

## **Micro Machining and Hard Cutting – Challenges of Modern Manufacturing Technology**

**Marton Takacs**

Budapest University of Technology and Economics  
Department of Manufacturing Sciences and Technology  
Budapest, Hungary  
tm@manuf.bme.hu

At the beginning of the 21st century there is an increasing demand for miniaturization in all field of industry, and in everyday life. Other important effort is the economical processing of high strength metallic materials. So ones of the biggest challenges of modern production technology are continuous development and economical application of micro machining and hard machining.

Micro machining is shaping of structures with size range of 1-999  $\mu\text{m}$ . Conventional processes, such as turning, milling, drilling, electrical discharge machining, and laser beam machining can be adopted for micro machining. One of the most important and flexible mechanical micro manufacturing method is micro milling. Micro sized machining conditions differ substantially from those observed at conventional sized machining. Anisotropy of workpiece material, smaller ratio of theoretical chip thickness and tool nose radius, higher tool deformation, and larger tool run out are of essential importance of the micro milling process.

Hard machining is machining of material of parts with hardness in the range of 45-70 HRC by chip removal process. This technique is mainly applied as alternative machining method of grinding after heat treatment of the workpiece. Research about hard machining started in the 1970s, when PCBN tools were introduced. One of the most important natures is forming of serrated chip, which can be explained by different theories. Further typical characteristics are the tool geometry with negative rake angle, the high machining temperature, and the increased passive force. Main research aims are the investigation of tool degradation, regenerative effect, and dynamical instability. Chip formation can be analysed by 2D or 3D finite element simulation, too.

Common challenge of both discussed processes is micro milling of hot or cold work tool steel, because manufacturing micro mould by cutting processes is gaining more and more importance.

In the last decades comprehensive research activity was carried out at Department of Manufacturing Sciences and Technology of Budapest University of Technology and Economics. The keynote lecture will be dedicated to the summary of most important knowledge regarding micro milling and hard machining, as well as introducing the results of own experimental and theoretical research.

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