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Effect of the saw blade geometry at its static stiffness

K. DUCHNICZ, R. WASIELEWSKI
Department of Manufacturing Engineering and Automation, Mechanical Engineering Faculty,
Gdansk University of Technology.

Abstract: *Effect of the saw blade geometry at its static stiffness*. This article describes the impact of selected saw blade parameters significant effect on the static stiffness

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INTRODUCTION

Static stiffness of each element depends on its shape (geometry), method of attachment and the material properties, that it is made. Parameters of saw blade, which have a decisive impact on the value of stiffness are:

- diameter of the saw *Dz*,
- diameter of the collars *Dt*,
- thickness of the saw *b*,
- geometry of the saw blade (quantity, shape and size of chips grooves, as well as notch: compensating cooling, soundproofing, scrapers)
- the attachment method of saw blades,
- type of material and stress of saw blade.

Because, on the value of static stiffness of the saw blade are affected by many factors, it is difficult to formulate detailed formulas on the quantitative impact of individual factors for a saw blade. However, based on examples showing the effects of selected parameters for specific saw blades can be formulated as a series of general recommendations concerning the qualitative impact of selected parameters of the static stiffness of saw blades.

EFFECT OF SELECTED PARAMETERS ON SAW BLADE STIFFNESS

Effect of basic parameters on the saw blade stiffness, such as: diameter *Dz*, thickness *b* or diameter of collars *Dt*, is generally known in quality range. In terms of quantities, because of the complexity of the construction of a saw, however, requires testing.

Apart from these basic parameters, a significant impact on the stiffness of the saw blade has a geometry of the saw blade body. This is shown by the results of experimental studies [WASIELEWSKI]. Each notch reduces stiffness of cutting edge which are in their vicinity. An interesting example of the effect of geometry on the stiffness of the saw blade shown in Figure 1. Two deep notch into the body of the saw blade (fig. 1a) resulted in a decrease in the stiffness of the blades, not only in the vicinity of these notch (blade No. 6 and 16) (first two numbers of blades shown in fig. 1a), but also blades situated that are central part of the notch (blade No. 2 and 12). The reason is that the load of these blades causes the deformation of the entire segment saw blade.

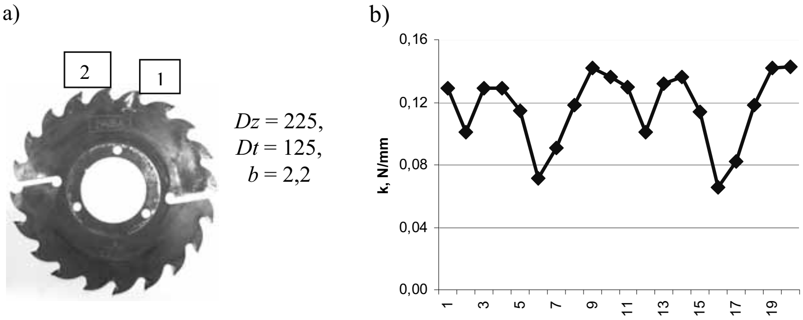

Fig. 1. Stiffness *k* of the saw blade for each edge

For the saw blade, in addition to the geometry of the body, an important parameter is also the size of the chips grooves located near the edges. Effect size of the grooves on the saw blade stiffness is shown in the calculation example edge deflection of the saw blade, which are differ only in size and shape of notch grooves (fig. 2a, b). The calculations were performed for saw blades with a thickness of b = 2.54 mm and a diameter of collars Dt = 105, 125 and 160 mm, which corresponds to the difference of diameters Dz-Dt = 195, 175 and 140 mm [DUCHNICZ].

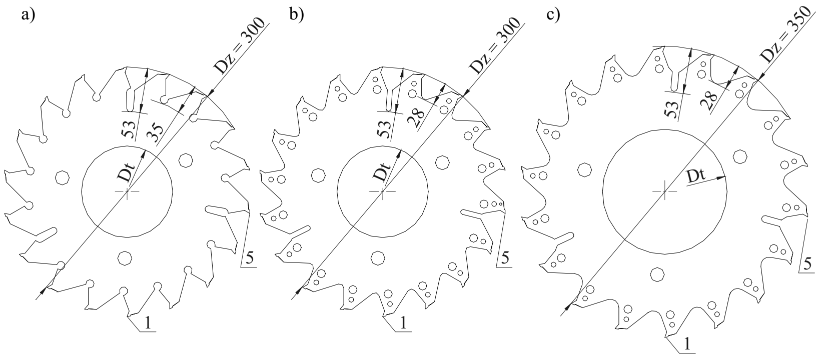

Fig. 2. Saw blades taken for calculations

The values of corner deformation f edges 1 and 5 (fig. 2), loaded with a force Fp = 50N, shown in Figure 3. As you can see the change in shape, and above all reduce the quantity of chip grooves in a saw blade from Figure 2b reduces edges deflection and thus increase their stiffness.

