusion of the study and research of the work came out world wide, regarding the full rectification of the threads, with single coil abrasive disk, it is state as a fact that one of the reasons that stops the increase of the productivity and limitless the size of advances, in which can be used the full grinding of the threads, is the appearance of the combustion's on the surface of the threads sides, due to the high temperature that is produced in the splintering zone.

Consequence of the friction between the abrasive wheel and the piece subject of the transformation process, it is developed an amount of heat that influences the splintering capacity of the abrasive wheel. The piece subject of the transformation absorbs the most part of the generated heat. The knowledge of the temperatures at the grinding and also the understanding of the thermal phenomena that joins this process is necessary for the achievement of a surface layer of the high quality piece.

In spite of all precautions in using a cooling environment in the splintering zone, during the full rectification process of the threads appears the combustion of the side surfaces of the thread, at bigger depths and revolution turns of the semi-finished product.

In each physical process there are specific ways to convey the information. In order to join the modalities of intercepting this information, sensors that convert the specific information of the processes in electrical quantities are used. In case of determination of the temperature produced in the splintering at the full rectification of the threads, it was used as a sensor a PTC thermistor which transfers the thermal information in electrical information for the measuring system and data processing.

2. The measuring system of the temperature with P.T.C. sensors.

The PTC thermistors has sintered oxides mixtures in tablet shape whose resistance has a large, positive temperature coefficient comparing to metals. The utilized thermistors

had 15 Ω of resistance, and because there were three in series connection, the total resistance was 45 Ω.

This thermistors were assembled on a measuring device which assures the position of the sensor as close as possible to the splintering zone. In fig.1 and 2 the draft of the measuring device assembling is presented, and the explanation of the component elements included.

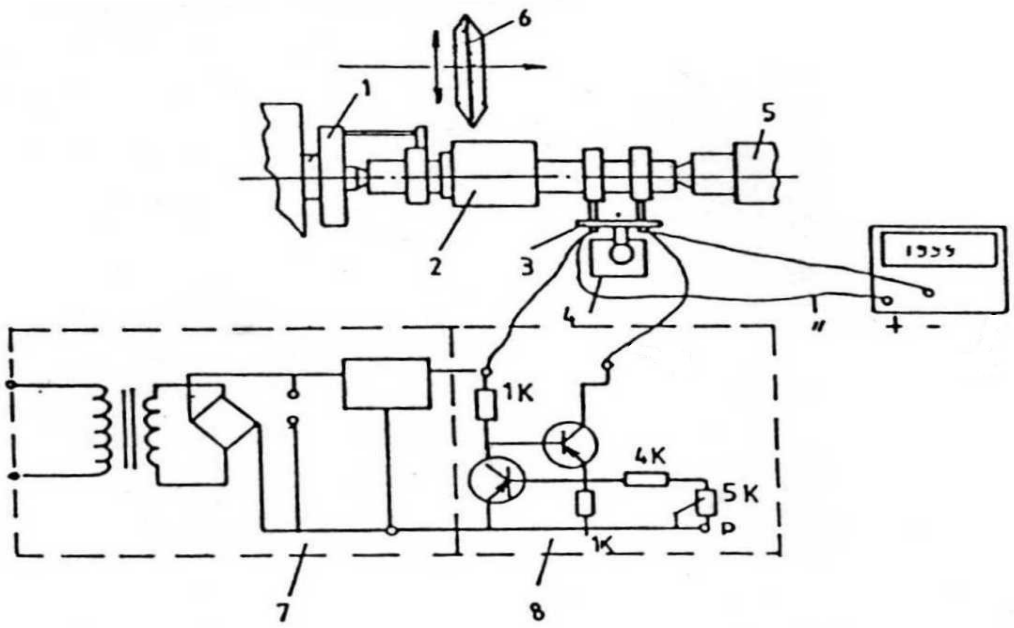

Fig. 1. General diagram of the installation used in experimental test

The diagram of the installation used at the full grinding of the threads, with single coil abrasive disk, is composed of the following main components: 1) The carrier plate of the grinding machine; 2) The device containing the semi-finished product subject of the transformation process; 3) The support of collector blades; 4) The fixing magnetic support of the collector plate on the machine; 5) Mobile spindle of the grinding machine; 6) Abrasive wheel with single coil ; 7) Power unit; 8) Direct current generator.

