# STUDY OF MULTIBODY DYNAMIC SIMULATION SOFTWARE SUITABILITY FOR ENGINE SIMULATION

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## ABSTRACT

Computer-based simulations have developed along with computers, software and calculation techniques [2]. At Wärtsilä, the engine development is based on highly detailed computer-based simulations of a running engine. Results obtained from simulations have been found to correspond very well with measured results from a running engine [1], [3]. However, there is still need to speed up the development process, and as an additional challenge, the constantly increasing amount of the customer-specific variations of the product configurations can be mentioned.

The central purpose of this work was to investigate the ability of the multibody dynamic (MBD) simulation program, which is called software S, in the simulation of a large engine, as a part of the strength analysis process. The ability was studied by comparing the software with another MBD simulation program, which is called software E. The capability of software E has been proven as a result of years of user experience at Wärtsilä, and today it has an essential role in the strength analysis process. The aim was to find the shortcomings and restrictions of the program but also the advantages that it could bring into the strength analysis process for Wärtsilä.

The simulation models for the big engine were made successfully with both programs by using flexible bodies, and the obtained results corresponded to each other reasonably well. As a summary, the results of this work can be said to show that Software S is more comfortable to use and its GUI is more sophisticated than other software, but it still has some deficits compared to Software E related to the MBD simulations of the big engine Maybe the influential restrictive factors of Software S to mention are the problems with hydrodynamic as well as the elastohydrodynamic bearing modules.

Future work is to investigate more the effect of different mode combinations in time integration regarding calculation times and result accuracy. Also, the possibility to determine a unique damping value for a single frequency would require more research. Potential features might also be co-simulation with software S and Abaqus and different contact situations based on surface geometries.

## REFERENCES

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