COMPARATIVE STUDY REGARDING THE PROCESSING OF METRIC AND TRAPEZOIDAL THREADS PRODUCED BY OLC 45 BY TURNING, MILLING AND WHIRLING THREAD CUTTING

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The threads cutting still represents the most used method of processing. For establishing, in certain given conditions, a certain method of processing it has been achieved a comparative study. As a comparison criterion it has been used the time rate that corresponds each processing.

1. TECHNICAL CONSIDERATIONS

The thread cutting ensures a high efficiency and precision for threads. It can be made starting from a circular semi-fabricated material or using semi-fabricated materials obtained by plastic deformation.

The helical flute generation can be achieved using out line tools (which can make simultaneous the flanks and the bottom of the threads) or chip removal elements that can make separately the three surfaces.

In this paper, it has been taken in consideration only the tools from the first category.

1.1 . The thread cutting with one cutting tool or a pack of cutting tools (rack-shaped cutter, die head)

This method can be applied in the single serial production for the achievement of every single type of threads, which can not be processed with top or screw plate tools.

This method can also be used for the rough-cut thread finishing throng other methods and for the thread cutting with high diameter.

For the thread cutting can be used a variety of turning tools depending on the outline and the sizes of the thread.

K. Elekes proposes [1] a special shape for the cutter holder used in processing (fig.1) which can permit a very good behavior with the vibrations.

The construction of the cutter holder can also permit an easy rotation of the cutting tool with an angle of inclination of the thread screw on the reference diameter.

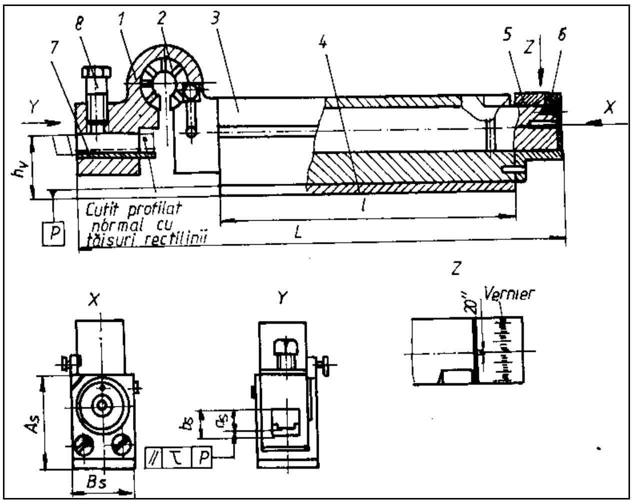

Figure 1. Special cutting tool for the turning of the Threads.

It can be noticed that at present the tool companies achieve a variety of screw plates, which facilitates the obtaining of accurately threads and with high productivity.

The threads turning with die head applies particularly in big or mass serial production. This alternative permits processing speeds of 15-20 m/min, assuring higher productivity than the method mentioned before.

These endings can be used in thread cutting on normal lathes, turret lathes and automatic lathes or on special machine tools of threading.

Die head consist of four or more prismatic cutting tools or disk, ordered on the thread diameter

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1.2.Thread processing through milling

For processing helical surfaces through milling are used different cinematic schemes (fig 2.). Each scheme presents the advantages and disadvantages as well as specific indications of use depending on the outline and the sizes.

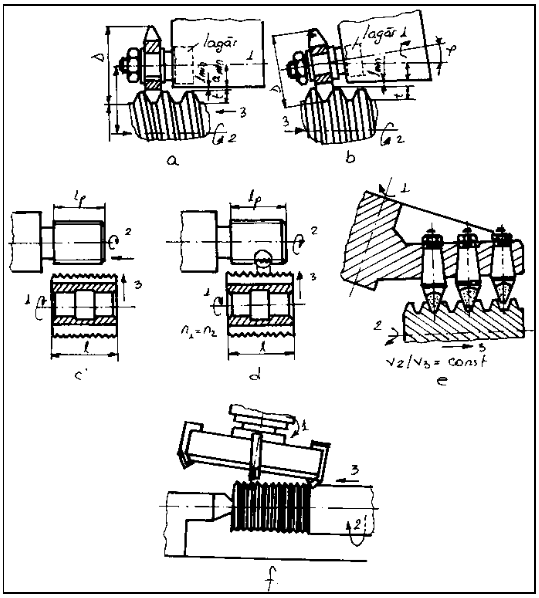

Figure 2. The milling threads processing.

Taking in consideration that when applying this process it remains an outstanding section, it can be used specially in rough cutting.

In figure 2.e is presented the frontal thread cutting of worms with a Romascon milling cutter with three lines of claws which assures a high level of chip removal uniformity and increasing productivity.

The cutter head for high milling productivity are used in helical flute processing with large sizes (fig. 2.f). They process after the tangent contact method with semi-fabricated materials.

1.3. Thread processing using whirling thread cutting

The thread processing with this mechanism is achieved according the figure 3.

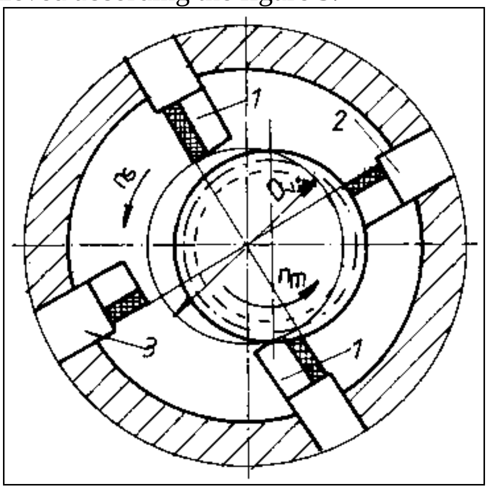

Figure 3. Whirling thread cutting principle.

