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APPLICATION OF THREE-AXIS ACCELEROMETER ON VIBRATION ANALYSIS IN MACHINING PROCESSES

R.S. Gonçalves[1(*)], T.L. Santos[2], J.G.S. de Jesus[2], M.S. Vieira[2]

[1]Instituto Federal do Maranhão, Department of Mechanical and Materials, São Luís, Brazil
[2]Instituto Federal do Maranhão, Department of Electrical and Electronics, São Luís, Brazil
[(*)]*Email:* palsm@fe.up.pt

ABSTRACT

In the machining process the lathe, controlled by someone, is responsible for transform the unprocessed material in a piece according to specifications previously established. The inherent vibration in the process can be extremely harmful to the final product. This work proposes to realize the three-dimensional monitoring of these vibrations using the triaxial accelerometer.

Keywords: vibration, triaxial accelerometer, monitoring, three-dimensional.

INTRODUCTION

The machinability can be considered a property of the material, whose measurement depends on the parameters of the machining process. According to Trent, (1991) machinability is not a property, but the mode of material behaves during grinding. In general, this can be defined as an amount indicating the ease or difficulty of machining a material (MACHA-DO, 2004). Some of the parameters used to evaluate machinability are shear force, tool life, surface finishing, wear rate and shear temperature, with test conditions being a key factor in determining the machinability of a material.

The machining process with the chip removal in which a crude cylindrical solid is transformed by removing chips from its periphery in order to obtain a cylindrical object with defined and precise shapes. In this process, the workpiece rotates about the main axis of the machine and the tool travels in a path in the same plane of said axis. During the chip formation, much of the energy generated is converted into heat, causing high temperatures in the region that can cause thermal damage to parts and compromising their surface integrity, with the emergence of cracks, distortions, residual stress and non-dimensional conformities (Trent).

The vibrations of the machine-tool-piece assembly are inherent to the process, however, they can cause damages such as the early wear of the cutting tool, problems with the roughness of the part to be manufactured, losses in dimensional reliability and reduction of the life of the tool itself equipment. Thus, the present article proposes the monitoring of such vibrations in three dimensions using the triaxial accelerometer.

RESULTS AND CONCLUSIONS

Experiments were performed in the Department of Mechanics and Materials of the Federal Institute of Maranhão using the assembled prototype. According to the specifications of the previous session in a NARDINI type ND 195 S. Figure 1 shows the results of one of these experiments with rotation equal to 400rpm, 1,30mm advance and 1mm depth.

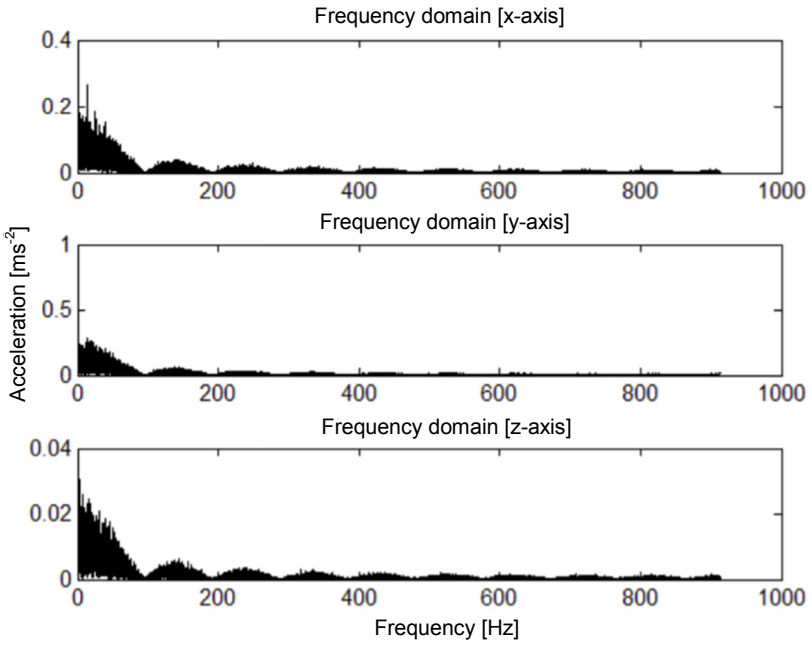

Fig. 1 - Responses in the frequency domain. The value of gravity on the z axis was disregarded.

Observing the image above, it is possible to see that the results obtained are in agreement with the expected ones, since the graphs have an oscillatory character, typical of equipment that has a rotating mass, as is the case of what is being worked on.

Considering the above, it is clear the need to study and treat such vibrations in order to allow optimum use of the equipment. For this purpose, it is proposed the analysis of the three-dimensional behavior of the vibrations acting using the Doehlert Experimental Planning. The use of experimental planning allows for your team, the reduction of tests necessary, while maintaining the reliability of the data obtained and the simultaneous study of several variables, separating their effects. In this case, the goal is to study the effects of cutting speed and breakthrough in the machining process, based on the acceleration present in each axis.

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