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Subject Area	Simulation Technology
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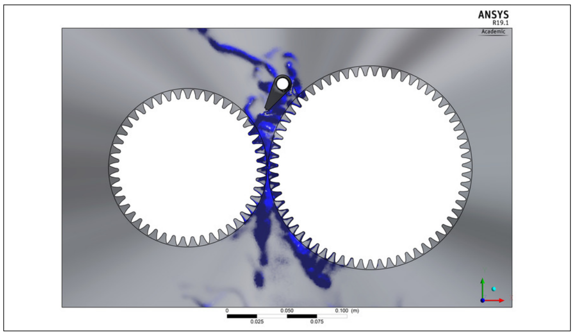
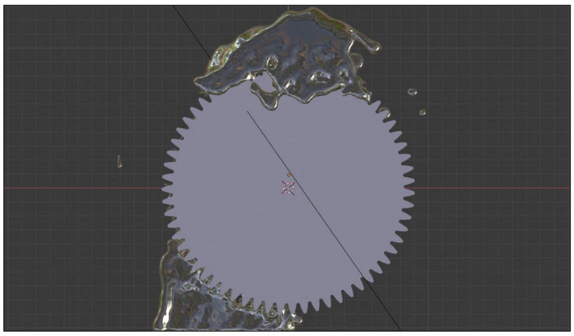
Investigation of the Lubrication System of the Main Gearbox of a SH09 Helicopter



Flow of an injected fluid with rotating gears (finite volume method).
Own presentment



Simulation with a smoothed-particle hydrodynamics software.
Own presentment

Problem: A planetary gearbox is often used when space is an issue, but a high gear ratio is needed. As is the case in the drivetrain of the kopter SH09. The SH09 gearbox features a pressure lubrication system and lubricates each gear and bearing individually.
Detailed information on the flow behavior of the oil distribution in a planetary gearbox allows manufacturers to create higher efficiency transmissions without risking adding unnecessarily power-losses due to windage, churning or other effects caused by an inefficient lubrication system.
CFD is a valuable tool to visualize fluid flows, in this case, the oil distribution inside a gear-box. This eliminates the need for practical experiments for visualizations. However high computing time and power are commonly required for these simulations.

Objective: Within the framework of this study, the feasibility of a CFD simulation of the lubrication system of the gearbox of a SH09 helicopter has been investigated. By showing the accuracy and time required for visual understanding of the oil behavior in the gearbox, a base for further research is established. The study explores different methods to simplify the simulation and shorten the computation time. The simulations are done with a verified CFD-Model based on the Finite-Volume-Method.

Result: The results show that the tools used in this study can be applied to some extent, but free surfaces, high velocities, and the multiphase nature of the problem require special treatment in the simulation setup and are only partially accurate simulated.
Simplification of some of the models can be used for macroscopic simulations, reducing the required power drastically, while still providing usable results.
Simpler simulation methods have been considered and tested and showed promising visualization of the problem, but don't provide any physical calculation data to determine the accuracy of the solution.