INVESTIGATION OF ENVIRONMENTALLY ACCEPTABLE BASE OIL/ADDITIVE COMBINATIONS WITH REGARD TO THEIR FUNCTIONAL REQUIREMENTS

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ABSTRACT
The development of new types of lubricating oils is subject to ever stricter requirements in terms of environmental compatibility and toxicology. The reason is that any leakage of lubricating oil can lead to a contamination of the environment or even enter the human food chain. Therefore, the use of conventional mineral oil-based lubricating oils in combination with toxicologically questionable additives in the food industry can have serious consequences for the human body. For this reason, there is great interest in environmentally compatible and toxicologically safe lubricant alternatives.

Current development trends in these lubricant alternatives are aimed at the use of biodegradable, mineral oil-free base oils and the reduction or avoidance of toxicologically harmful additives. As an alternative to base oils containing mineral oil, esters or polyglycols with a higher polarity and a lower amount of mineral oil hydrocarbons (MOH) can be used [1]. The interactions between polar base oils and various additives can influence the functional requirements of the lubricating oil, such as the tribological requirements (anti-wear function, friction efficiency), material compatibility and ageing stability. These interactions have not yet been sufficiently clarified.

For this reason, various model oil formulations are being tested for their anti-wear function and frictional efficiency using the Mini-Traction-Machine (MTM). In a first step, a suitable test procedure for investigating the tribological requirements for different base oil-additive combinations are derived. Subsequently, this test procedure is used to evaluate the frictional efficiency, the wear protection effect and the boundary layer formation of the model oil formulations. In addition to the tribometer tests, component tests with the axial rolling bearing test rig (FE8) are carried out in order to evaluate the wear protection effect of selected model oil formulations under standardized test conditions. In addition to the tribological requirements, the model oil formulations are also tested with regard to material compatibility (elastomers and metals) and ageing stability. Furthermore, the chemical (viscosity, oxidation) and toxicological changes in the lubricants used in the tests are determined using analyses. Based on these results, the influences of the various environmentally compatible base oil/additive combinations on the functional requirements of a lubricating oil can be determined.

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