

MEASUREMENT OF CUTTING FORCES AT HIGH SPEED INTERNAL GRINDING

Daniel Popescu¹, Mirela Cherciu¹

¹University of Craiova, Faculty of Mechanical Engineering
e-mail: daniel.popescu1119@yahoo.com, mirela_cherciu2005@yahoo.com

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Abstract: Grinding is one of the most complex cutting processes due to the fact that the abrasive tool has a large number of cutting edges, whose position and cutting capacity are random. Thus a large number of very small chips are removed, which provides high precision surface finish.

Due to this fact, the dynamic phenomena present at internal grinding play an important role in the precedence of factors that influence the quality of the finished surface.

Vibrations and forced auto-vibrations that occur during internal grinding [1] usually have larger intensity than in case of other grinding types. This adversely affects the processing results and limits cutting productivity. Forced vibrations caused even by slightest unbalance at high rotation speeds produce a large degree of defects in the finished surface.

There are several force measuring systems for cutting machines. In case of internal grinding it is used the measuring system for the tangent component of the cutting force designed by TOYO Company

The force measurement system presented in what follows has the advantage that it can measure directly the tangent (F_t) and axial (F_x) components of the cutting force. It uses an original design for the measurement captor; it is reliable and lightweight, which ensures elimination of parasite electrical signals caused by sources in rotation movement.

The presented measurement system provides the following benefits:

- Lightweight, very high sensitivity;
- It eliminates the dynamic effects of transient regimes, which in case of tangent component are an algebraic sum of two opposite rotation torques, the inertial torque of the captor being much larger than the torque caused by cutting forces; initially, the electrical signal recording systems shall be calibrated such that to indicate a minimum value at offload functioning.
- The measurement quality is significantly improved, first because the measurement is performed as close as possible to the tool-workpiece contact and second because the length of the measurement chain is considerably shortened.

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