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Abstract. Bush chains and roller chains are frequently used in valve train systems of combustion engines. Their complex dynamical behaviour is dominated by the effects of high velocities and transient driving torques as well as by polygonal action and rotatory impacts.

These phenomena may be studied efficiently by the methods of multibody dynamics. However, the high-frequency characteristics and the comparatively large number of degrees of freedom cause challenging numerical problems. There are two basic strategies to keep the numerical effort in time integration within reasonable bounds: On the one hand it may be reduced by adapted modelling, on the other hand specific time integration schemes may be used to solve the equations of motion. The paper introduces methods in both fields and presents simulation examples to show their effect on efficiency and to validate their implementation. In order to cope with those applications a consistent theoretical framework is introduced by the present paper that enables a combined thermal and elastic analysis in multibody dynamics. The theory is based on a linear material constitution that is inserted into the weak field equations of a flexible and heat conducting body.

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