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"DETAIL DESIGN AND ANALYSIS OF A FREE STANDING I BEAM JIB CRANE"

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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.

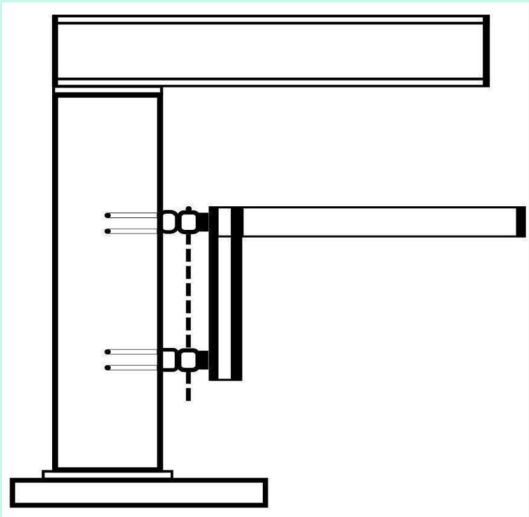
The aim of this thesis to carry out detailed design &analysis of jib crane. This project investigates the stress regions in the jib crane with different materials and the work is carried out by designing reinforcement to overcome those stresses in the component. With the analytical design dimensions 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.

KEYWORDS: 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 Column mounted jib cranes are commonly used in packaging industry. These cranes are used for hoisting up to 1 ton loads.

Fig. 1: Column mounted jib crane



Jib cranes are either attached to a building

Research Paper

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.

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.

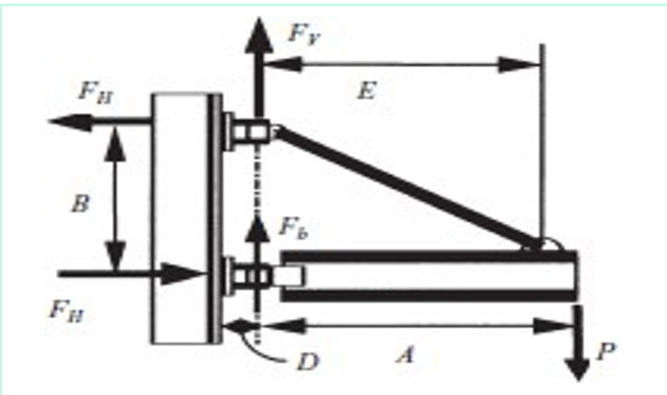
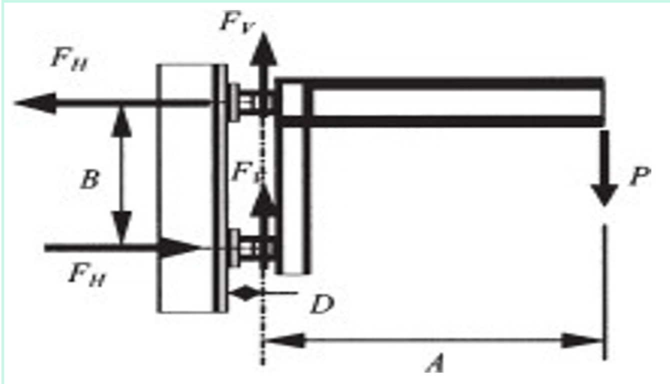


Fig. 3: Cantilevered boom jib crane



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.

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.

Fig. 5: Wall mounted jib crane

1.4.3 Wall bracket jib crane :

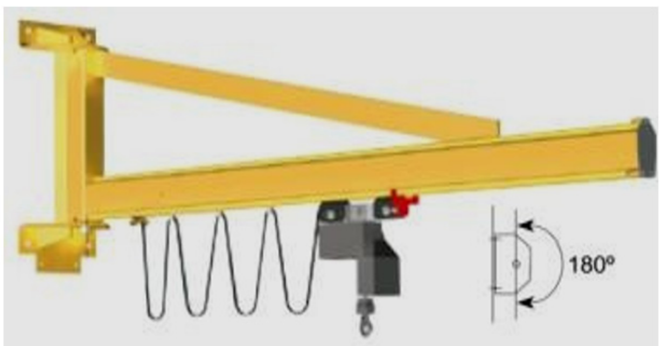
This crane is similar to wall mounted jib cranes but with a bracket. It's a most economical means of providing hoist coverage for individual use in bays, along walls or columns of plants. The installation requirements and load and rotation are like the wall mounted crane as shown in figure 6. Use a lot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

Fig. 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.

