Synthetic Special Products

Cooling Lubricants in the Machining of Hardmetals

On cooling lubricants which are used in machining of hardmetals especially high demands are made. In this case especially problematic is the cobalt which is emitted during the grinding of hardmetals. Therefore something has to be observed already at the formulation of the lubricants. More about it you'll read in the following paper.

Hardmetals are alloys produced by pressing and sintering where mainly - dependent on the application - combinations of tungsten carbide, titanium carbide, but beside them also carbides of tantalum, molybdenum, niobium, zircon and vanadium as hard abrasive acting "grain" are deposited in a matrix of cobalt, iron or nickel. Hardmetals stand out by an extremely high resistance against wear and also against temperatures and corrosion. They have versatile applications e.g. at borer in mines, in glass cutters, at machining tools etc.

Problematic at the grinding of hardmetals is primarily cobalt. The following classifications were established (TRK values):

– cobalt as cobalt metal, as cobalt oxide: carcinogenic dangerous material according to GefSTV. appendix II No.1.1

– cobalt in hardmetal: highly endangering according to GefSTV appendix II, if during handling the material may arise as dust or aerosol.

– MAK value (until 1979): 0.5 mg Co/m^3 dust

– TRK value (now): 0.1 mg Co/m^3 dust (as Co in the total dust for grinding of Co-containing hardmetal).

At Cooling Lubricants Much Has to Be Observed

At the wet machining of hardmetal mainly water-mixable (mineraloilfree, total synthetic) cooling lubricants are used according to TRGS 611. That means that they are based on primary and /or tertiary alkanolamine compounds. These alkanolamines are the cause that the cobalt is dissolved from the binding matrix or respectively chromium and nickel from alloys and in complex soluble form is enriched in the cooling lubricant. Even at low cobalt contents the solution will discolour from pink to deep dark red with increasing content of cobalt.

From the formulation-technical side different statements have to be considered:

– The alkanolamine compound should show an ability as low as possible of dissolving metals up to a set pH value range of about 8.2 to 9.0.

– A total absence of alkanolamine reduces the tendency of complexing heavy metals considerably.

– Similar to the copper inhibitors corresponding inhibitors have to be built in.

– A low pH value supports a reduced solution of cobalt and other heavy metals (Co-(II)-ions are easier hydrolyzed in alkaline solution).

During a long service life of a grinding solution in inadequately cleaned systems it may occur that a sufficient inhibitor concentration by cooling lubricant concentration is not at disposal anymore and an increase of heavy metal concentration is recorded. Thus it is necessary to get the situation under control by appropriate additives. Therefore an identification of the metal concentration should be made and registered. Today there is the possibilty to control the cobalt content by high-speed measurement methods similar to the nitrite/nitrate identification. More exact identifications are possible by atom absorption spectrometry.

Also the filter system is an essential influencing factor. The better the finest abrasion of the hardmetal or the alloy respectively is eliminated out of the cooling lubrication system the lower is the solution potential.

Supplier of Systems for the Machining of Metals

As systems supplier for the metalworking industry Curtis Sytems has intensified the development and marketing of synthetic special grinding cooling lubricants free of boron and amine already for quite some time and has established itself as one of the few suppliers of "real" special hardmetal grinding means on the market of cooling lubricants. These special cooling lubricants have been developed to the current state of art of hardmetal grinding.

CURTIS SYSTEMS