International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 12 | Dec -2016 www.irjet.net p-ISSN: 2395-0072

Detail Design and Analysis of A Free Standing I Beam Jib Crane

M.Dhanoosha[1], V.Gowtham Reddy[2]

[1]Vikas College of Engineering and Technology, dhanusha.mech@gmail.com
[2]Vikas College of Engineering and Technology, gowtham0419@gmail.com
Author Correspondence: M.Dhanoosha, Vikas College of Engineering and Technology, Andhra Pradesh, Pin-521165

---***---

Abstract - A jib crane is a type of crane having cantilevered beam with hoist and trolley and it is either attached to a building column or cantilever vertically from an independent floor mounted column. This paper will mainly concentrates floor mounted jib cranes here the trolley hoist moves along the length of the boom and the boom spin allowing the lifted load to be skillfully about in a relatively circular area. While designing a jib crane several factors have to be considered in these most important factors are own weight of the crane, the weight of the goods.

The aim of this thesis to carry out detailed design &analysis of jib crane. This project investigates the stress regions in the jib crane with different materials and the work is carried out by designing reinforcement to overcome those stresses in the component. With the analytical design dimensions models are prepared in modeling software and the analysis is performed on the models by finite element solver with suitable conditions and results are compared.

Key Words: JIB CRANE, PRO-E/CREO, ANSYS.

1. INTRODUCTION

Jib crane have three degrees of freedom. They are vertical, radial, and rotary. However they cannot reach into corners. They are usually used where activity is localized. Lifting capacity of such cranes may vary from 0.5 ton to 200 ton and outreach from a few meters to 50 meters. Such cranes find various applications in port area, construction site and other outdoor works. For handling general cargo, lifting capacities usually 1.5 ton to 5 ton with maximum out reach of 30 meter.

Jib crane provided with grabbing facilities have usually a capacity ranging from 3 ton operating 50 to 100 cycles per hour. Lifting heights may be 30 meter or more. Jib cranes used in ship yards for lifting heavy machinery equipment, weighing 100 to 300 tons, are usually mounted on pontoons. Frequently, these cranes are provided with two main hoisting winches which can be employed singly or together to lift a load. For handling light loads may hand auxiliary arrangement localized, such as in machine shops. Column mounted jib cranes are commonly used in packaging industry. These cranes are used for hoisting up to 1 ton loads.

Jib cranes are either attached to a building column or cantilever vertically from an independent floor mounted column. Shown in Figure 1 is a representation of a column mounted jib crane. Essentially a jib crane is a boom with a moveable trolley hoist. The trolley hoist moves along the length of the boom and the boom swivels allowing the lifted load to be maneuvered about in a relatively small semi-circular area. The hoists and trolleys of jib cranes are usually slow moving and either manually or radio operated. The arc swing is usually manually accomplished but can be mechanized when required. There are two different types of column-mounted jib booms normally encountered. The fundamental difference between the two is in the way in which the vertical column force is distributed. The suspended boom as depicted in Figure 2 is analyzed as if it delivers 100 percent of the vertical load to the column at the top hinge. The cantilevered boom (Figure3) distributes the vertical load equally between the two hinges.

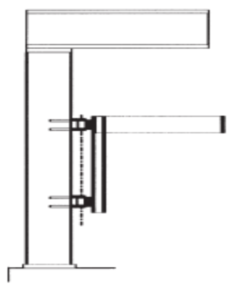

Figure 1 Column mounted jib crane

Column-mounted jib crane forces produce effects on the overall building frame and building bracing systems as well as local effects at the columns to which they are mounted. The effects on the building can be accounted for by placing point loads on the column(s) at the appropriate locations and combining them with the appropriate load combinations as prescribed by the building code. The local effects must be dealt with individually.

1.1 Global jib crane loads

Jib cranes exert vertical gravity loads and horizontal thrust loads on the supporting column. Hinge forces supplied by the crane manufacturer should be used if available. If unavailable, the loads may be approximated from statics as shown below and in Figures 2 and 3.

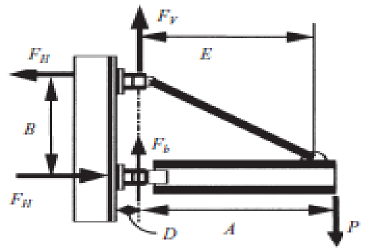

Figure 2 Suspended boom jib crane

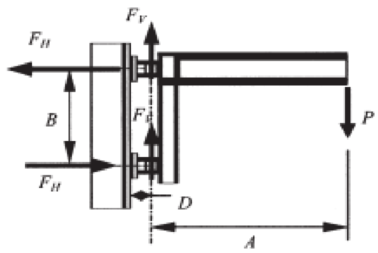

Figure 3 Cantilevered boom jib crane

1.2 Pivoting jib cranes

Any discussion of jib cranes would be incomplete without the inclusion of the pivoting type jib crane. This device consists of a vertical column (usually a WF shape) with a thrust bearing at its base and a ring-type roller or ball bearing, or a bushing, at its top, plus one or more horizontal arms (usually a standard beam section so as to accommodate the trolley wheels). Characteristics of the pivot jib are as follows:

1. The components can be assembled in most fabricating shops.
2. There are no hinge assemblies to purchase and install. In the case of a single boom the boom is attached directly to the jib column flange.
3. The bearings generally have less friction and enhance the ease of swinging the jib.
4. The upper bearing/bushing can easily be devised so as to eliminate the application of axial load from the building system into the jib column.
5. In the case of a single boom there are no torsional considerations to be made neither regarding the jib itself nor to the supporting structure except the miniscule effects from acceleration and braking in the case of a mechanical powered arc swing.
6. A 360-degree arc swing is possible rather than the usual limit of approximately 200-degree in the case of a hinge-mounted jib arm.
7. More than one jib arm can be attached to the jib column in the case where multiple machines are to be serviced by the same jib.
8. A broad range of hoists and trolleys are available.
9. The tops of the jib column can be braced directly back to the building columns without inducing any torsion or axial forces in the building columns.