Fig. 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 cranesoffer 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.

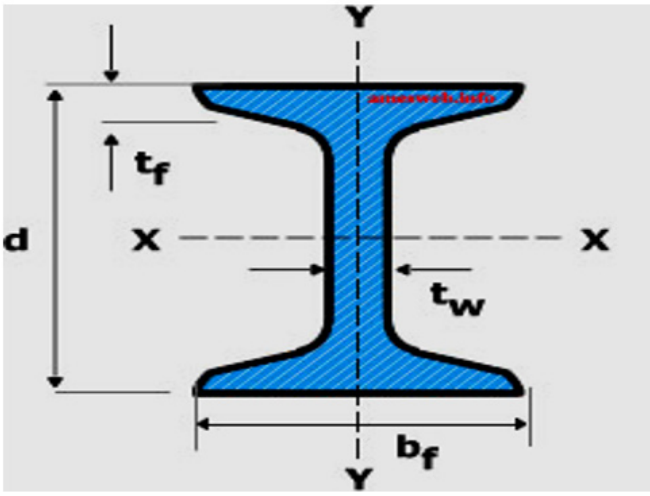
- **According to the Crane Manufacturers Association of America**

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)

Fig. 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.

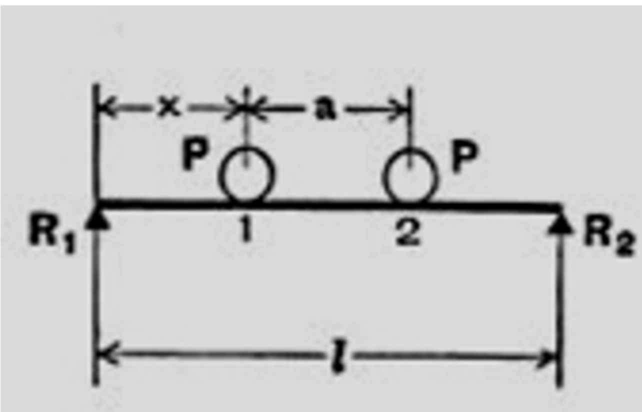
3. Dead load = 2.53KN/m x 6.096m= 15.42 kN
Dead load due to Dead Load Factor = 15.42 x 1.2 = 18.5 kN …….. (3)

4. Inertia forces from drives = 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 MH due to side thrust: MH = 0.041 x 322.65= 13.2 kN-m
Factored moment due to side thrust: MHF = 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.

Fig. 9: Simple beam: two equal concentrated moving loads



R1max = V1max (at x=0) = P (2 – a/l) …….. (5)
Mmax (when a < (2 - √2)) = 0.586l

Under load at x = ½ (1- a/2)) = P/2l (l – a/2)2 …….. (6)
Mmax (when a > (2 - √2))= 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
$R1_{max}$ = $V1_{max}$ = 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 Cf =139.3 kN
- Maximum factored moment x-axis Mfx =139.3x2.99 = 417 kN-m
- For the free standing jib crane, try the column H_S 406 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

$$\frac{C_f}{C_r} + \frac{(U1_x * M_{fx})}{M_{rx}} + \frac{(U1_y * M_{fy})}{M_{ry}} \le 1.0$$

1. Cross-sectional strength
From (Hoda-Emami) Comparison of Member Design between Canadian Standards Association (CSA) and LRFD PAGE NO 13-19.
$C_r = C_{rx}$ = 298 * 5700 = 4679kN (for uni-axial strong-axis bending),
$U1_x$ = 1.003
Accordingly, 139.3/4679 + (1.003*417) / 621 =0.03 + 0.675 = <u>0.705 < 1.0</u>, It is OK.