a) b)

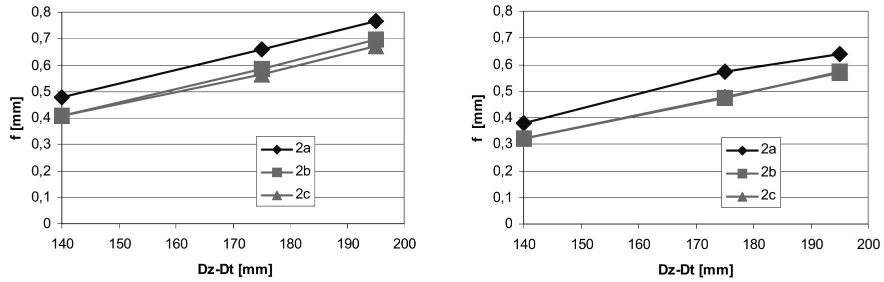

Fig. 3. Deformation *f* edges corner: a) No. 1, b)No. 5, saw blades from fig. 2

Effect size of the chip grooves can be seen clearly in the example in Figure 4, which shows the results of deformation calculations of the saw blade in Figure 2a for *Dt* = 105 mm and circular disc in the same way loaded and mounted. Deflection of the saw blade without grooves is two times smaller than the saw blade, with them.

a) b)

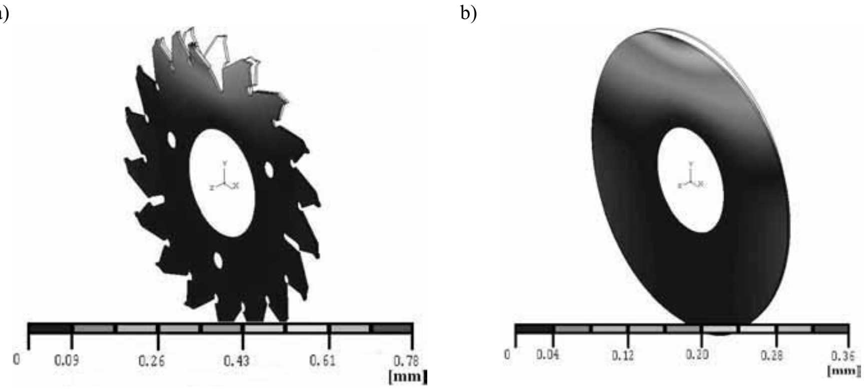

Fig. 4. Deformation of the saw blade : a) with chip grooves, b) without chip grooves

For the saw blade is also an important parameter of the difference in saw blade diameter and the collar diameter *Dz-Dt*. On Figure 3 also compared deformation of two saw blades with the same shape and size of the grooves, however, with different outer diameter (fig. 2b, c), while retaining the same difference diameter *Dz-Dt* = 195, 175 and 140 mm. As you can see deformation of these two saw blades are very similar. Local character of deformation of the saw blade makes, on the the blade deformation do not affect the absolute values of external diameter of saw blade *Dz* and the diameter of collars *Dt*, therefore difference in these diameters *Dz-Dt*.

SUMMARY

The results of experimental studies and numerical calculations show that the static stiffness of a saw blade depend on a significant many saw blade parameters. Knowledge of their effect on the saw blade stiffness can be used both in the design process, as well as operating the saw blade.

REFERENCES

1. R. WASIELEWSKI, Static stiffness of circular saw. Annals of Warsaw University of Life Sciences - SGGW. Forestry and Wood Technology. 69 (2009) 393-396.
2. K. DUCHNICZ, Minimalizacja błędów mocowania pił na dwuwrzecionowej przecinarce tarczowej. Praca dyplomowa, promotor R. Wasielewski. Politechnika Gdańska, Wydział Mechaniczny, masz. Gdańsk 2010.

Streszczenie: *Wpływ geometrii piły tarczowej na jej sztywność statyczną.* W niniejszym artykule opisano wpływ wybranych parametrów piły tarczowej wpływających w istotny sposób na jej sztywność statyczną

Corresponding author:
Department of Manufacturing Engineering and Automation, Mechanical Engineering Faculty, Gdansk University of Technology, Narutowicza 11/12, 80-952 Gdańsk, Poland
E-mail address: rwasiele@pg.gda.pl (Roman Wasielewski)