1.3 History of jib crane

Mr. Gibb in1934 of Aberdeen accompanied by Mr. Mitchell, of Inverness, inspected the harbor, and Mr. Telford being consulted, plans were drawn for its reconstruction. At this work travelling jib crane was used. First actual jib crane was used by The David Round Company in1869.

1.4 Types of jib cranes

1.4.1 Free standing jib crane

Floor mounted jib cranes is directly fixed on the floor without any support to keep it upright. To maintain its stability and not topple over it you fix it to a foundation of 3 to 5 feet deep and up to 4 to 10 feet square foundation base as shown in figure 4. The foundation depends on the load and reach. Advantage of this type of crane is it doesn't need a support wall or structure and provides optimal range of span and control compare to wall mounted cranes and other types of jib cranes.

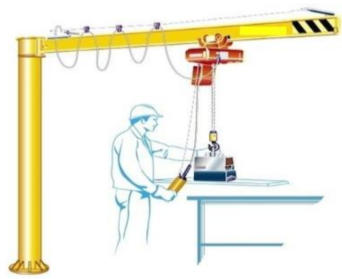

Figure 4 Free standing or Floor mounted Jib crane

1.4.2 Wall mounted jib crane

Wall mounted jib crane. Like the name suggests this kind of jib crane is fitted onto the wall. It requires very little headroom, so it can be fitted very close to the underside of roofs etc. to provide maximum lift for your hoist. The coverage like other types of cranes is circular and generally around 20 feet. But it requires a strong wall or column structure to fit it and degree of rotation is lesser than that of mast style and free standing jib cranes as shown in figure 5. This crane is very efficient way to move material when floor space is not available and digging a foundation for the crane is not feasible.

Figure 5 Wall mounted jib crane

1.4.3 Wall bracket jib crane

This crane is similar to wall mounted jib cranes but with a bracket. It's a most economical means of providing hoist coverage for individual use in bays, along walls or columns of plants. The installation requirements and load and rotation are like the wall mounted crane as shown in figure 6. Use a lot for swinging around obstacles and over obstructions.

Figure 6 Wall bracket jib crane

1.4.4 Mast style jib crane

This is similar to free-standing jib cranes but doesn't need a special foundation making it more economical. But they do require mounting at the top and bottom as shown in figure 7. They also provide a full 360 degree rotation jibs depending on the manufacturer and maximum amount of lift with full use of available headroom and allows specific placement of boom to clear obstructions.

Figure 7 Mast style jib crane

1.4.5 Working of jib crane

The underlying layout of a jib cranes consists of a solid boom shackled to a fixed pivot point. In turn, this pivot is securely mounted onto a wall or on top of a freestanding column. This pivot moves freely, allowing180 or 360-degree rotation, and a wide arc of operation. The lifting is performed by an incorporated pulley or motorized chain hoist, which can slide along the book and offer a large footprint of operation. Freestanding and mast type jib cranes offer 360-degree rotation. Wall mounted types offer 200-degree rotation.

1.5 Loads on Jib crane

1. **Trolley load:** the weight of the trolley and equipment attached to the trolley.
2. **Dead load:** the weight if all effective parts of the bridge structure, the machinery parts and the fixed equipment supported by the structure.
3. **Lifted load:** The working load and the weight of the lifting devices
4. **Vertical inertia Forces:** Dead Load Factor + Hoist Load Factor.
   - According to CMAA, Dead load factor equals to 1.2 and Hoist load factor equals to 0.15.
5. **Inertia forces from drives:** The inertia forces occur during acceleration or deceleration or crane motions and depend on the driving and braking torques.
   - Inertia forces from drives equals to 2.5% of the vertical load.
   - Test Loads will be 125 percent of related load.

1.6 Applications of Jib Crane

1. Jib cranes are arranged, for example, in shipbuilding yards for use in transportation of heavy burdens.
2. A jib crane is provided which can prevent an unexpected movement of a burden and can sufficiently ensure the safety of a burden handling work.
3. The major strength is its stability and flexibility of the device.
4. It is ideal for lifting a product to or from material handling system to a work station or machine.
5. Jib crane is commonly used for workstation and simple loading/unloading operations where it is not necessary to spot a load precisely.
6. Jib cranes most often handle lighter loads at lower duty cycles than their bridge and gantry crane counterparts.

1.7 Designing of the Free Standing Jib Crane

Here the model is designed according to the Crane Manufacturers Association of America Considering Capacity of jib crane: 5 tones= 5000kg.

• **According to the Crane Manufacturers Association of America**

1. Span length : 6.096 m
2. Overall height : 4.572 m
3. Height under boom : 3.658m
4. Mast : D= 406.4 mm
5. Trolley model : 3122B-1223,
6. Weight : 374.21kg (For 5 tones Jib crane)
7. Wheelbase : 232mm=0.232m

1.7.1 Loads calculation:

Standard I-beam shape: W920 x 238 (W36 x 160)

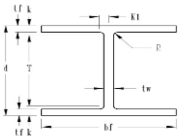

Figure 8 Standard I-beam shape

1. Lifted load = (5000 x 9.81)/1000 = 49.05 kN
Due to the Hoist Load Factor = 0.5 x 49.05 = 24.53kN,

Impacting on Lifted load = 0.25 x 49.05 = 12.26 kN.

∴ Total Lifted load = 49.05+24.53+12.26 = 85.84 kN……….(1)

2. Trolley load = (374.21 x 9.81)/1000 = 3.67 kN

Trolley load due to Dead Load Factor = 3.67 x 1.2 = 4.4kN..(2)

For the W920 x 238, the mass is 238kg/m, which equals to 2.34 kN/m.

∴ The section mass is 2.53 kN/m, which include rail and conductors.

