

Research of chatter suppression in turning operation with process damping using stability lobe diagram

ABSTRACT

This paper presents a chatter detection technique based on the stability of the measured Ra and Rz values of process damping and surface roughness in low cutting speed activities. In practice, process damping during machining procedures is hard to predict and identify due to the model and technique of limitation. The impact of cutting conditions on process damping in turning with P20 steel pre-hardened metal in terms of cutting velocity, feed rate and cutting depth was explored by the Stability Lobe Diagram method. A CNC turning machine was used in dry turning procedures with carbide insert. The highest and minimum value of natural frequencies and damping ratios were evaluated by modal testing and the stability lobe diagram analysis was applied. It is concluded that in the same region of the Stability Lobe Diagram, the chatter and measured surface roughness values were correlated and shown to have strong consensus.

Keyword: Chatter vibration; Modal analysis; Process damping; Stability lobe diagram; Turning