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Influence of parameters of machine cutting on drills durability in a line of frame casting

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Summary

The text shows the influence of parameters of machine cutting on wear and tear of drills which are made of low-alloyed high-speed steal SW2M5 while holes drilling in spheroid cast iron samples GGG50. The results showed that only wear and tear of the VBwo tops is monotonically rising in a time and can be assumed as criterion of wear and tear. The value of VBwo that starts the wear and tear depends on the parameters of machine cutting and features of material processing.

Key words:. parameters of machine cutting, production line, drill, criterion of wear and tear.

1. Introduction

While planning a system of production the most important is continuous flow, sucking system and delivery of row material to the production lines [1]. While designing the line of frame casting Fig. 1 are also machine needed to machine working. The machine working consists of the following operations: cut off sprue, front processing, drilling, countersinking, reaming, threading and milling. The sum of machining time is about 30% of the time of frame making [2].

In operation of mechanical working the important problem is the identification of the tool that limits the size of a production stroke and providing the proper time of consistency through selection of the proper blade material and using proper surface treatment. To achieve this aim the proper algorithm has been prepared, which is describe in this text [3,4,5], and which is giving an opportunity to :

- select proper machine cutting parameters
- select the proper structure and the material of the part of tool machine cutting
- propose the most proper surfacing.

While frame processing the drilling operation, reaming, countersinking, threading take over 50% of the time needed for frame mechanical working and therefore the special attention is paid to drilling operation [6,7].

At the beginning the criterion of drills wear and tear was established, which also is explained in the text [8,9]. It established that while drilling holes in a spheroid cast iron test pieces GGG50 with drills which are made of steel SW2M5, their wear and tear took place on flank face, and analysis of dynamics of wear and tears places showed that only the wear and tear of VBwo tops have risen monotonically in a time and can be quite accurate measured. It satisfies concerned the criterion of wear and tear, and the size of VBwo's wear and tear, by which lost of drill cutting takes place, is the wear and tear criterion. The aim was to establish the influence of machining parameters on assumed criterion.

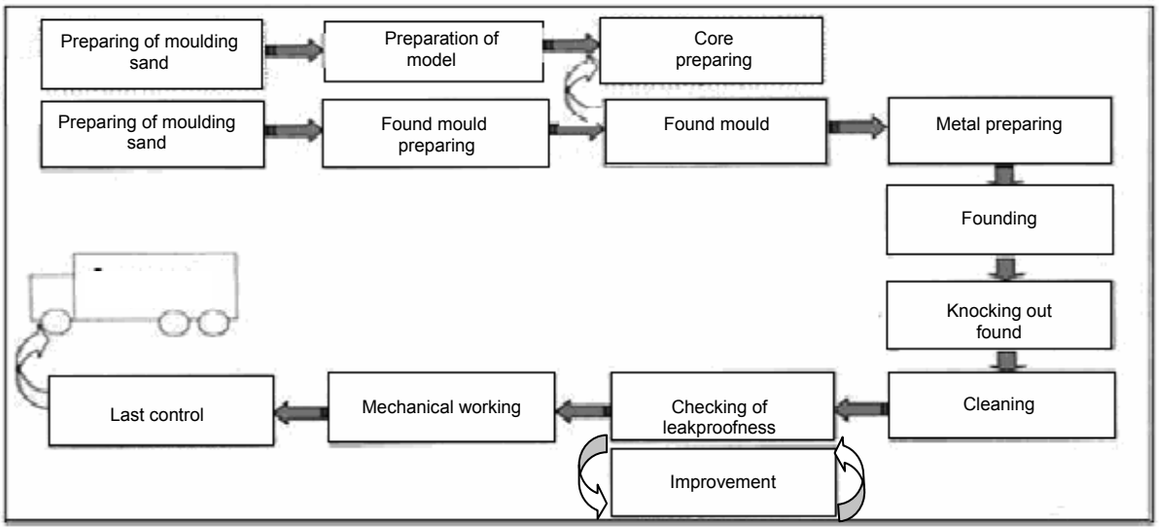

Fig. 1. Designing the line of frame casting [1]