3. Dead load = 2.53KN/m x 6.096m= 15.42 kN

Dead load due to Dead Load Factor = 15.42 x 1.2

= 18.5 kN……………….(3)

4. Inertia forces from drives

Inertia forces from drives = 2.5% x Vertical load……….(4)

Vertical load = Trolley load + Lifted load + Dead load

= 4.4+85.84+18.5=108.74 kN

Inertia forces from drive= 2.5%x108.74=2.72kN

∴ Total load= 108.74+ 2.72= 111.46 kN and

Test load is 125% x 111.46= 139.3 kN

5. Determine side trust for jib crane:

Use 20% of the sum of the lifted load and trolley equally distributed to each side as shown in figure 9.

Side thrust = 20% of combined weight of lifted load and

Trolley = (0.2 x 4.4+85.84)

= 18.05 kN = 4.51 kN/wheel.

Ratio of side thrust to maximum wheel load = 4.51/110 = 0.041

Specified moment M_H due to side thrust: M_H = 0.041 x 322.65 = 13.2 kN-m

Factored moment due to side thrust: M_{HF} = 1.5 x 13.2 = 19.9 kN-m

6. Girder Design

For the free standing jib crane, make assumption for the beam design, span length is 20 inch (6.096m). Using the girder design formulation, according to Canadian institute of steel construction (CISC), make assumption that maximum wheel load of per wheel is P = 110 kN which include impact.

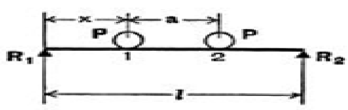

Figure 9 Simple beam: two equal concentrated moving loads

$R_{1max} = V_{1max}$ (at x=0) …….= P (2 – a/l) …………………..(5)

M_{max} (when a < (2 - √2) l= 0.586l

Under load at x= ½ (1- a/2))…= P/2l (l – a/2)²…(6)

M_{max} (when a > (2 - √2) l= 0.586l

When one load at center of span)………….. = Pl/4

The point of maximum bending moment is at 0.5 (6096 – 232/2) = 2990mm,

Based on crane wheel base a = 232mm < (2-√2) x 6096 = 3570mm,

So the M_{max} = P/ 2l (l- a/2)²

= 110/ 2 x 6.096(6.096 – 232/2)² = 322.65 kN

$R_{1max} = V_{1max}$ = P (2 – a/l)

= 110(2 – 232/6.096) = 216 kN

Lifted load bending moment M_{LL} = 322.65 kN - m

And M due to impacting = 322.65 x 0.25

= 80.66 kN-m

M_{DL} = 2.53 x 6.096 x 6.096/8 = 11.75 kN-m

∴ Factored moment M_f = 1.25 x 11.75 + 1.5 x (322.64 +80.66) = 619.64 kN-m

Design check W920 x 238, after using the spreadsheet to check, it is OK

1.8 Column design

Factored compressive load C_f=139.3 kN

Maximum factored moment x-axis M_{fx}=139.3x2.99

= 417 kN-m

For the free standing jib crane, try the column HS406 x 13,

Mass = 123kg/m,D = 406.4mm, t =12.7mm, r = 139mm

Dead load: (123 x 9.81) / 1000 = 1.206 kN/m.

Column height = 3.658m

$$C_f/C_r + (U_{lx} * M_{fx})/M_{rx} + (U_{ly} * M_{fy})/M_r \leq 1.0$$

1. Cross-sectional strength

From (HodaEmami) Comparison of Member Design between Canadian Standards Association (CSA) and LRFD PAGE NO 13-19.

Axial compressive resistance $C_r = C_{ro}$ = 621 kN.

Uniformly distributed load per unit of length nearest left reaction ω_{1x} = 1.0

KL_x/r_x = 1.0(3658/139) = 26.3,

C_e/A = 2810 MPa (by interpolation), which is Euler buckling load.

C_e = 2810*15700mm^2 = 44117 kN,

C_f/C_e = 139.3 / 44117 = 0.003,

Maximum deflection U = 1/(1- C_f/C_e) = 1/(1-0.003) = 1.003

Deflection of overhang section of beam at an distance from nearest reaction point U_{1x} = 1.003

Accordingly,

139.3/4950 +(1.003*417) / 621 = 0.028 + 0.675 = 0.703<1.0

It is OK.

2. Overall member strength

KL_x/r_x = 1.0(3658/139) = 26.3

C_r/A = 2810 MPa,

For Specified minimum yield strength of base plate steel F_y=345 MPa

$C_r=C_{rx}$=298x5700=4679kN(for uniaxial strong-axis bending),

U_{1x}= 1.003

∴ 139.3/4679 + (1.003*417) / 621 =0.03 + 0.675 = 0.705 < 1.0, It is OK.

3. Lateral- torsional buckling strength

Axial compressive resistance $C_r = C_{ry}$ = 4679 kN,

Factored moment M_r =621 kN-m,

U_{1x} = 1.0

Accordingly, 139.3/4679 + (1.0*417) / 621 = 0.03 + 0.671 = 0.701 < 1.0,It is OK.

1.9 Material properties

1. **Structural steel**
   - Density: 7.85 X 10^{-6} Kg/mm
   - Young's modulus: 2 x 10^5 Mpa
   - Passions ratio: 0.3
2. **ASME A36 Steel**
   - Density: 7.80 X 10^{-6} Kg/mm
   - Young's modulus: 2 x10^{11} Mpa
   - Passions ratio: 0.32

2 Element: Solid 20 Node 186

2.1 3-D 20-Node Structural Solid 186 Element Description

SOLID186 is a higher order 3-D 20-node solid element that exhibits quadratic displacement behavior as shown in figure 5.2. The element is defined by 20 nodes having three degrees of freedom per node: translations in the nodal x, y, and z directions. The element supports plasticity, hyper elasticity, creep, stress stiffening, large deflection, and large strain capabilities. It also has mixed formulation capability for simulating deformations of nearly incompressible elastoplastic materials, and fully incompressible hyperelastic materials.

