

Structural And Failure Analysis Of Jib Crane Structure

B.Vikram¹, N.Elumalai², V.Giridharan³

^{1,2,3} Assistant Professor, Department of Aeronautical Engineering, Bharath Institute of Higher Education and Research, Chennai.

Article History: Received: 11 January 2021; Accepted: 27 February 2021; Published online: 5 April 2021

ABSTRACT: The main objective this project to analyze the structural capability of jib crane for different load condition 0.5ton, 1ton, 2ton. Jib crane designed in soild work and FEA softwarwe used for static structural anaylizes, then results of deformation, equalant strees, strain and safty factore compared for given load condition.

Keywords: FEA, Solid works, Static structural stability

INTRODUCTION:

In this research work we going to analyze the cantliver beam with different point load condition. That mean we going to analyze static strucutral capability of the jib crane with various point load condition.

Based on holding time, load and length of the crane the shear force and bending moment of the structure will varying, here we used contiliver beam with various point load with constant time and length of the crane.

The jib crane designed in solid works with required dimension, Structural mesh used for meshing and analyzes is done on jib crane by using FEA software. The results are took for static structural analysize like total deformation, equivalent stress and strain then we analyze the safty factor of the structure various load condition for particular time. Here the loads are 0.5 ton, 1 ton, 2 ton.

Finally we compare the all results for given load conditon with help simulation and graphical results then conclude whethere the jib crane is wistand for all load condition