2. Methodology of research

To establish the influence of machining parameters on assumed criterion of drill wear and tear, the set of research was done concerned the drills durability Φ10 made of steel SW2M5 according to the methodology described in the text and by the spheroidal iron GGG50, HB=200 strength. The researches were done with Vc=40mm/min, f=0,1mm/revolution, Vc=24m/min f=0,3mm/revolution, Vc= 20m/min f= 0,4mm/revolution and ensured the period of time of drill durability T=15mit, what replies the finishing treatment 80-100 holes. The picture shows the points of measurement the wear and tear blade.

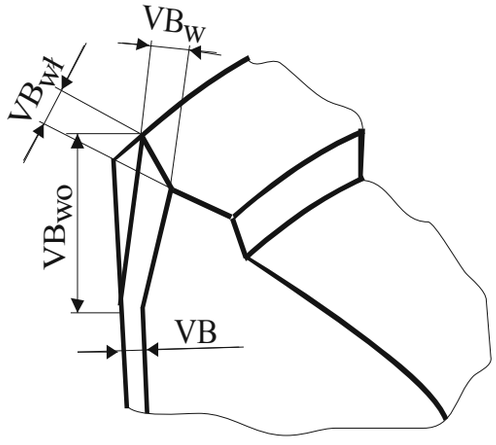

Fig. 2. The points of wear and tear of drill under control

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3. Results and analysis

The points of wear and tear of drill under control with Vc=40m/min and f=0,1 mm/revolution are presented in fig. 3. As can you see in the picture, while using the drills on machine cutting parameters the enormous using is visible on all controllers points of using. The period of time of normal using starts with VBwo=3mm, VBw=0,2mm, VBł= 0,15mm, VB=0,1mm. At the period of time of normal using, the size of using of all controlled points at using can be presented with the straight lines slant to X axis at different angles, which means that the intensity of wear and tear of these points at the normal wear and tear is constant. Only wear and tear flank face VB at this time does not actually change.

The period of time of enormous using starts with getting the following value of using: VBwo=VBw=0,7mm, VBł=0,37mm. In this period the size of using VB is also increasing .As can you see in the fig. 3 while using the drills on machine cutting parameters, enormous using and loosing of machining properties follow after results of enormous using of all those places where using was controlled. Fig. 4 shows dynamics of using drills with Vc=24m/min, f=0,3mm/revolutions, which is described in a text [9]. According to researches the enormous using of flank surface of tops VBw does not cause loss of machine ability of drills. It causes only intensity using of drills VBwo in a second stadium of normal using. Loss of machining properties is a result of enormous tops using which is started with VBwo=1,4mm