2.2 SOLID186 is available in two forms

Homogenous Structural Solid (KEYOPT (3) = 0, the default)– See "SOLID186 Homogenous Structural Solid Element Description ".

Layered Structural Solid (KEYOPT (3) = 1) See "SOLID186 Layered Structural Solid Element Description".

A lower-order version of the SOLID186 element is SOLID185.

2.3 SOLID186 Homogenous Structural Solid Element Description

SOLID186 Homogenous Structural Solid is well suited to modeling irregular meshes (such as those produced by various CAD/CAM systems). The element may have any spatial orientation.

2.4 SOLID186 Homogenous Structural Solid Geometry

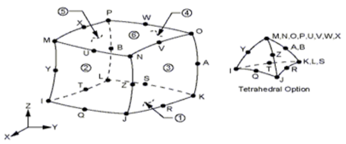

Figure 10 SOLID186 Homogenous Structural Solid

Input Summary (Using Tetrahedral)

1. **Nodes:**I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, A, B
2. **Degrees of Freedom:**UX, UY, UZ
3. **Real Constants:**None
4. **Material Properties:** EX, EY, EZ, ALPX, ALPY, ALPZ (or CTEX, CTEY, CTEZ or THSX,THSY, THSZ),PRXY, PRYZ, PRXZ (or NUXY, NUYZ, NUXZ),DENS, GXY, GYZ, GXZ, DAMP
5. **Surface Loads (Pressures):** face 1 (J-I-L-K), face 2 (I-J-N-M), face 3 (J-K-O-N),face 4 (K-L-P-O), face 5 (L-I-M-P), face 6 (M-N-O-P)
6. **Body Loads (Temperatures):** T(I), T(J),T(K), T(L), T(M), T(N), T(O), T(P), T(Q), T(R), T(S), T(T), T(U), T(V), T(W), T(X), T(Y), T(Z), T(A), T(B)
7. **Body force densities**:The element values in the global X, Y, and Z directions.

2.5 SOLID186 Homogenous Structural Solid Element technology

SOLID186 uses the uniform reduced integration method or the full integration method, as follows: Uniform reduced integration method helps to prevent volumetric mesh locking in nearly incompressible cases. However, hourglass mode might propagate in the model if there are not at least two layers of elements in each direction.

2.6 Full integration

The full integration method does not cause hourglass mode, but can cause volumetric locking in nearly incompressible cases. This method is used primarily for purely linear analyses, or when the model has only one layer of elements in each direction.

3. Drawings of Jib Crane

3.1 2D-Drawings of Jib Crane

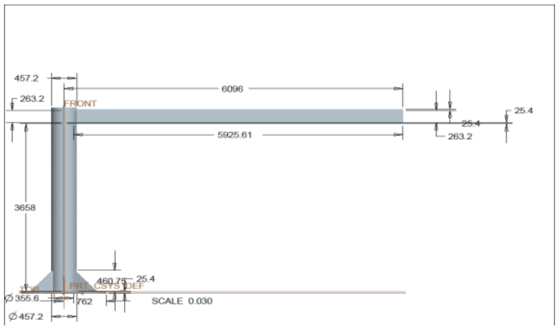

Figure 11 Jib crane final assembly drawing using Pro-e

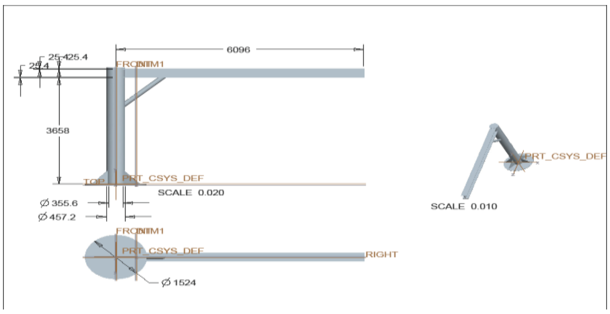

Figure 12 Reinforced Jib crane final assembly drawing

3.2 3D Modeling isn Pro-E/ Creo

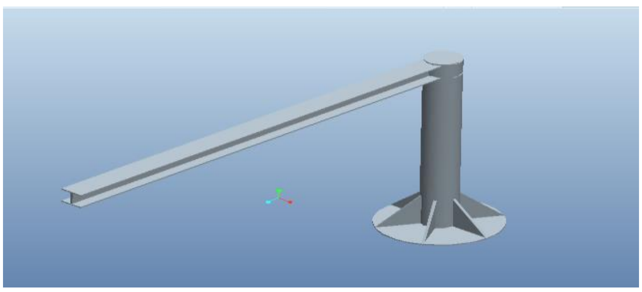

Figure 13 Jib assembly solid model using Pro-e

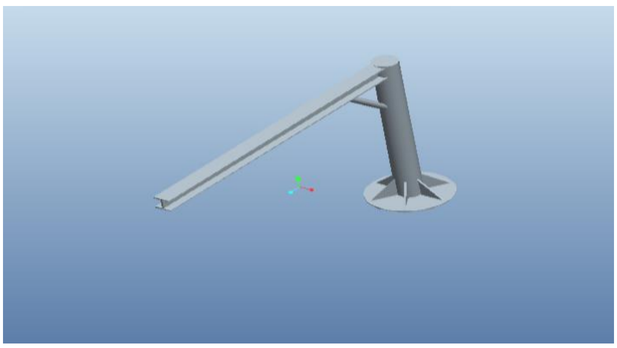

Figure 14 Reinforced jib crane assembly solid model

3.3 Analysis by Using Finite Element Solver (ANSYS)

The analysis was done by using ANSYS15.0 software and the figure 15 represents the view of jib crane is meshed state by applying loads and conditions. by using element type as Solid 20 Node 186.

