Optimization research of telescopic boom structure of truck crane

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Abstract
Structure of telescopic boom is becoming increasingly complicated, since truck crane with excellent performance, larger-ton as well as intelligence has dominated the tendency of development, enterprises home and abroad attach importance to the investigation of telescopic boom and some achievements have been obtained. So far, structure of telescopic boom with single cylinder and pinning system equipped with high intelligence and reliable performance represents the newest technology. Targeted with telescopic boom with single cylinder and pinning system, The paper builds the model of the whole telescopic boom and designs the newfashioned pinning structure by using 3-D sofware Solidworks, and investigates the statics of telescopic boom and calculates the static and dynamic stiffness concerned as well as having analysis to dynamics of boom system, dynamic equations are built by using Lagrange equation[1-3], which provides strong proof for the optimization design of telescopic boom, then, press analysis of four booms with hexagon cross-section is implemented by using drag-style design software COSMOS/works integrated into Solidworks, more specifically, at the background of crane with lifting competence 25 ton( rating load), contour plot of press and displacement for each boom in all-extended condition are also studied, which contributes to strengthening design of slide-pad attached to moving boom and also confirms location of regional stress concentration for each boom. Finally, the cross-section size for the first telescopic boom is optimized by using optimization toolbox which brings about the reducing gross weight of the whole system.

Keywords: single cylinder and pinning system; Solidworks software; optimization design; finite element; telescopic boom
Fig. 1. The structure of telescopic boom.

Fig. 2. Cross-section of boom

Fig. 3 Model of mechanics

Fig. 4 Load conditions of fourth boom

Fig. 5 Load conditions of third boom
Fig. 6 Load conditions of fourth boom  Fig. 7 Load conditions of third boom

Fig. 8 Displacement of first boom in all-extended stage

Fig. 9 Magnification of maximal stress in region
References