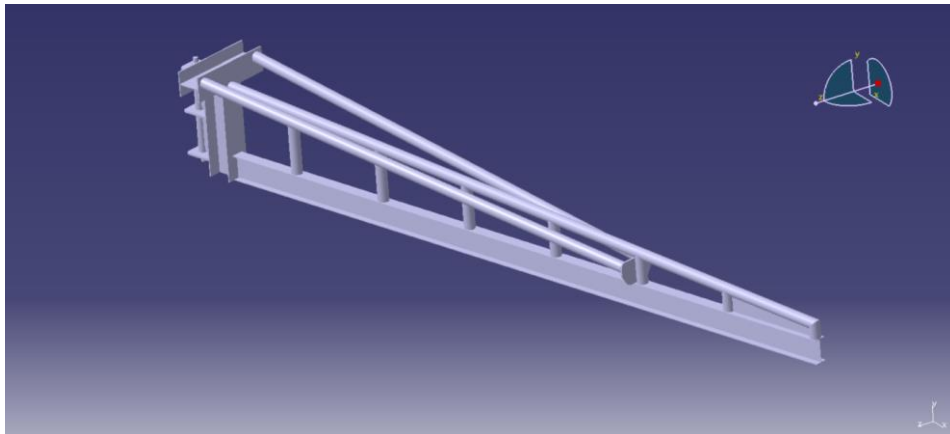


FIG1.3D MODELLING OF JIB CRANE

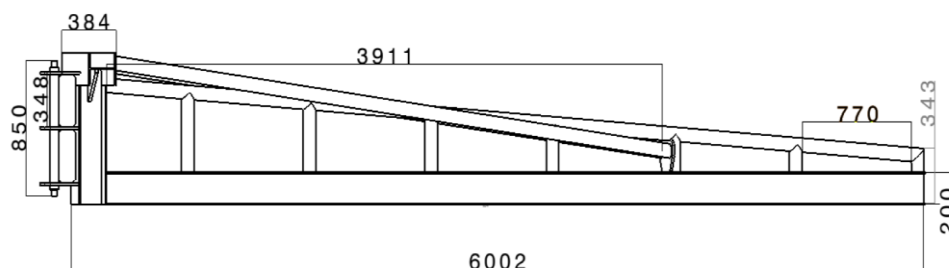


FIG2.2D DRAFTING OF JIB CRANE

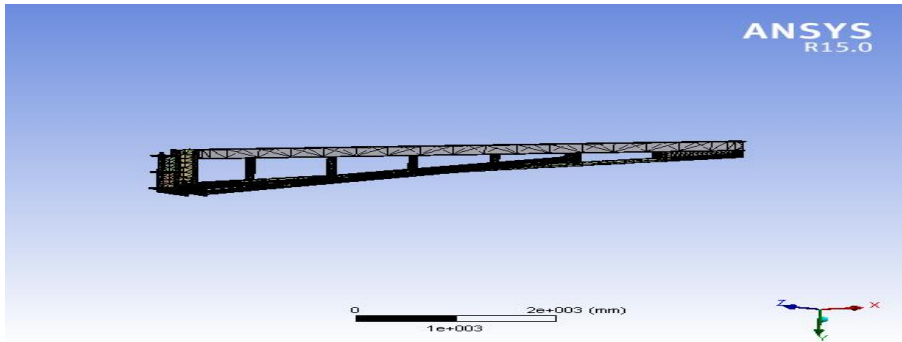


FIG3.MESH MODEL OF JIB CRANE

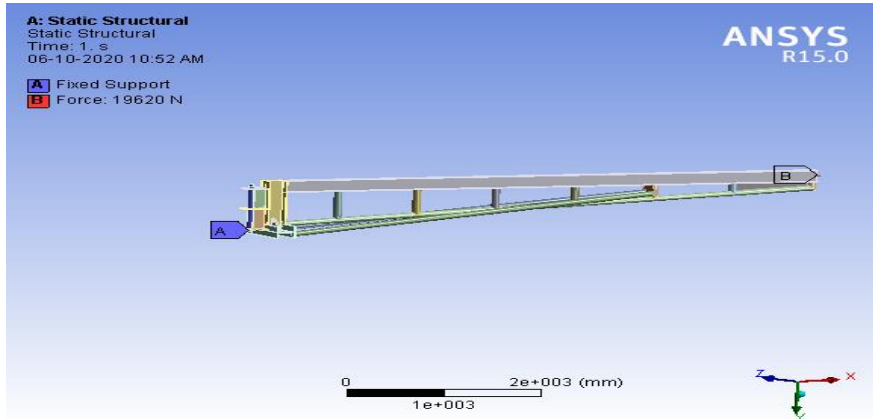


FIG4.BOUNDARY CONDITION OF JIB CRANE

TOTAL DEFORMATION

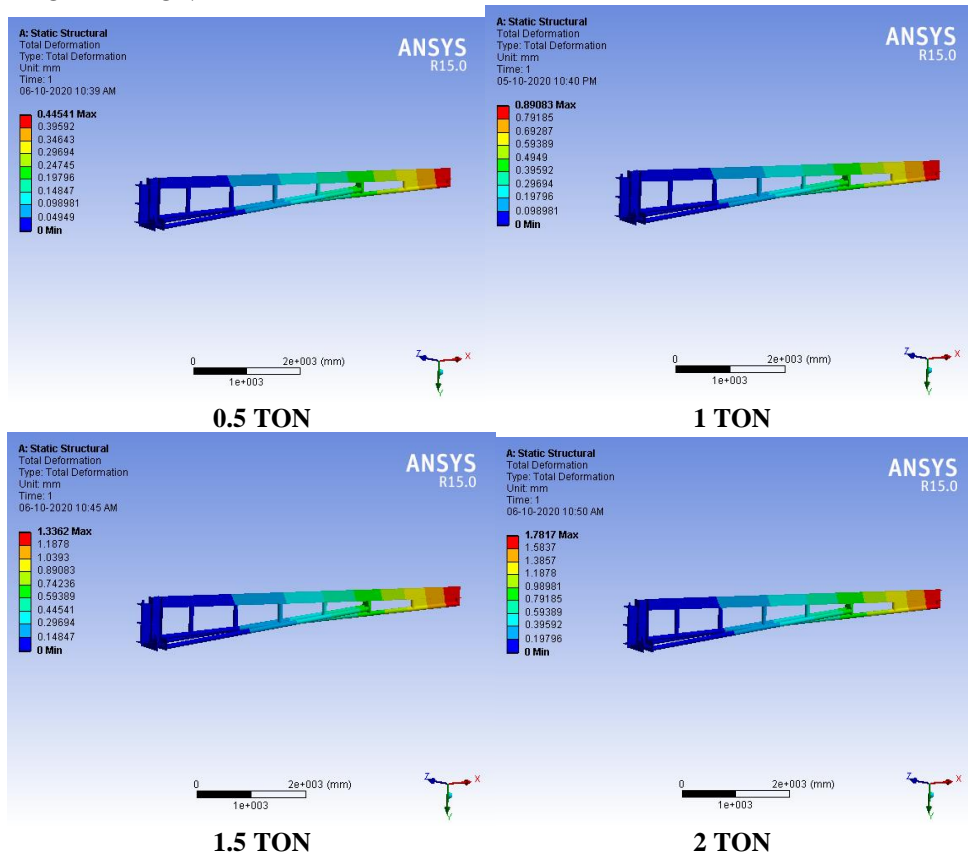
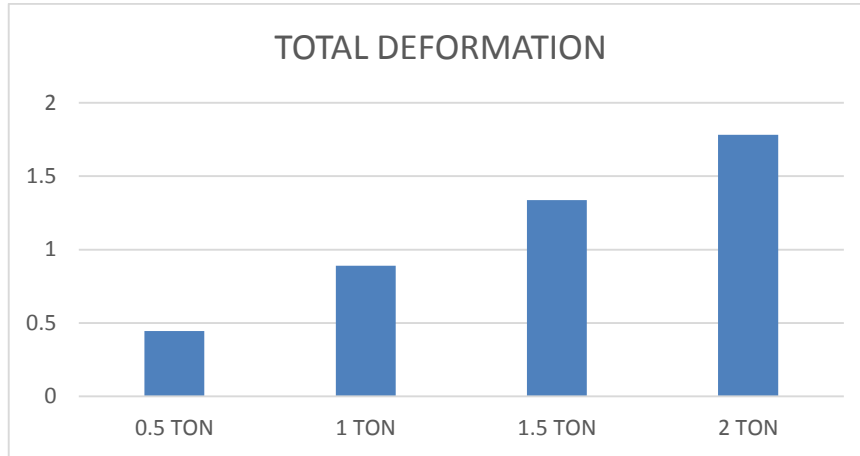


FIG5.TOTAL DEFORMATION RESULTS OF JIBCRANE

TOTAL DEFORMATION	0.5 TON	1 TON	1.5 TON	2 TON
	0.44541	0.89083	1.3362	1.7817

TABLE.1 TOTAL DEFORMATION RESULTS



GRAPH1.TOTAL DEFORMATION RESULTS

In this graph the deformation starts from 0.444541mm at the weight of 0.5 ton. As the amount of weight increases the amount of deformation also increases linearly. So we got the maximum deformation of 1.7817mm at the weight of 2ton.

