

Dynamic chain drive simulation in an elastic environment – Influence of friction on the dynamics

Markus Grinschgl¹, Franz M. Reich¹

¹ Virtual Vehicle Research Center, Inffeldgasse 21/A, 8010 Graz, Austria,
markus.grinschgl@v2c2.at, v2c2.at

Key Words: friction, chain drive, FEM, MBS

Chain drives are widely used to synchronize crank shaft and cam shaft in modern vehicle combustion engines. The increasing demand in driving comfort and fuel efficiency leads to further requirements in the prediction of the dynamic behaviour of chain drives. A validated simulation method is absolutely necessary to determine the engine vibrations and efficiency reliably already in the early phase of engine development.

The polygonal action of chain drives leads to an excitation of critical frequencies that have a negative influence on the acoustics. Especially in the case of excitation of resonance frequencies of elastic components in the environment of the chain drive the polygonal action can cause vibrations in a critical frequency range.

This work deals with the modelling and simulation of chain drives in combustion engines under consideration of the elastic environment. For the validation of the simulation model, extensive tests were run on a chain drive test rig. Further this work focuses on the influence of the friction in the chain and between the chain drive components (chain-sprocket, chain-guide) on the dynamic behaviour of the system.

The research was performed in collaboration with iwis motorsysteme GmbH & Co. KG and BMW AG.