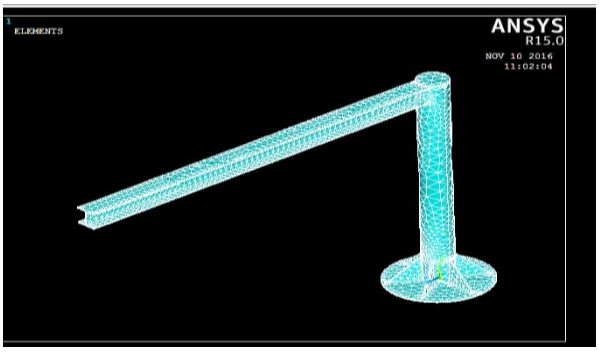

Figure 15 Jib meshed model (Element type: Tetrahedral)

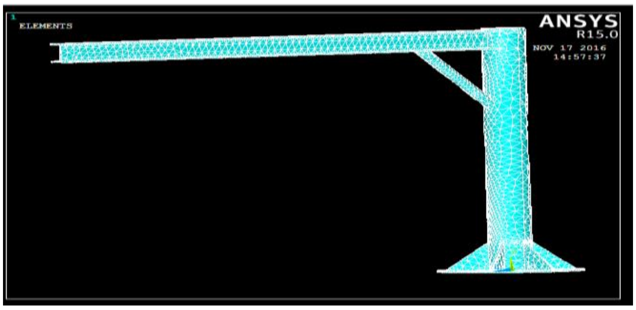

Figure 16 Reinforced jib meshed model (Element type: Tetrahedral)

4. RESULTS AND DISCUSSION

4.1 Jib crane load at end of the span

A. Structural Steel

The figure 17 represents the jib crane at end of the span of deformations occurs at 72.27 mm in structural steel

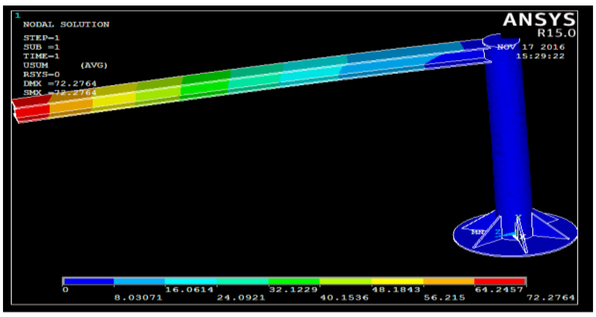

Figure 17 Deformation of structural steel at end of the span

The figure 18 represents the jib crane at end of the span of Stress intensity occurs at 321.47 N/ mm^2 in structural steel

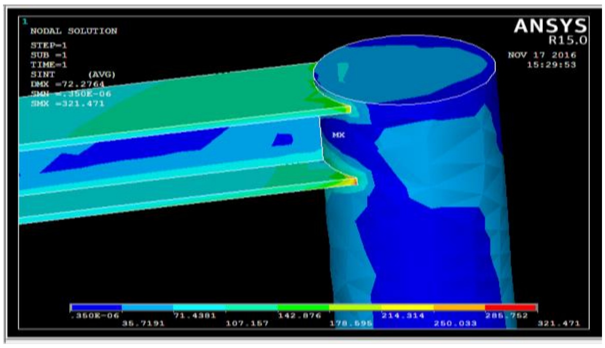

Figure 18 Stress intensity of Structural steel at end of the span

A. ASME A36 Steel

The figure 19 represents the jib crane at end of the span of deformation occurs at 72.26mm in ASME A36 steel

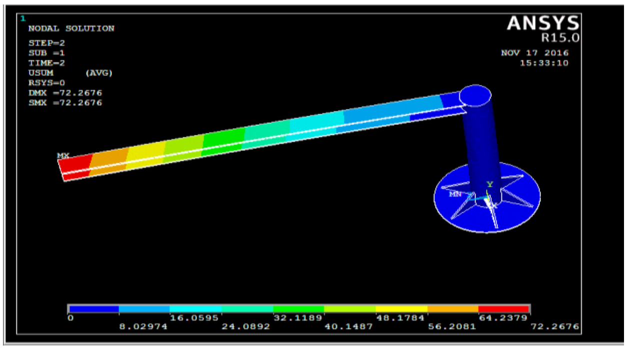

Figure 19 Deformation of ASME A36 steel at end of the span

The figure 20 represents the jib crane at end of the span of Stress intensity occurs at 315.8N/ mm^2 in ASME A36 steel

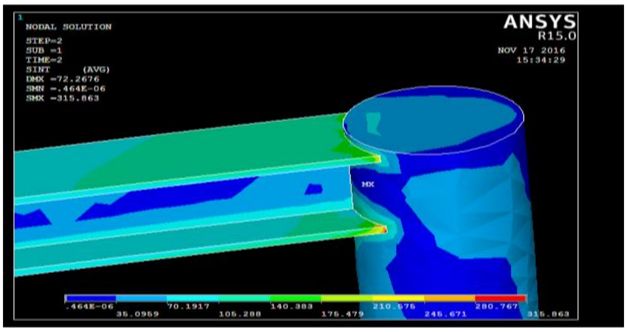

Figure 20 Stress intensity of ASME A36 steel at end of the span

4.2 Reinforced jib crane load at end of the span

A. Structural Steel

The figure 21 represents the Reinforced jib crane at end of the span of deformation occurs at 54.03mm in structural steel

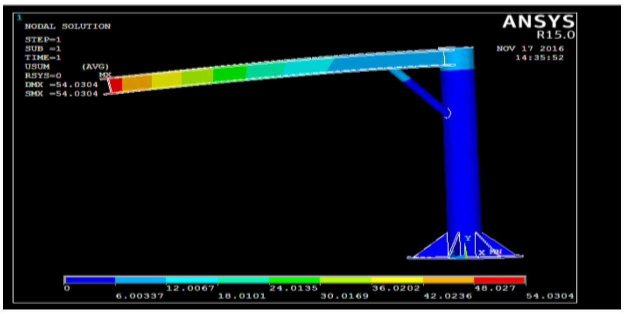

Figure 21 Deformation of structural steel at end of the span

The figure 22 represents the Reinforced jib crane at end of the span of Stress intensity occurs at 225.08N/ mm² in structural steel