2. Lateral- Tensional 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 = <u>0.701 < 1.0</u>, It is OK.

1.9 Material properties

1.9.1 Structural steel

- Density: 7.85 X 10^{-6} Kg/mm
- Young's modulus: 2 x 10^{5} Mpa
- Passions ratio: 0.3

1.9.2 ASME A36 Steel

- Density: 7.80 X 10^{-6} Kg/mm
- Axial compressive resistance $C_r = C_{ro} = 621$ kN.
- Young's modulus: 2 x10^{11} Mpa
- Passions ratio: 0.32

Uniformly distributed load per unit of length nearest left reaction $\omega_{1x} = 1.0$
$KL_x/r_x = 1.0(3658/139) = 26.3$,
C_e/A = 2810 MPa (by interpolation), which is Euler buckling load.
$C_e = 2810*15700\text{mm}^2 = 44117$ 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.

1.9.3 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

Element: Solid 20 Node 186.

2D-Drawings of Jib Crane

Fig. 11: Jib crane final assembly drawing using Pro-e

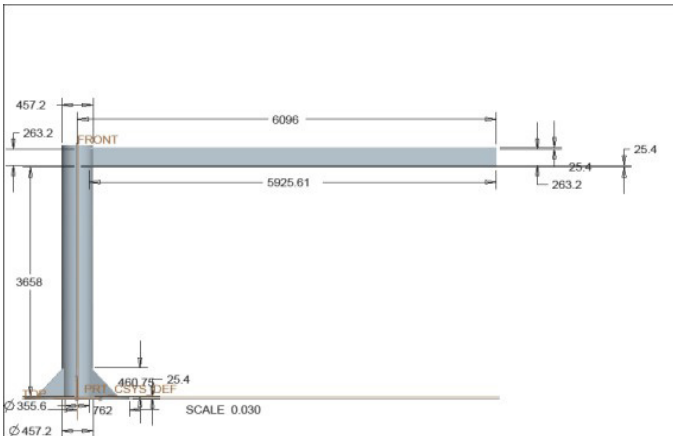
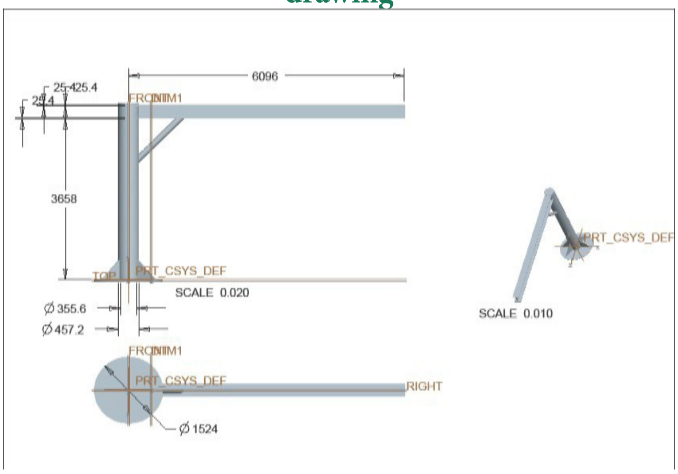


Fig. 12: Reinforced Jib crane final assembly drawing



1.11 3D Modeling in Pro-E/ Creo.

