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INFLUENCE OF VIBRATION ON A SURFACE ROUGHNESS IN FINISH TURNING

Experimental studies were carried out on lathe machine 16K20. Different materials were treated like steel 45, ductile iron KCH37 -12 -2, bronze BrAMts9 and aluminum alloy D16. Treatment was conducted at different cutting speeds with depth of cut t = 1 mm and feed s = 0,1 mm / rev. These modes correspond to finish processing.

The aim of this study was to investigate the effect of vibrations on surface roughness in finish turning. The graphic of cutting speed, roughness, frequency and amplitude dependence was built. On the basis of this research the data from different material were received.

When turning steel 45 the quality of the treated surface is influenced by the frequency and amplitude of low-frequency signal harmonic. The roughness value for steel 45 ranges between 1.45 microns to 2.49 microns. The amplitude of the low-frequency harmonic is between 0.826 to 5.9322 volts and the frequency ranges between 3168.77 Hz and 3817.89 Hz. The surface roughness is influenced mainly by the frequency of low-frequency signal harmonic. The amplitude growth leads to some reduction in roughness. The amplitude of the high frequency harmonic is between 0.000307 to 0.029676 volts, and frequency ranges between 22549.17 Hz to 35008.26 Hz. The best cutting speed at which vibrations are minimal is V = 2, 76 m / s. When turning ductile iron frequency and amplitude have an ambiguous effect on the roughness. The amplitude growth leads to some reduction in roughness. The low-frequency harmonic vibrations growth leads to peak-like changes of roughness. It is characterized by alternating growing and lowering values. The roughness value for ductile iron brand KCH37 ranges between 1.97 microns to 2.55 microns. The amplitude of the low-frequency harmonic is between 0.4943 to 2.7707 volts and the frequency ranges between 378.39 Hz to 3400.62 Hz. The surface roughness is influenced mainly by the amplitude of high-frequency signal harmonic. The amplitude of the high frequency harmonic is between 0.000557 to 0.005261 volts, and the frequency ranges between 23,516.6 Hz to 37103.87 Hz. The best cutting speed at which vibrations are minimal is V = 2, 79 m/s.

When turning aluminum the amplitude of harmonic vibrations grows together with the cutting speed. The frequency has a minimum when v = 3, 84 m / s, corresponding to the minimum roughness. The frequency of signal harmonic grows when the cutting speed grows too. The roughness value for aluminum brands D16 ranges between 2.18 to 4.47 microns. The amplitude of the low-frequency harmonic is between 0.7687 to 1.3213 volts and the frequency ranges between 3266 Hz to 41148 Hz. Thus, the surface roughness is influenced mainly by the amplitude of high-frequency signal harmonic. The amplitude of the high frequency harmonic is between 0.000036 to 0.000161 volts, and the frequency ranges between 31195 Hz to 41765 Hz. The best cutting speed at which vibrations are minimal is V = 3, 84 m / s.

When turning bronze BrAMts9 2 the amplitude of harmonic vibrations grows with the cutting speed and has a maximum value when v = 2, 26 m / s and then decreases. When the cutting speed v = 3,4 m / s it takes the lowest value and then increases. The frequency has a minimum when v = 3,4 m / s, corresponding to the minimum roughness. The roughness value for bronze brand BrAMts9 -2 ranges between 1.48 microns to 2.27 microns. The amplitude of the low-frequency harmonic is between 0.7687 to 1.3213 volts and the frequency ranges between 3266 Hz to 41148Hz. The surface roughness is influenced mainly by the amplitude of high-frequency signal harmonic. The amplitude of the high frequency harmonic is between 0.00009 to 0.00376volts, and the frequency ranges between 22382 Hz to 43720 Hz. The best cutting speed at which vibrations are minimal is V = 1, 85 m / s.

These data prove that different amplitudes of vibration and different roughness of machined surfaces occur when turning different materials. Therefore, to reduce the signal vibrations it is necessary to select appropriate optimal values of cutting speed, frequency and amplitude, for every material.