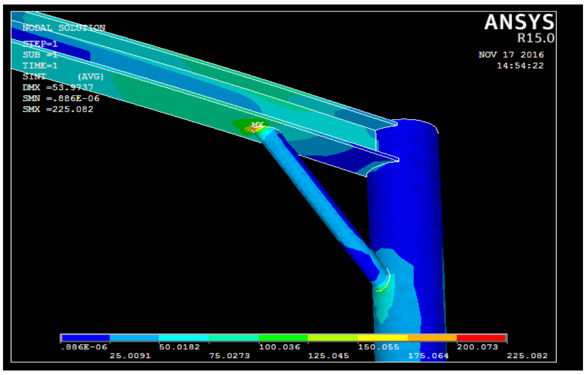

Figure 22 Stress intensity of structural steel at end of the span

B. ASME A36 Steel

The figure 23 represents the Reinforced jib crane at end of the span of deformation occurs at 53.9mm in ASME A36 steel

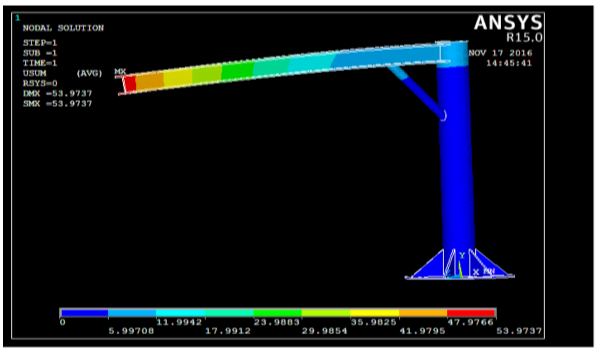

Figure 23 Deformation of ASME A36 steel at end of the span

The figure 24 represents the Reinforced jib crane at end of the span of Stress intensity occurs at 223.02N/mm² in ASME A36 steel

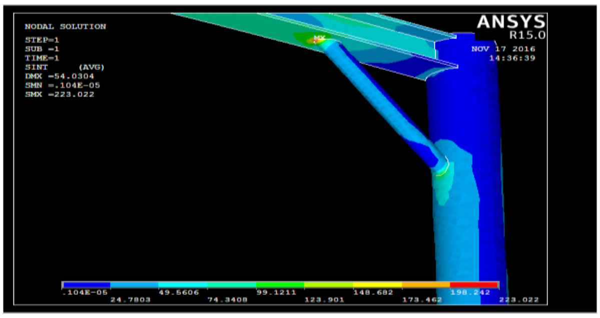

Figure 24 Stress intensity of ASME A36 steel at end of the span

4.3 Jib crane load at middle of the span

A. Structural steel

The figure 25 represents the jib crane at middle of the span of deformation occurs at 27.49mm structural steel

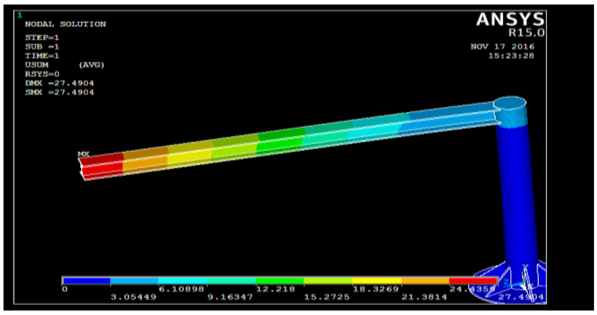

Figure 25 Displacement of structural steel at middle of the span

The figure 26 represents the jib crane at middle of the span of Stress intensity occurs at 161.09N/mm² in Structural steel

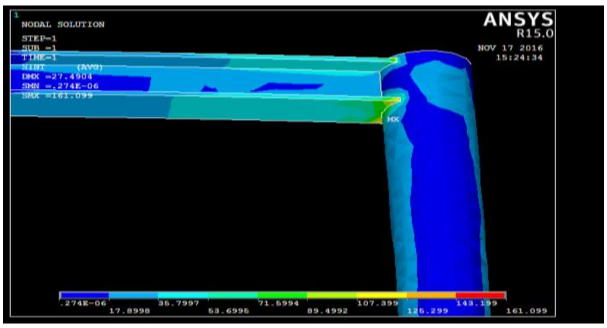

Figure 26 Stress intensity of structural steel at middle of the span

B. ASME A36 steel

The figure 27 represents the jib crane at middle of the span of deformation occurs at 27.47mm in ASME A36 steel

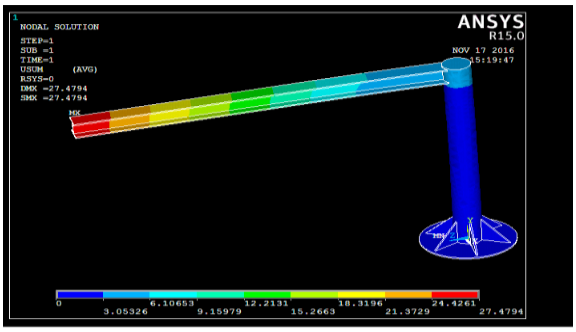

Figure 27 Displacement of ASME A36 steel at middle of the span

The figure 28 represents the jib crane at middle of the span of Stress intensity occurs at 158.24 N/mm² in ASME A36 steel

