

## Evaluation of the crane's actuators strength based on the results obtained from dynamics model

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*Abstract:* The strength analysis of the crane's actuators is presented in the paper. The analysis is performed using the loads obtained from the dynamics analysis. The mathematical model of the flexible supported crane is formulated using the Lagrange equations of the second kind. The main structure of the crane is built of the five bodies forming an open-loop kinematic chain. The actuators form the closed-loop kinematics chains. The crane performs an assumed motion aimed at transferring a load in the form of lumped mass of various values. The mathematical model takes into account the jib's flexibility, which is discretized by means of the Rigid Finite Element Method (RFEM). The formalism of the joint coordinates and homogeneous transformation matrices are used to describe the crane's kinematics. The equations of motion are supplemented by the constraint equations formulated for the cut-joints. The Lagrange multipliers corresponding to reaction forces at the cut-joints, are used to the actuators' quasi-statics analysis. The Finite Element Method (FEM) is used to model the actuators' flexibility. The numerical calculations present the influence of the jib's flexibility and load's mass on the maximum stresses and strains of the actuators at a given crane's working moment.

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