Machinability of Lead Free Copper Alloys

Jan Madl, Vaclav Koutny
Faculty of Mechanical Engineering, CTU in Prague, Technicka 4, 166 07 Praha 6, Czech Republic, E-mail: jan.madl@fs.cvut.cz, vaclav.koutny@fs.cvut.cz.

Lead is traditionally used for completing free-machining materials. This paper deals with newly developed lead free copper alloys. Unfortunately, lead affects the haematological and nervous system. Therefore, materials containing lead represent one of the greatest environmental problems in world production. Research Material Institute in Panenske Brezany (CZ) developed new environmentally friendly cooper alloys. Machinability of these materials was tested at the Department of Machining, Process Planning and Metrology CTU in Prague. Some of the research results related to the machinability from the viewpoint of chip forms, surface roughness, cutting temperature, cutting time in drilling with constant feed force, and forces in cutting are presented.

Keywords: Machining, Cooper alloys, Lead free, Machinability

References

[1] BARTL, R. et all. (1996). Saubere Fertigungstechnologien - Ein Wettbewerbsvorteil von Morgen? *Kolloquium, Aachen*. TU Aachen, Aachen, pp. 4-35 - 4-107.

[2] KIPP, E.M., RIDDLE, B.L.A. (2000). Guide to the Development of Advanced Metal-working Lubricants, *Int. Coll. TRIBOLOGIE, Eslingen*, pp. 46-52.

[3] MADL, J., SANOVEC, J. (2000). New Environmentally friendly Cutting Fluids, *IV Symposium ECOFRIM "Recycling and Neutralization of Metalworking Fluids"*, Vol. 1. IOS Krakow, Krakow, pp. 7-11.

[4] JERSAK, J., VRKOSLAVOVA, L. (2013). The Influence of Process Fluids on the Properties of the Surface Layer of Machined Components. *Manufacturing Technology*, Vol. 13, No. 4, FVTM UJEP, Usti nad Labem, pp. 466-473.

[5] BALULESCU, M. et all. (1994). Environmentally Friendly Metalworking Fluids, *9th.Int.Coll. Ecological and Economical Aspects of Tribology, Esslingen*, pp. 11-13.

[6] FELDMANN, D. G., HINRICHS, J. (1997). Evaluation of the lubrication properties of biodegradable fluids and their potential to replace mineral oil in heavily loaded hydrostatic transmissions. *Spec. Tech. Publ*., pp. 220-229.

[7] DOBEREINER, R., HOHN B., MICHAELIS K. (1999). Decisive characteristics for gear mechanisms of environmentally friendly lubricants. *Mineraloeltechnik*, Vol. 42, No. 5, pp. 1-22.

[8] FALTUS, J., MADL, J., KOUTNY, V., SLAMA, P. (2004). Slitiny med – zinek pro pouziti v instalacich pro pitnou vodu, *Metal*, Hradec nad Moravici, pp. 34-38.

[9] FALTUS, J., BALIK, J., MADL, J., KOUTNY, V., EREMIAS, B. et all. (2005). Vlastnosti ekologickych nizkoolovnatych mosazi urcenych pro obrabeni. *METAL 2005*, CDRom, Ostrava-Tanger, pp. 49-54.

[10] BOLIBRUCHOVA, D., BRUNA, M. (2013). Effect of Germanium on Secondary Lead-free Tin, *Manufacturing Technology*, Vol. 13, No. 3, FVTM UJEP, Usti nad Labem, pp. 281 -289.

[11] MADL, J., FALTUS, J., KOUTNY, V., BENDIKOVA, E. (1998). Chip Analysis of New Free-Cutting Lead-Free Aluminium Alloy. *CO-MA-TECH 6*, Trnava, pp. 491 – 496.

[12] MADL, J., KOUTNY, V., RAZEK, V. (2009). Surface roughness in machining free-machining environmentally friendly cooper alloys. *ICPM 2009*, FVT TU KOSICE, Kosice, pp. 146 – 151.

[13] BOOTHROYD, G., KNIGHT, W. A. (1985). *Fundamentals of Machining and Machine Tools*, Marcel Decker, New York, 542 p.

[14] KOCMAN, K., PROKOP, J. (2001). Prediction of Grinding Wheel Parameters, *Manufacturing Technology*. Vol.1, No. 1, pp. 26-32

[15] KOCMAN, K., PROKOP, J. (2001). *Technologie obrabeni*, AN CERM, Brno, 270 p.

[16] TREND, E. M. (1991). *Metal Cutting*, Butterworth-Helnemann, London-Boston: Ed. Oxford, 273 p.

[17] VASILKO, K., MADL, J. (2012). *Teorie obrabeni*, FVTM UJEP, Usti nad Labem, 526 p.

[18] KALPAKJIAN, S. (1989). *Manufacturing Engineering and Technology*, Addison Wesley Publishing Company, New York, 1999 p.

[19] MADL, J. (2001). Theoretical Aspect of Precise Machining. *ICPM 2001*, FVTM UJEP, Usti nad Labem, pp. 176-182.

Paper number: M2015160