STRAIN

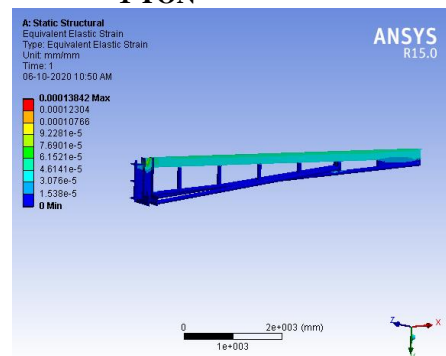
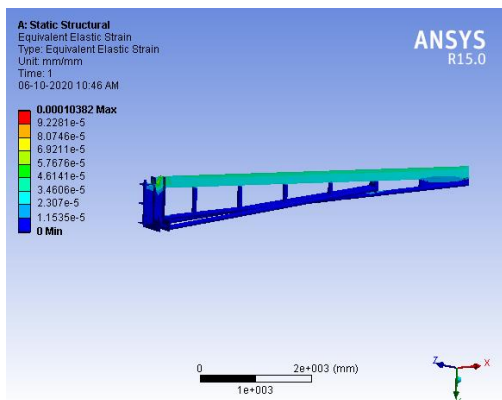
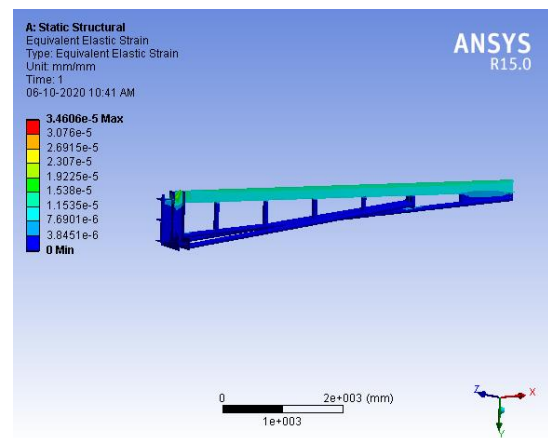
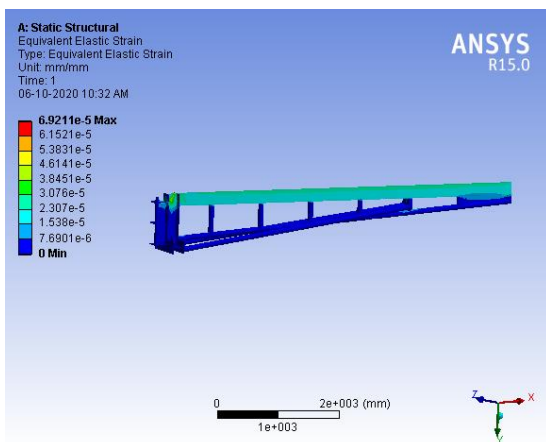
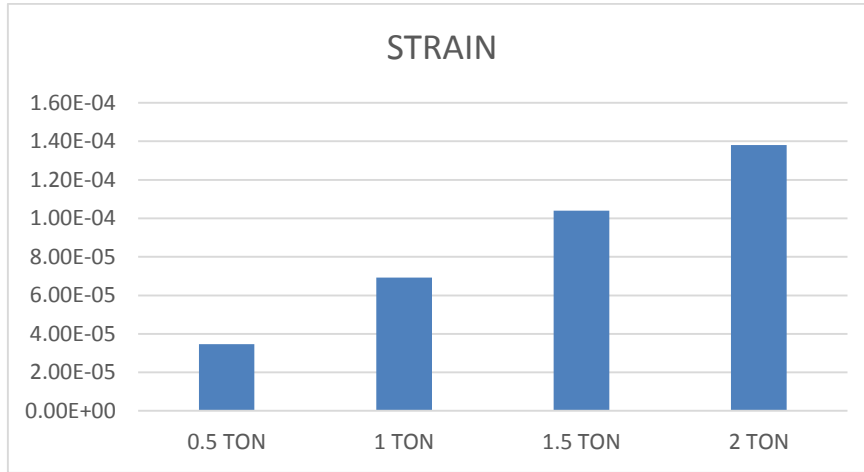


FIG.6 STRAIN RESULTS OF JIB CRANE

STRAIN	0.5 TON	1 TON	1.5 TON	2 TON
	3.4606	6.9211	0.000104	0.000138

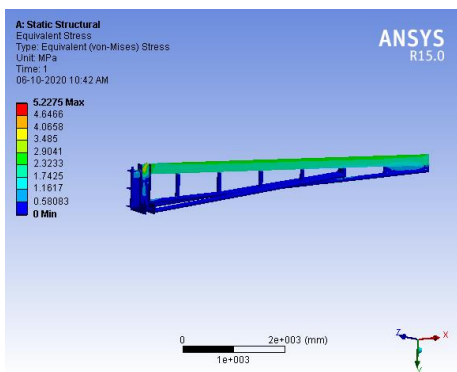
TABLE2.STRAIN RESULTS



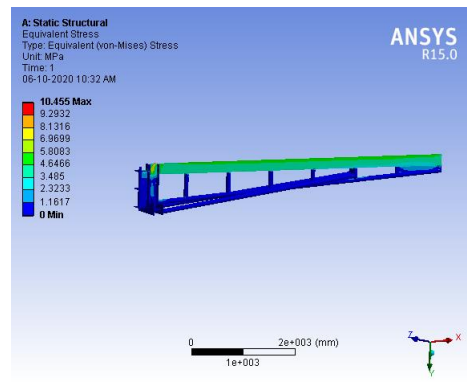
GRAPH2.STRAIN RESULTS

In this graph the strain value starts from 3.4606at the weight of 0.5 ton. Here the graph decreases as the weight increases. we got minimum strain of 0.00013842at the weight of 2ton.

