Chatter Detection Using the Main Cutting Force (1-st Part)

George C. Balan, Alexandru Epureanu
Dunarea de Jos University of Galati

ABSTRACT

Li et al (1997) uses the coherence function between two crossed accelerations (in the directions: axial X and vertical Z, measured by two accelerators mounted on the tool shank), to identify chatter in turning.

In a frame of an experiment focused on the monitoring of a lathe we registered the accelerations of the cutter-holder, for different cutting wear classes (c1 ÷ c6), where c6 means "Chatter".

12 monitoring indices were calculated, among: $X_5 \rightarrow F_z$ variation range; $X_6 \rightarrow$ number of intersections of oscillogram F_z with its average value $\overline{F}_z$.

In the second part of this paper we will demonstrate the accurate use of these indices values for chatter detection.

In this first part of the paper we present the state of the art and the experimental setup.

Keywords*: turning, chatter, main force*

References

1. BALAN G ., *The monitoring of a lathe using an artificial neural network*, Grant type A nr. 33 445, 2002, Theme 19, Cod CNCSIS 451

2. COLGAN J, CHIN H, DANAI K, HAYASHI SR (1994) *On-line tool breakage detection in turning: a multi-sensor method*, J Eng Ind 116:117–122

3. CROUSE MS, NOWAK RD, BARANIUK RG (1998) *Wavelet-based statistical signal processing using hidden Markov models*, IEEE Trans Signal Process 46(4):886–902

4. SIM WM, DEWES RC, ASPINWAL AC (2000) *A knowledge-based system for the selection of cutting tools and data for high speed machining of moulds/dies*, Proceedings of the 33*rd* International Matador Conference, pp 119–125

5. WANG T, MENG C, ZHAO G (1995) *Research on intelligent monitoring technology of machining process*, International Conference on Intelligent Manufacturing, Wuhan, China, pp 333–337

6. X. Q. LI, Y. S. WONG, A. Y. C. NEE (1997) *Tool wear and chatter detection using the coherence function of two crossed accelerations*, Int. J. Mech. Tools Manufact., Vol. 37, No. 4, pp. 425-437