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USING THE ADVANCED AND ADJUST SPINDLE SPEEDS VIBRATION CONTROL

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Abstract
The paper refers to a strategy of vibration control using speed correction function aimed at improving the robustness and minimize vibration during HSM milling wood processing centers.

Key words: HSM, SLD, chater control.

INTRODUCTION

Control procedure is the schematic representation of the process of milling, detection and vibration control. By modeling the stability threshold is calculated diagram. Diagram using SLD, choose an operator operating point (speed and depth of cut). During milling spindle speed remains constant as long as the vibration detected by the accelerometer method using.

MATERIAL AND METHOD

Use in modeling as a schematic representation of the process of routing loops, detection and vibration control (Fig. 1). Then proceed to calculate the stability diagram SLD threshold. By choosing an operating point on the chart (speed and depth of cut) vibration is observed to maintain constant speed.

Detection method presented reveals new or vibration. In this respect even the existing speed can be known as long as it is needed to calculate appropriate detection method described above.

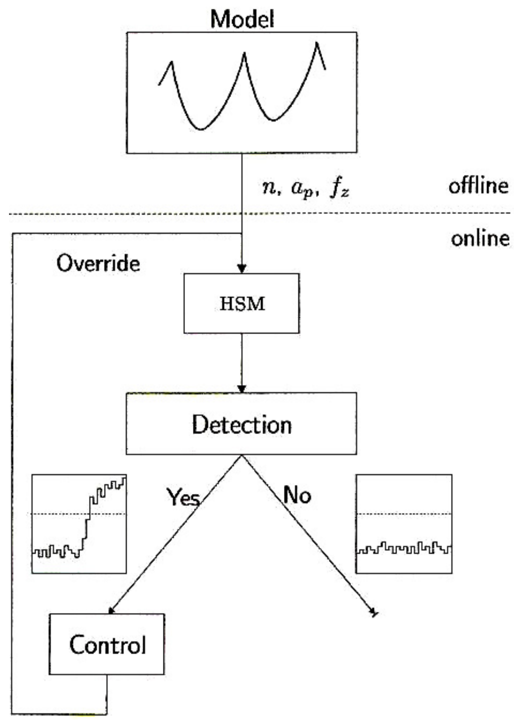

Fig. 1. Schematic representation of closed loop that includes the milling process, detection and vibration control. [4], [5]

Working parameters can be set in response to two requirements: robustness and minimize vibration HSM during milling. Next we meet the first requirement of improving the dynamic stability of HSM. Such a choice is optimal speed so that the dominant frequency f_{chat} estimated to coincide with the highest frequency harmonic excitation of the new advances in tooth f_{TPE} [4], [5].

Vibration frequency is similar to the phase difference between two consecutive where:

$$\varepsilon + k = f_{chat}\frac{60}{zn} \qquad [Hz] \qquad (1)$$

where k is an integer of waves and ε is the incomplete wave fraction between two consecutive processing. Optimum speed is the calculated so: ε = 0. The ideal situation is when the chip thickness is minimal dynamic (ε = 0).

So, the optimal number of which is the calculated by:

$$k_{new} = \{ \frac{60 fchat}{zn} \} \quad \text{[nr. întreg]} \tag{2}$$

where k_{new} means rounding (approximation) to the nearest integer, and n is the current speed. This new value of speed calculated by:

$$n_{new} = \frac{60 fchat}{Knew \cdot z} \quad \text{[rot/min]} \tag{3}$$

Using this method, the wave speed is directed toward the center. However the center can not be calculated exactly wave (Fig. 2). In this figure, the dominant frequency f_{chat} is the illustrative of our case. Thus, the new speed calculated by (2) and (3) is shown by thick broken lines. Centers where appropriate speed can be determined in fig. 3, the point where the jump occurs in f_{chat}. From this graph, we can conclude that if the initial setting of parameters is the minimum portion of the wave, the new value of the parameters are within the wave near the center. However, the top curve of stability, although the new parameter value is in the best position, it can happen that will change speed so much that the next wave to be deleted. This deviation can be prevented by an alternative definition of processing parameters were removed once the vibration. [4], [5].

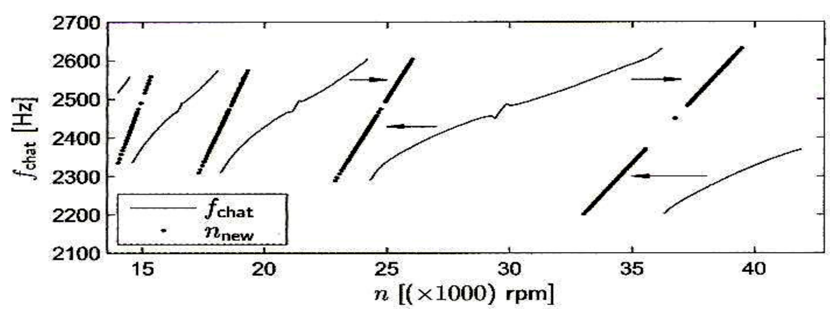

Fig. 2. Operating parameters for the new speed, the relation (2) and (3) for different frequencies. [4], [5]

Change speed leads to a new frequency of vibration and thus changing the processing parameters. So, the parameters will be updated as long as the milling process produces vibrations. When milling is stable, the parameters obtained from the last update that calculation speed can be changed, even if vibrations are eliminated.

RESULTS AND DISSCUSIONS

The benefits of this method is that speed is more stable around the center area is wider SLD if wave. If the wave is sharp, another option is to change the parameters at the current speed, where the vibrations have been eliminated. This may prevent sharp deviation for wave. Change speed leads to a new frequency of vibration and thus changing the processing parameters. So, the parameters will be updated as long as the milling process produces vibrations. When milling is stable, the parameters obtained from the last update that calculation speed can be changed, even if vibrations are eliminated.

CONCLUSIONS

Theoretical premises and vibration control method presented is an important chapter in the development of practical methods for simulation and control of milling operations on CNC machining centers HSM wood industry.

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