3. The graduation of the measuring system.

To realize the graduation of the measuring system, a splintering process was simulated in the placing zone of the sensors. It was agreed a splintering speed so that the revolution of the piece should be 0,1 turn/min, the splintering depth 0,1 mm and the cooling process has not been used. In this way, thanks to the 1-mm walls and to the lack of the cooling agent, the temperature in the thermistor zone is identical to the one in the real splintering process, before the evacuation of the heat by the cooling medium.

Due to the low revolution of the piece, it was possible measure simultaneously with the temperature measuring device TERMOPHIL 4443-2b, the real value of the temperature and the value at mV which appears in PTC thermistor joints. In this way it was raised the graduation curve from plate 2, according to table 1, obtained during the graduation process.

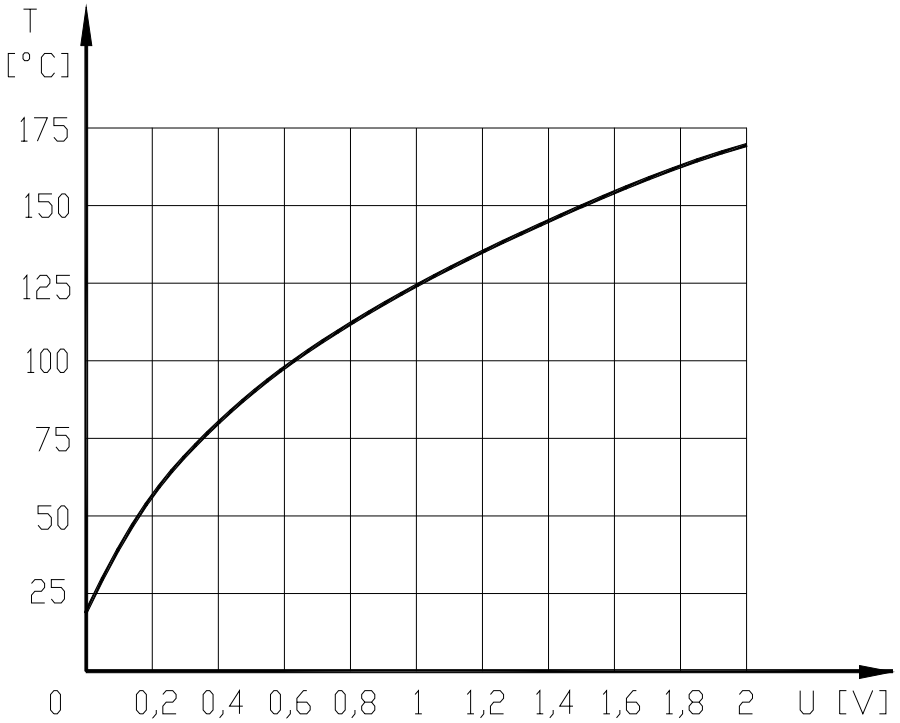

Plate. 2. The measuring diagram of the temperature

Table 1. The results of the measurements during the graduation of the measuring device

Pos. of the disk with coil nr. at the measured temp.	Measured temperature [^{o}C]	Tension in thermistors [V]
n-3	27	0,039
n-(2+2/3)	52	0,152
n-(2+1/3)	59	0,220
n-2	70	0,315
n-(1+2/3)	82	0,420
n-(1+1/3)	93	0,560
n-1	101	0,680
n-2/3	112	0,840
n-1/3	148	1,520
n	169	1,970

The domain from (n-3) at (n) represents the number of the coils of the threaded piece with 2 mm pitch at the n_p = 0,1 turn/min revolutions, at the t = 1,25 mm depth mm situated above the PTC sensors. By n is noted the total number of coils.

5. Conclusions.

The methodology of the temperature measuring with thermistors was chosen due to the fact that the tool has no favorable electrical and thermal properties, and the thermal conductivity of the steel is unsatisfactory. Also the presence of an important quantity of cooling oil prevents the use of a contact or optical method.

When the temperature of the oil that flows down the piece was measured, it was determined an approximate 2 ^{o}C healing. It can be considered that the cooling effect is obtained on the benefit of the quantity and not by increasing the temperature of the cooling agent. So the increase of the productivity can be realized by rising the quantity of the cooling liquid.

With the small pitch pieces, the temperature during the grinding process is a little higher, because the radiant effect of the splintered canal is smaller, while with the large pitches, the oil cools the piece easier, due to the bigger dimension of the radiant channel.

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