NAFEMS UK Regional Conference 2018 - Abstract Submission

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Will you be the presenting author?	Yes
Presentation Title	Tribology solutions for fluid lubricated sliding bearings
Relevant Themes / Keywords	RHD, EHD, TEHD, SBA, SALBA, tribology, bearing, multi-body dynamics

Abstract (plain text)	A number of tribology solvers have been developed for journal bearing solutions for the design of machines involving multi physics and multi fidelity solutions. For multi fidelity we have both analytical and numerical solutions. Analytical solutions for plain journal bearings include the short bearing approximation (SBA) and the short and long bearing approximation (SALBA). Both the SBA and SALBA solutions have been enhanced by AIES Ltd to incorporate squeeze effects to better model dynamically and transiently loaded bearings. In fact SALBA is so good for plain bearings that it is difficult to distinguish its results from our numerical Finite Difference solver RHD, as will be shown in this paper. We also have numerical solutions for journal bearings and this begins with rigid hydrodynamics (RHD). All our solutions are an FD (Finite Difference) and MBD (Multi-Body Dynamics) scheme that includes the effects of grooves, slots, and moving oil holes or slots in the journal. The geometry of the oil film clearance can vary, and can model the effects of displaced shape due to assembly and manufacture, and temperature can also be included. Our solutions enable meshes to be accommodated for our analytical solutions, so they can be readily compared for accuracy and performance against our numerical solutions. SBA, SALBA and RHD can be used for the determination of rotor dynamic stiffness and damping coefficients, and used for instability calculations via MBD calculations for high speed turbo machine applications. In the instability calculations the rotor system is run up and run down, where the bearing orbit trajectories can be seen to vary and show up issues with instability if they arise. The rotor dynamic coefficients can be used for forced response shaft system calculations, with any type of forcing. This paper will show examples of bearing solution applications and comparisons. Advanced tribology systems nowadays require the solution by multi physics methods. This can include the effects of bearing and structural elasticity (EHD) and also the effects of temperature in a (TEHD) solution. There will be examples of engine and turbocharger simulations, showing also examples of piston tribology and prediction of cavitation erosion in bearing systems.
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