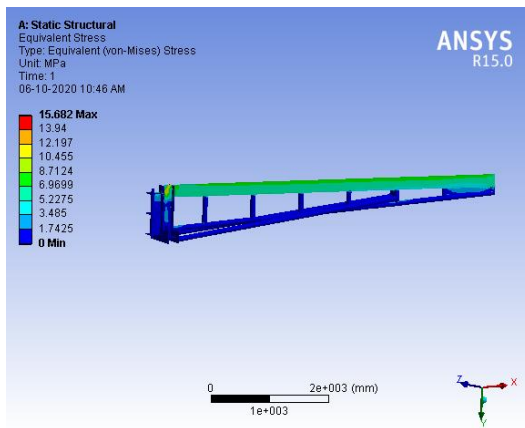
STRESS



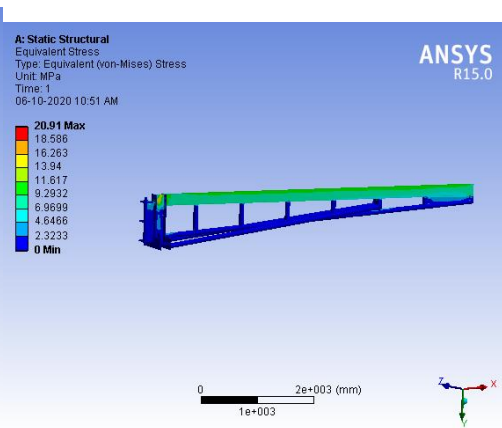
0.5 TON



1 TON



1.5 TON

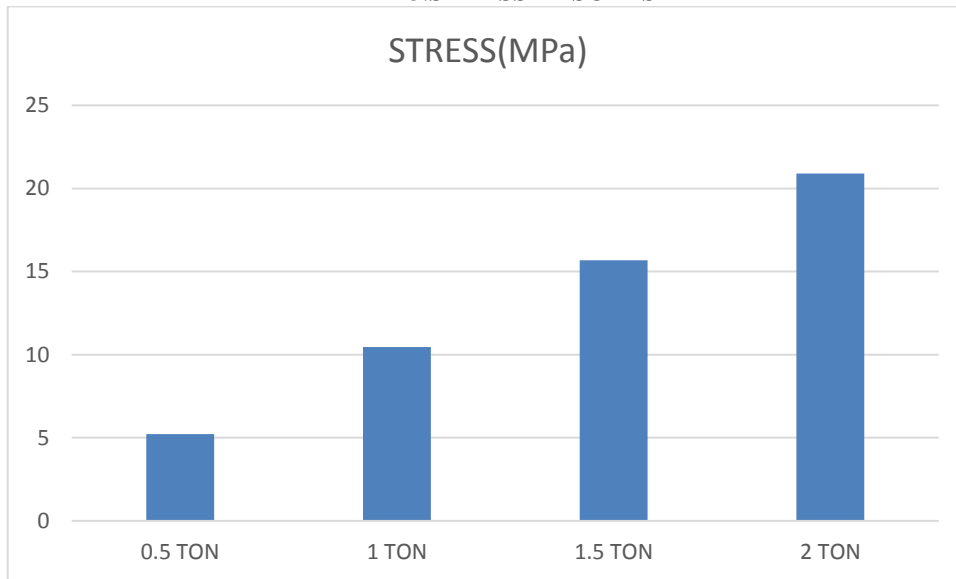


2 TON

FIG.7 STRESS RESULTS OF JIB CRANE

STRESS	0.5 TON	1 TON	1.5 TON	2 TON
	5.2275	10.455	15.682	20.91

TABLE3.STRESS RESULTS



GRAPH3.STRESS RESULTS

In this graph the stress value starts from 5.2275 at the weight of 0.5 ton. Here the graph decreases as the weight increases. So we got minimum stress of 20.91 at the weight of 2 ton.