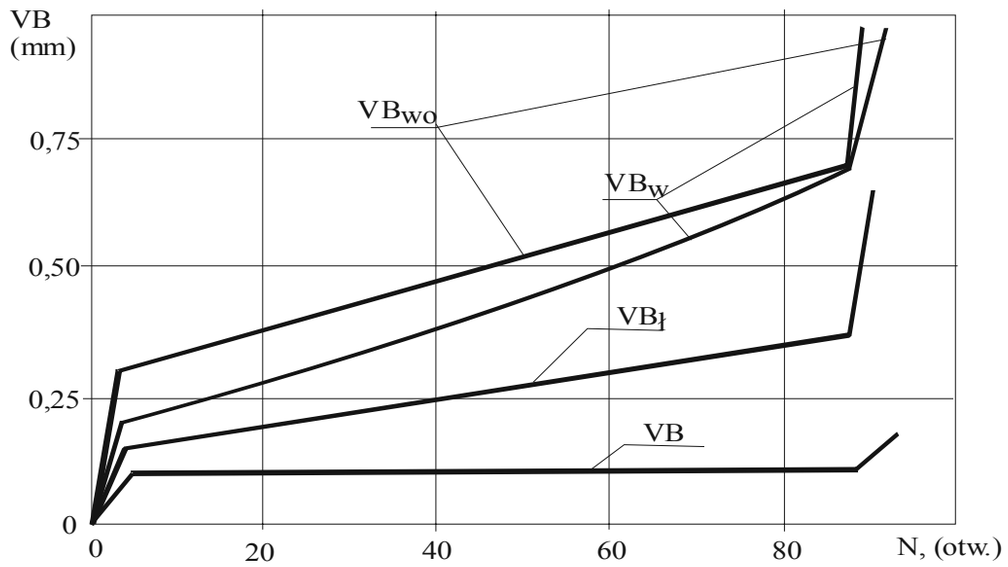

Fig. 3 Dynamics of using drills with: Vc=40m/min and f=0,1 mm/obr.

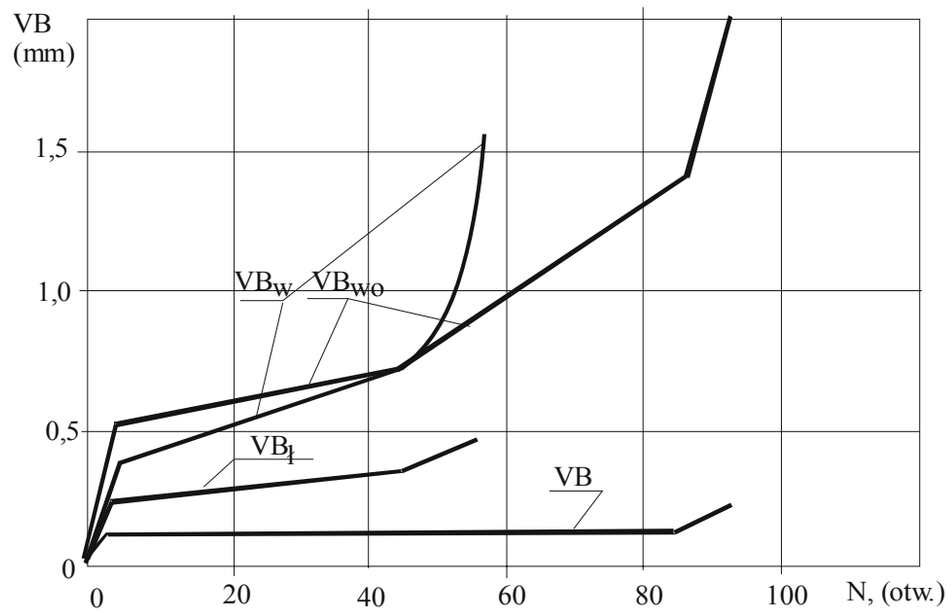

Fig. 4. Dynamics of using drills with Vc=24m/min, f=0,3mm/obr.[9]

Fig. 5 shows dynamics of using drills with: Vc=20m/min i f= 0,4mm/revolutions. As you can see in the picture, the period of normal using starts with higher value of controller points of using than in the first and the second cases. Only wear and tear flank face VB at the beginning of normal using is 0,1 mm – the same way as in other cases. More intensive using of drill pointed in checking places causes that after definite flow of time value of using VBw spread out all over entire width of drill margin and makes measurement of using drill margin VBw impossible, because measurement base is worn out.