In this process takes place an interrupted chip removal with high frequency. This permits achieving very high cutting speeds comparable with those used in extern chip removal.

This process is performed with a special whirling thread cutting set on a lathe or using special whirling thread cutting machine tools. The piece revolution must be determined so that in assures the most propitious advance on the claw.

This process assures a high accuracy of the obtained thread, a high level of productivity as well as a very good flank roughness comparable with the rough cutting grinding.

2. THE DETERMINATION OF THE CHIP REMOVAL REGIONS AND TIME RATE IN PROCESSING METRIC AND TRAPEZOIDAL THREADS THROUGH THE THREE METHODS

In achieving the comparative study, it has been taken in consideration semi-fabricated materials with the same length (1000m). They considered three metric threads (M20, M30 and M60) and three trapezoidal threads (30X60, 60X14 and 140X32). The material which has been used in carbon steel of OLC45 quality. For each of this semi-fabricated were calculated the cutting conditions used in helicoidal surfaces processing. It has been established the cutting speed, the longitudinal speed (equal with the thread pitch), the number of passing, the cutting depth on each passing. Based on this was calculated the time rate necessary for processing each semi-fabricated. The results have been centralized for each type of processing in tables 1, 2, and 3.

Table 1. The time rates necessary in turning.

	Metric threads			Trapezoidal threads		
d [mm]	20	30	60	30	60	140
p [mm]	2,5	3,5	5,5	6	14	32
i	2	3	5	8	14	20
f [mm/rot]	2,5	3,5	5,5	6	14	32
V [m/min]	17 8	176	173	188	166	140
Nt [min]	20, 4	54,8	116	26,3	36	53, 1

In the calculus performing was not considered the high decreasing necessity of rotation in turning because of the lathe handling (stopping at the end of the processing zone).

Table 2. The time rates necessary in milling.

	Metric threads			Trapezoidal threads		
d [mm]	20	30	60	30	60	140
p [mm]	2,5	3,5	5,5	6	14	32
i	2	3	5	8	14	20
f [mm/rot]	2,5	3,5	5,5	6	14	32
V [m/min]	47,1	44,3	44,4	70,6	33,9	11,3
Nt [min]	23,7	60,7	158	35	53,8	73,4

Table 3. The time rates necessary in whirling thread cutting.

	Metric threads			Trapezoidal threads		
d [mm]	20	30	60	30	60	140
p [mm]	2,5	3,5	5,5	6	14	32
i	1	1	1	1	1	1
f [mm/rot]	2,5	3,5	5,5	6	14	32
V [m/min]	399	336	269	125	83	54
Nt [min]	6,93	10,8	18,7	19,1	24,6	36,3

The plotting for the time rate variation with the diameter for the three processing methods are represented in fig. 4 for metric threads and in fig. 5 for trapezoidal thread.

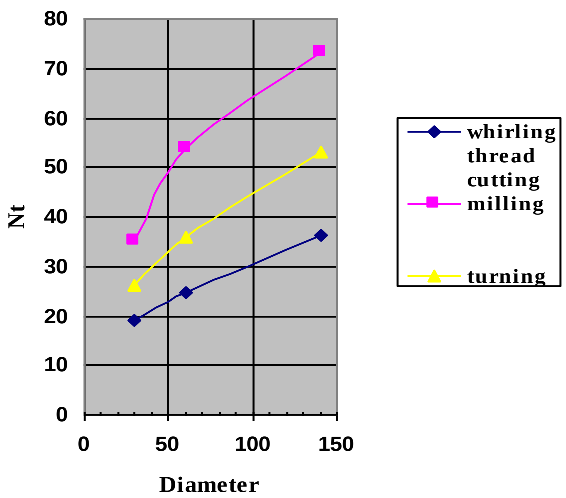

Figure 5. The time rate variation with the diameter in trapezoidal thread processing in OLC45.

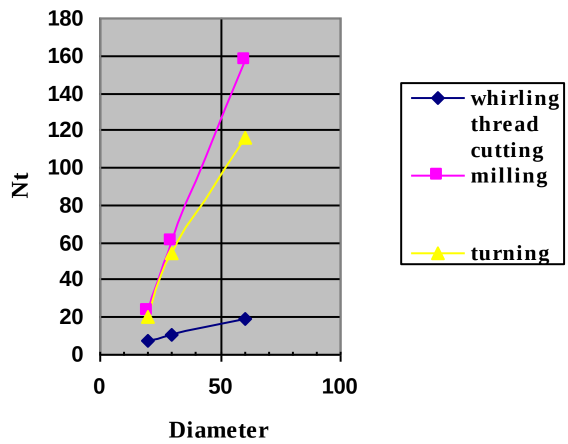

Figure 4. The time rate variation with the diameter in metric thread processing in OLC45

3. CONCLUSIONS

As a result of the study made on the influence of processing method on the necessary time rate we can conclude that:

- Whirling thread cutting method is the most productive type of processing indifferently the sizes or the pitch of the thread. This process achieves simultaneous the rough cutting and the thread finishing. In a serial production, the higher price of a device does not constitute a major disadvantage so this method is recommended.
- The time rate increases at the same time with the diameter increasing especially in metric threads. This is due to the considerable increasing passing number.
- The shape of chips is different in the three processing methods. In order to avoid the long chips that appear in turning, special measures are necessary to protect the operator. The cutting tool wear is also higher in processing method.
- In milling and whirling thread cutting the tool refrigeration in achieved in good conditions both due to the discontinuous chip removal and the turbine effect made by the cutting tool.

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