SAFETY FACTOR

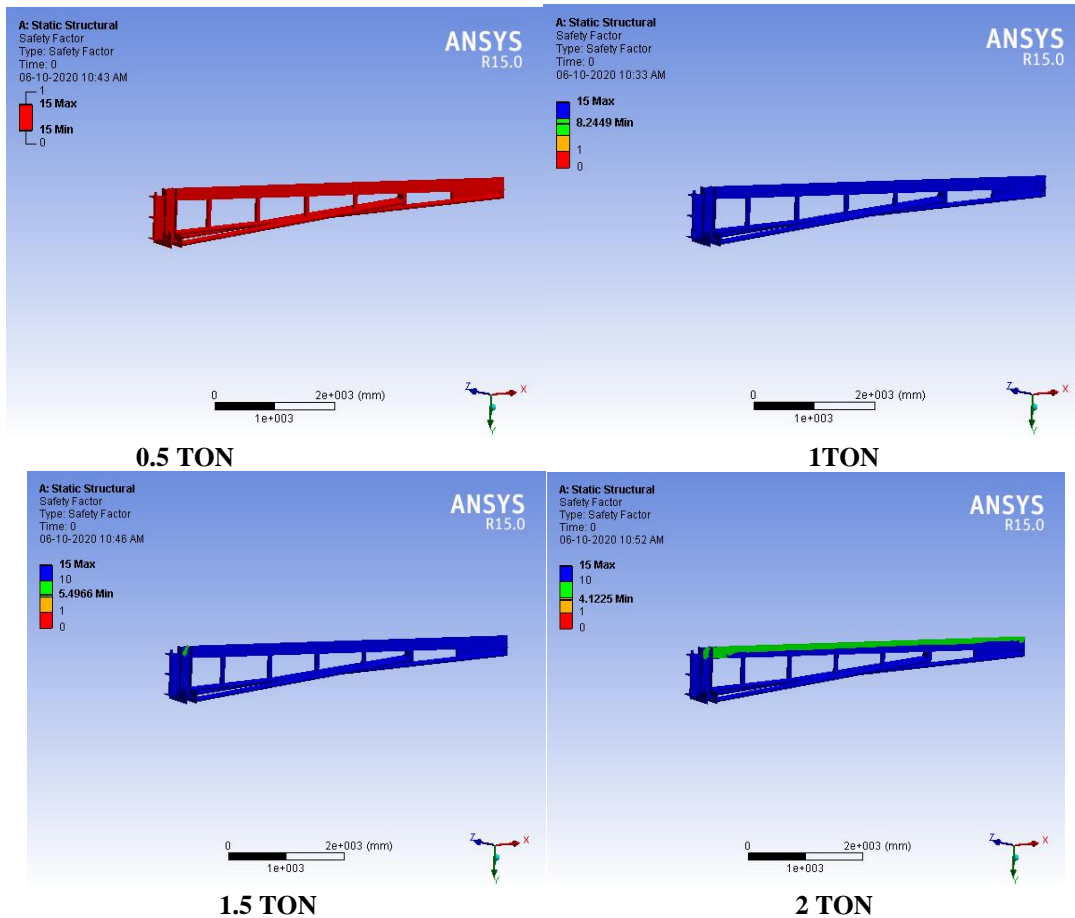
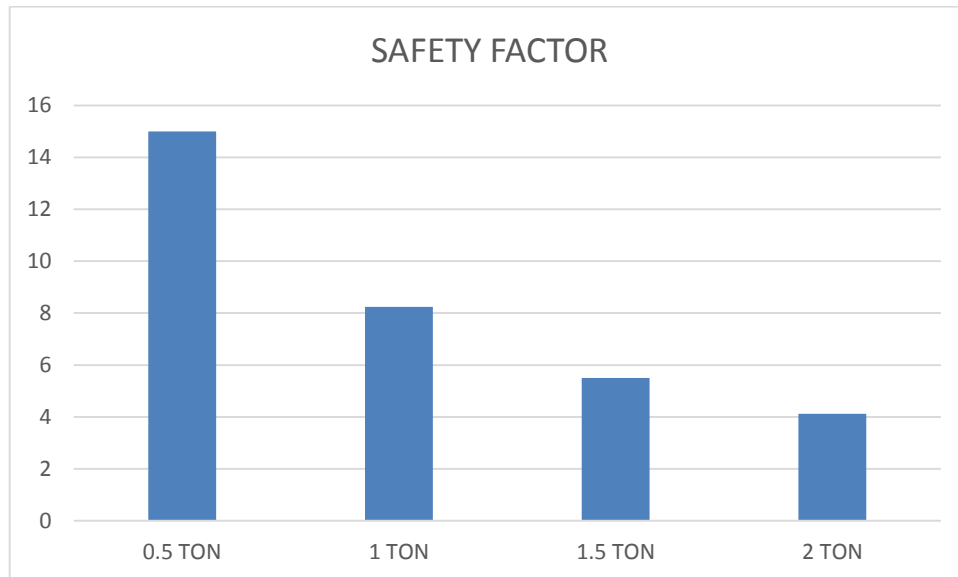


