



Multan 73-30 MG successfully introduced at automotive components supplier Kaiser

New lubricoolant from Henkel enables magnesium machining without deposit formation

The trend toward lightweight construction has resulted in the rediscovery in many industries of magnesium as an engineering material. In the automotive segment particularly, components of magnesium make a decisive contribution to reducing the weight of vehicles, and thus their fuel consumption levels. The water-miscible lubricoolant Multan 73-30 MG from Henkel brings significant advantages for the machining of this material with its particular cutting behavior. The benefits of this fluid are particularly apparent in the series production of gear cases at automotive components supplier Kaiser.

In the design departments of the automobile industry, people have been endeavoring for years to replace steel, the classic engineering material, with lighter materials such as aluminum or technical plastics. Magnesium is a particularly interesting alternative as it is around one third lighter than aluminum. Technology historians remind us that magnesium was widely used on an industrial scale back in the 1930s but that, for various reasons, it underwent a significant decline following the end of the Second World War. Only in the legendary VW Beetle was it retained for some years for the manufacture of the crankshaft cases and gear cases.

Favorable and problematic machining properties

With its low specific weight, magnesium is the lightest metal that can be used for technical applications on an industrial scale. As a rule, magnesium alloys are employed because pure magnesium can be problematical in terms of its castability, cor-

rosion resistance and other properties related to its manufacture and application. The most important alloyant is aluminum. In the common magnesium pressure die-cast alloy AZ91, the proportion of magnesium is 89 percent, while the aluminum fraction is 9 percent. The alloy is readily castable and allows the manufacture of cast components with very intricate surface shaping. Its machining behavior is also advantageous as the material only requires minimal cutting forces and allows the application of high cutting speeds. This significantly reduces tool wear: tool lifetimes are up to ten times longer than in the case of aluminum machining, for example.

Aside from these basic positive properties available with magnesium alloys, there are certain critical aspects that have to be taken into account when considering industrial-scale production. These include in particular the danger of explosion, as magnesium reacts very easily with hydrogen. Consequently, in wet machining, it is imperative that the lubricoolant emulsions used are incapable of developing critical concentrations of hydrogen within the system. A further problem is the contamination of the emulsion arising from the introduction of dissolved magnesium ions. These cause the water hardness to rise appreciably, as a result of which the emulsion dissociates and can no longer be used. Abrasion also constitutes a serious problem, this in turn causing disruptive deposits on the tools and in the machine when using conventional water-miscible lubricoolants, giving rise to high cleaning and maintenance costs.

Modern manufacturing techniques for magnesium machining

The problem of high levels of depositing also affected automotive components manufacturer Kaiser. This company operates two large plants representing a total production area of 55,000 square meters, located not far from Passau in Germany. For over 25 years, the company has specialized in the machining and coating of metal components. Among its specialties is the series manufacture of brake discs and drums, and also clutch housings and gear cases of cast iron, steel, aluminum and – to an ever-increasing extent – magnesium. The automated magnesium machining line with over 60 interlinked cells was installed in 2003. The metal cutting operations are performed under high-duty conditions with speeds of up to 16,000 rpm. In order to preclude the danger of fires and explosions, the machining centers are equipped with advanced exhaust air systems and machine-integral fire-fighting installations in accordance with the demands of the Employers' Liability Insurance Association. The chips are ducted to a large press where they are consolidated and rendered harm-

less. "In terms of operational safety, we have reached the highest possible technical standards here in this plant," explains production manager Klaus Kasberger, the man responsible for magnesium machining at Kaiser. "Something that we found very difficult to combat initially was the millimeter-thick limescale deposits. Machines, tools, pumps, pipes, filtration screens – they all had to be constantly cleaned in order to maintain operations. The amount of work and expense involved was immense and our maintenance team often found it difficult to cope."

New lubricoolant ensures operations are completely deposit-free

At the end of 2005, Kaiser decided to fill its systems with a new lubricoolant from Henkel. The company had heard that Henkel had already achieved remarkable successes with its Multan series in aluminum machining applications. The lubricoolant chosen is based on a patented emulsifier concept exhibiting in particular exceptional flushing properties. As a result, the chips can be readily washed away, reducing machine contamination and decreasing tool wear. In order also to utilize the advantages of water-miscible lubricoolants for the machining of magnesium, Henkel developed a new product in the form of Multan 73-30 MG. "Magnesium alloys place particular demands on a water-miscible lubricoolant, rendering a specific formulation necessary. Our chemists defined as their main objective the achievement of the highest possible cleaning performance while maintaining emulsion stability," reports Henkel cutting fluid expert Jürgen Schöllkopf who provides Henkel's customer support of Kaiser. In fact, the change-over of lubricoolant exceeded the expectations of all those involved, leading to exactly the kind of results that had been hoped for.

"We were truly amazed at the improvement brought about from using the Henkel product," confirms Kasberger. "It immediately eliminated the problem of deposit formation and was even able to flush away those deposits that had previously formed. The fluid also resulted in an improvement in machining quality. Because there are also no longer any deposits on the tools, we have virtually no reject production whatsoever." Kasberger was also full of praise for the service and the problem-solving competence of his new lubricoolant supplier: "Nuisance odors, stability problems and excessive filter consumption did give us problems initially, but Henkel was able to quickly get all these issues under control. We also find the professional laboratory capacities of Henkel very useful for our needs."

Significant reduction in maintenance requirement

Now, Multan 73-30 MG has been in successful service with Kaiser for one and a half years. The annual lubricoolant change no longer requires any major maintenance overhaul. Instead of the previous four-day cleaning operation performed on the plant and systems, it is now merely a matter of disposing of the old emulsion and filling the system with new fluid. With a concentration of just 6 percent, the consumption values are also very low. "Below the line, the new lubricoolant saves us significant amounts in terms of personnel, material, time and cost. Moreover, it provides increased reliability and quality in production," Kasberger is keen to underscore. The cooperation with Henkel is all the more rewarding for Kaiser, as its magnesium production output has, in the meantime, tripled. And the future prospects for this lightweight material remain exceptionally good.

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Photos



Kaiser has been manufacturing gear cases and clutch housings from the magnesium alloy AZ91 for the VW Group since 2003.



In the machining centers and other parts of the production system, heavy depositing was a regular feature. Thanks to the flush effect of Multan 73-30 MG, Kaiser today no longer has any problems with such phenomena.



The heavy limescale deposits built up into thick layers on the internal walls of the machines.



The new lubricoolant was an immediate hit. Jürgen Schöllkopf (l.), Henkel, and Klaus Kasberger in the magnesium production facility of Kaiser.