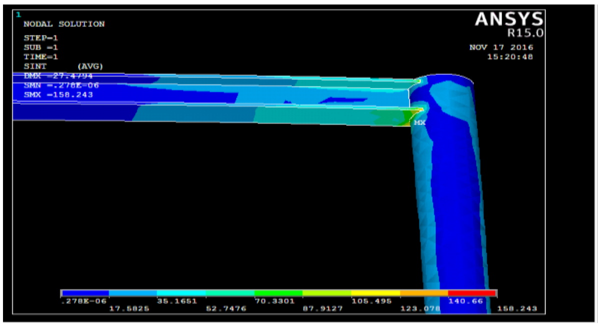

Figure 28 Stress intensity of ASME A36 steel at middle of the span

4.4 Reinforced jib crane load at mid span

A. Structural steel

The figure 29 represents the Reinforced jib crane at middle of the span of deformation occurs at 18.7mm in Structural steel

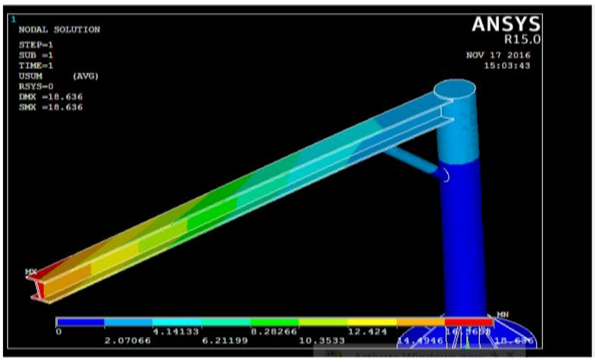

Figure 29 Displacement of structural steel at middle of the span

The figure 30 represents the Reinforced jib crane at middle of the span of Stress intensity occurs at 103.9 N/mm² in Structural steel

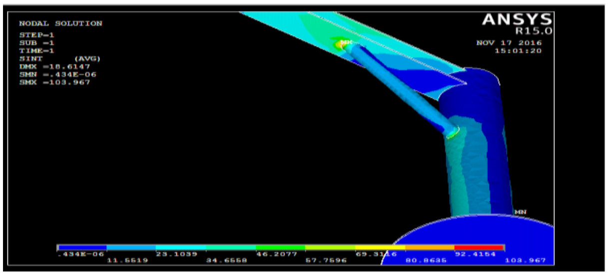

Figure 30 Stress intensity of Structural steel at middle of the span

B. ASME A36 steel

The figure 31 represents the Reinforced jib crane at middle of the span of displacement occurs at 18.6mm in ASME A36 steel.

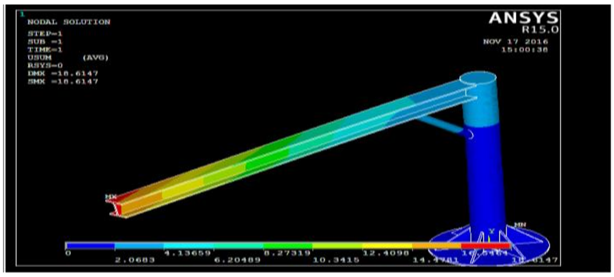

Figure 31 Displacement of ASME A36 steel at middle of the span

The figure 32 represents the Reinforced jib crane at middle of the span of Stress intensity occurs at 103.04 N/mm² in ASME A36 steel

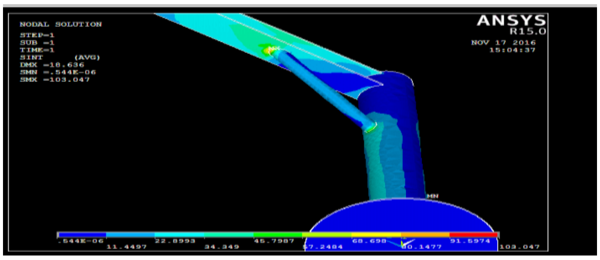

Figure 32 Stress intensity of ASME A36 steel at middle of the span

4.5 Results Analysis

Table 1 represents the Jib crane analysis results when applying load at the end of the span

Table 1 Jib crane at the end of the span

S.No.	Material	Structural steel	ASME A36 Steel
1	Deformation (mm)	72.27	72.26
2	Stress intensity(N/mm^2)	321.47	315.8

Table 2 represents the Reinforced Jib crane analysis results when applying load at the end of the span.

Table 2 Reinforced Jib crane at the end of the span

S.No.	Material	Structural steel	ASME A36 Steel
1	Deformation (mm)	54.03	53.9
2	Stress intensity(N/mm^2)	225.08	223.02

Table 3 represents the Jib crane analysis results when applying load at the mid span.

Table 3 Jib crane at the mid span

S.No.	Material	Structural steel	ASME A36 Steel
1	Deformation (mm)	27.49	27.47
2	Stress intensity(N/mm^2)	161.09	158.24

Table 4 represents the Reinforced Jib crane analysis results when applying load at the mid span

Table 4 Reinforced Jib crane at the mid span

S.No.	Material	Structural steel	ASME A36 Steel
1	Deformation (mm)	18.7	18.6
2	Stress intensity(N/mm^2)	103.9	103.04

4.6 Deformation analysis

Figure 33 represents the load at end of the span of a Deformation Results Analysis.

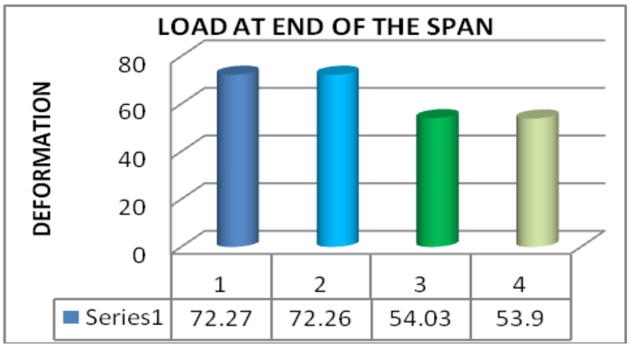

Figure 33 load at end of the span (Units mm)

Figure 34 represents the load at mid span of a Deformation Results Analysis.

