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Research paper

Design and Analysis of Crane Hook with Different Cross Sections

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Abstract

Load is to be transported from one location to other location with the help of heavy vehicles, the load is placed on heavy vehicles with the help of crane or forklifts or conveyer belt, crane hook which bears the entire load. The weight of the load is related to dimensions and material of the hook. The major part which is to be replaced as per load is crane hook, hook is subjected to pressure and bending stress. In the present work the crane hook of different cross sections is being analyzed on model of crane hook. The crane hook is modeled on the Solidworks and analysis using Ansys. From the structural analysis performed on crane hook the stress values based on the model and stress value modifications are found.

Keywords: *Crane hook, I- Section, analysis*

1. Introduction

The cranes which may be on wheels or fixed the loads are lifted with the help of hook. Generally the crane is designed for lifting multiple loads depending on where to be loaded The weights are suspended from a height from the hook .the beam is supported from a joint on the chassis that it can bear the load. The beam has hydraulic supports for arrangement of height up to which to be lifted up or moved to distance and placed in the position the hook is rigidly fixed on the hanger and the hanger is supported with the help of nut and bolt arrangement so that it can move freely. On thinking about the crane the main segment is hook. The majority of accidents happening are due to the hook. Crane hooks failure is due to build up of stresses, crane hook is used to grab and lift up the loads by means of a crane. Crane hooks with cross sections of trapezoidal, circular, rectangular and triangular are widely used for various applications. [6]. Performed analysis on a crane hook for the laminated hook considering complex boundary shape [1]. Finite element analysis is used along with non-linear geometry, material properties and residual stresses. [2]. For the crane controller design vision feedback is applied [3]. At heavy construction sites the choice of feasible crane is selected by decision support model [4]. Dissimilar sling sizes and angles are selected to perform stress analyses, their effects on safety factor and stress values of crane hook by using finite element simulation [5].

1.1 Different cross sections

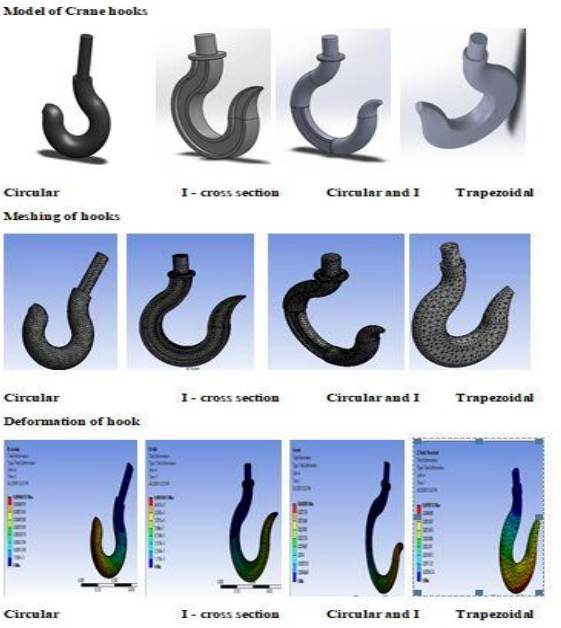
S.no	Name	Figure
1	Circular	
2	I cross section	
3	Rectangular	
4	Trapezoidal	
5	Triangular	

Table 1: Types of cross sections

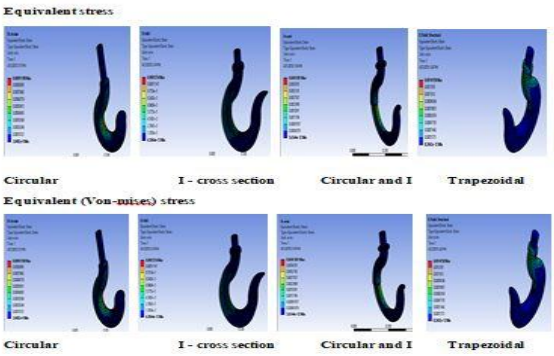
Figures and Tables

Table1:

S.no	Type	Value
1	Tensile strength	655 MPa
2	Yield strength	415MPa
3	Bulk Modulus	140GPa
4	Shear modulus	80GPa
5	Poisson's ratio	0.27-0.30
6	Brinell Hardness no	197
7	Thermal conductivity(@100^{0}c)	42.6W/mK



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2. Conclusions and Results

Solid works and Ansys is used to model and for analysis of various cross sections of crane hooks, they are circular, I cross section, combination of I cross section and circular section and trapezoidal cross section,comparison of these cross sections in terms of deformation and stress values it is found that I cross sections has less deformation and stress value than the other cross sections that are.considered in the present work.

Characteristic	Circular		I cross section		Combined I and circular Cross section		Trapezoidal	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Deformation	0	0.00068	0	0.00016	0	0.004201	0	0.00048
Equivalent stress	3.0492e-9	0.00091108	6.5064e-13	0.0001254	5.64e-12	0.0041381	8.2e-12	0.00141
Equivalent (von-mises) stress	504.89	1.37e8	0.10239	2.3987e7	0.6008	8.26e8	1.5082	2.5e8

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