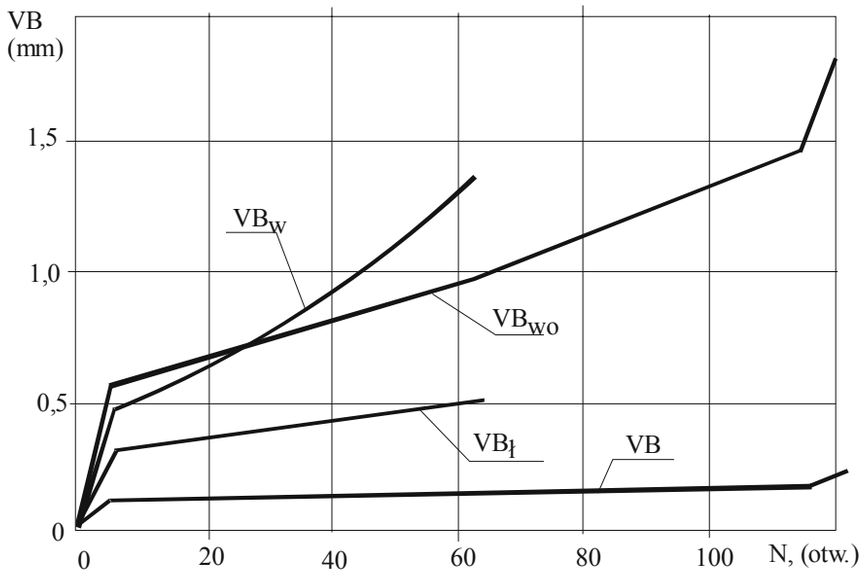

Fig. 5 shows dynamics of using drills with: Vc=20m/min i f= 0,4mm/obr.

However, drill still works and does not lose its cutting ability. It is obvious that these parameters of machine cutting: VBw, VBł and VB can not be use as a criterion of using. Enormous using follows with obtaining using of tops: VBwo=1,5mm which is more than in the first and the second case.

4. Summary

1. While drilling holes in a spheroid cast iron test pieces GGG50 with drills which are made of steel SW2M5, their wear and tear tooks place only on flank face.
2. While using drills with different parameters of machine cutting, loss of machining properties starts with different value of checking places using.
3. While drilling with high speeds of machine cutting and low rate of feeds, loss of machining properties starts with enormous using all of checking places.
4. While increasing rate of feed and decreasing speed of machine cutting starts very fast using of VB tops pressing surface and it does not cause loss of machining properties, but only increase intensity of VBwo tops using.
5. While using drills with small speed of machine cutting and high rate of feeds, loss of machining properties cause enormous using of VBwo tops.
6. The analysis of checking wear and tear places shows, that only VBwo tops using monotonically increased with flow of time and can be sufficiently, precisely measure.
7. The value of VBwo, which starts enormous using, is criterion of wearing. This quantity depends on machine cutting parameters and properties of material surface treatment.

5. Bibliography

1. R. Władysiak, Reengineering of precision castings production system Archives of Foundry vol.6, No.19 (2006) 413-424 (in Polish).
2. J. Jaworski, Application possibility of tools made of low-alloy high- speed steels in the planned housing, Archives of Foundry vol.5, No.17 (2005) 115-121 (in Polish).
3. J. Jaworski, Managament quality of tools in the planned housing casting. Archives of Foundry vol.7, (2007) 157-160
4. J. Zając**,** W. Orłowicz, D. Tresa, J. Pitel. The laser robotic word place for surface treatment of material. Przemiany strukturalne w stopach odlewniczych. Teoria i efekty użytkowe. Sekcja Teorii Procesów Odlewniczych Komitetu Metalurgii PAN, Instytut Podstaw Metalurgii PAN Kraków. V sympozjum naukowe Rzeszów 1993 (283-288)
5. J. Zając**,** W. Orłowicz, D. Tresa, J. Pitel. The laser surface hardening of cutting tools. Przemiany strukturalne w stopach odlewniczych. Teoria I efekty użytkowe. Sekcja Teorii Procesów Odlewniczych Komitetu Metalurgii PAN, Instytut Podstaw Metalurgii PAN Kraków. V sympozjum naukowe Rzeszów 1993 (289-294)
6. W.A. Sinopalnikow, S.N. Grigoriew. Reliability and diagnosis of technological systems, MGU STANKIN, Moskwa, 2003.
7. W.K. Starkow. Machining. Controlling of stability and quality systems in automatizated company, Maszinostrojenie, Moskwa, 1989
8. J. Jaworski, Development tendency of cutting tool materials, Przegląd Mechaniczny Nr11 (2005) (In Polish)
9. J. Jaworski, Determination of criterion on blunting of drills made of low-alloy high speed steel SW2M5. Archives of Foundry vol.8, (2008) 157-160 (in Rusish).