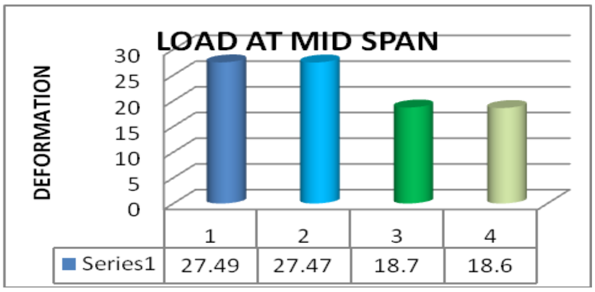

Figure 34 load at mid span (Units mm)

4.7 Stress Results Analysis

Figure 35 represents the load at end of the span of Stress Results Analysis.

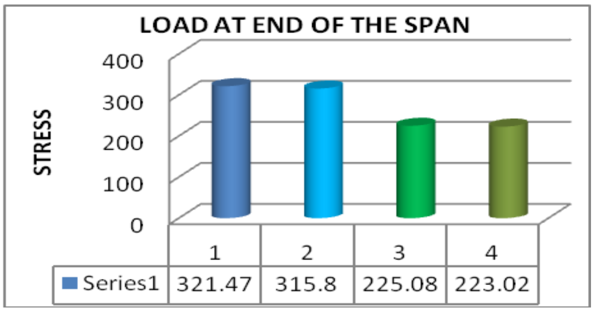

Figure 35 load at end of the span (Units N/mm^2)

Figure 36 represents the load at mid span of Stress Results Analysis.

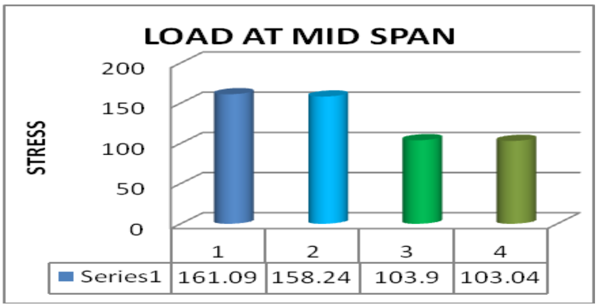

Figure 36 load at mid span (Units N/mm^2)

FIGURE DATA	
1	Jib crane with structural steel
2	Jib crane with ASME A36 Steel
3	Reinforced jib crane with structural steel
4	Reinforced jib crane with ASME A36 steel

CONCLUSION

According to the standards design and analysis of the jib crane is done using modeling software creo and finite element solver Ansys. The work is carried out by changing the design of the model with different material. In the analysis part model analyzed at two loading conditions i.e at mid span and end of the span and the results were compared. By observing the results the deformation and stress values of the reinforced jib crane are decreased than the actual jib crane this shows clearly that the stress values are reduced so the life time of the jib may increase and the purpose of the project is served.

In the extension of the current project the analysis is performed on the models by changing the materials also done. After comparing the results the stress and deformation values of the ASME A36 steel less than the structural steel by this we conclude that the reinforced jib with ASME A36 steel may better for industrial jib cranes for longer life with less maintenance.

REFERNCES

[1] Krunal Gandhare,VinayThute, "Design Optimization of Jib Crane Boom Using Evolutionary Algorithm", International Journal of Scientific Engineering and Research, Volume 3 Issue 4, pp. 2-8, 2014.

[2] Baker J. Cranes in Need of Change, Engineering, Vol. 211, PP- 298, 1971.

[3] Sandip D. Shinde"Standardization of Jib Crane Design by "F.E.M. Rules" and Parametric Modeling", International Journal of Recent Trends in Engineering, Vol. 1, No. 5, pp. 145-149, May 2009.

[4] K. Suresh Bollimpelli, V. Ravi Kumar, "Design and Analysis of Column Mounted JIB Crane", International Journal of Research in Aeronautical and Mechanical Engineering, Vol 3 issue 1, pp. 32-52, 2015.

[5] Amreeta R. K. "Design and Stress Analysis of Single Girder Jib Crane", International Journal of Engineering Research & Technology Vol. 4 Issue 09, pp. 932-936, September-2015.

[6] Subhash N. Khetre, S. P. Chaphalkar "Modelling and Stress Analysis of Column Bracket For Rotary Jib Crane", international journal of mechanical engineering and technology Volume 5, Issue 11, pp. 130-139, November 2014.

[7] Gerdemeli .I, Kurt .S and Tasdemir "Design and Analysis with Finite Element Method of Jib Crane", Mechanical Engineering Istanbul Technical University – Turkey 2012.

[8] B. Ünal, I. Gerdemeli, C. E. Imrak "Modelling and Static Stress Analysis of Shipyard Jib Crane With Finite Element Method", University Review Vol. 2, No. 4 Trenčín: Alexander Dubček University of Trenčín2, 90 p, 2008.

[9] Fuad Hadžikadunić, NedeljkoVukojević and SenadHuseinović "An Analysis of Jib Crane Constructive Solution in Exploatation", 12th International Research/Expert Conference Trends in the Development of Machinery and Associated Technology'' TMT 2008, Istanbul, Turkey, pp. 26–30 August, 2008.

BIOGRAPHIES

M. Dhanoosh is currently pursuing master's degree program in Machine Design, Engineering of Mechanical Engineering, VIKAS College of Engineering and Technology, Nunna, Andhra Pradesh, India. She has completed B.Tech from Gudlavalleru Engineering College, Gudlavalleru, Andhra Pradesh, India, in 2011.

V. Goetham Reddy is Assistant Professor, in Mechanical Engineering Department of VIKAS College of Engineering and Technology. He has about 6 years of experience and presented papers in several International and National Conferences and published papers in International Journals. His area of interest includes Machine Design.