FIG.8 SAFETY FACTOR OF JIB CRANE

SAFETY FACTOR	0.5 TON	1 TON	1.5 TON	2 TON
	15	8.2449	5.4996	4.1225

TABLE4.SAFETY FACTOR OF JIB CRANE



GRAPH4.SAFETY FACTOR RESULTS

In this graph the safety factor starts from 15 at the weight of 0.5 ton . As the weight increases the amount of safety factor decreases. So we got minimum safety factor of 4.1225 at the weight of 2 ton.

CONCLUSION:

Comparing the simulation and graphical results the jib crane can able to withstand the all-load condition for given dimensions, from analyse results we can operate this jib crane up to 2 ton without any structural deformation the safety factor is high for 0.5 ton compare than the other load condition.

REFERENCE:

1. Text book: Design of the overhead bridge crane beam and strength analysis for given loads By “Academia Gorniczno-Hutnicza” (AGH) university of science and technology Strength of materials book is used for our project material properties and strength of beam.
2. Javier Izurriaga Lerga: (Sofia 2011) modeling and simulation research on the metal structure of bridge cranes Technical University – Sofia English Language Faculty Of Engineering.
3. Trevor Neville Haas: Numerical (FEA) Evaluation Of Crane End Buffer Impact Forces December 2007 Doctor Of Philosophy In Engineering, At The University Of Stellenbosch.
4. Md Azriq Izwan Bin Md Yusop: Gantry Crane System Inverse Dynamic Analysis Method (MAY2009) University Technical Malaysia Melaka
5. Apeksha.K.Patel: Design And Dynamic Analysis Of 70 T Double Girder Electrical Overhead Crane (Nov 12 To Oct 13)C.U.Shah College Of Engineering And Technology, Wadhavan, Gujarat
6. Sergio Arman Morales (Madrid, Spain): DESIGN OF THE OVERHEAD BRIDGE CRANE BEAM AND STRENGTH ANALYSIS FOR GIVEN LOADS (COURSE 2011/2012) AGH University of Science and Technology
7. Ilker Ozkan: COMPUTER AIDED DESIGN AND ANALYSIS OFFRAME CRANE (DOE-STD-1090-2007)
8. Mr. Subhash N. Khetre, Ms. Priyanka S. Banker, Mr. Arun M. Meshram, “Design and Static Analysis of I-Section Boom for crane” International Journal of Engineering Research & Technology ISSN: 2278-0181, 2014.
9. Sunil R. Kewate, Charudatta A. Simpi, D.R. Choudhari and J.H. Atole, “Design Analysis of Cantilever I- Type Beam for crane” International Journal of Applied Engineering Research, ISSN: 09734562, 2014.
10. Ajinkya Karpe, Sainath Karpe, Ajaykumar Chawrai, “Validation of use of FEM for structural analysis of tower crane isection