Fig. 13: Jib assembly solid model using Pro-e

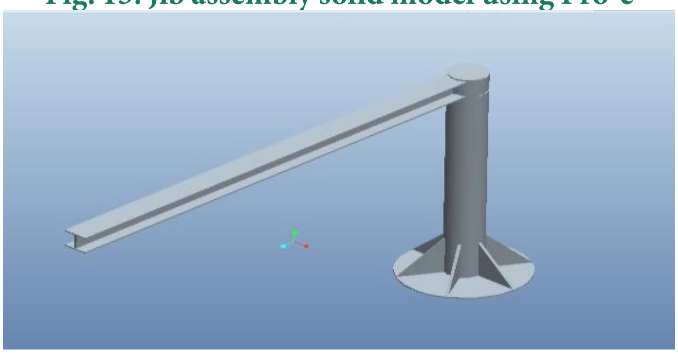
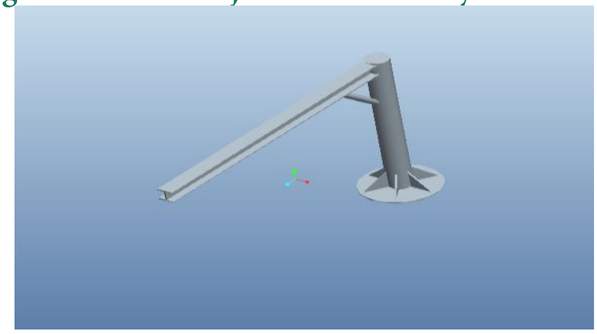


Fig. 14: Reinforced jib crane assembly solid model



1.12 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.

Fig 15: Jib meshed model (Element type: Tetrahedral)

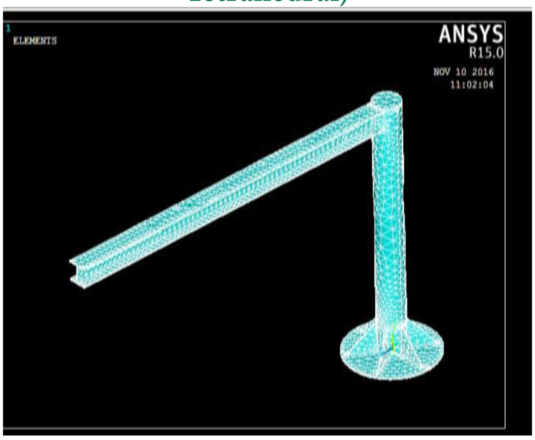
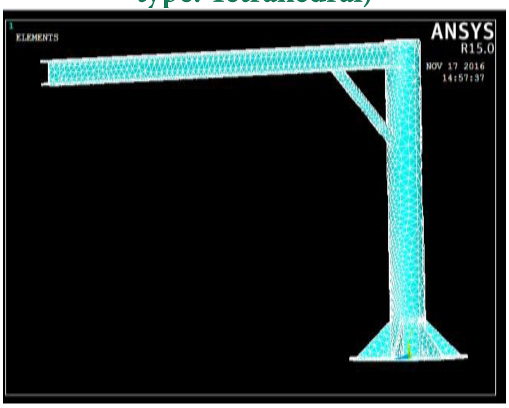


Fig. 16: Reinforced jib meshed model (Element type: Tetrahedral)



LITERATURE REVIEW

The study materials examined in this section offer a deeper understanding of numerous research projects focused on the creation, enhancement, and examination of jib cranes. Every Each study explores different aspects of advancements in jib crane design, such as the use of composite materials, analysis of stress distribution, weight minimization, and ensuring structural strength and stability. The research points out creative strategies such as probabilistic strategies, numerical modeling, and optimization strategies to enhance the performance, safety, and cost-effectiveness of cranes. These research efforts lay the groundwork for the development of a more effective and lighter jib crane design, tackling real-world obstacles as well as theoretical progress in the field of crane engineering. The research on cost optimization of steel structures encourages the use of optimization techniques in structural steel design. Compared to traditional weight optimization techniques, it provides a more realistic approach to modeling designs, resulting in higher cost savings. This study offers a thorough assessment approach for examining the design and static-dynamic performance of a particular kind of crane, in this case a jib crane. Although jib cranes are the main application for the approach, other crane types can also use it. The integration of computational methods and CAD technology plays a crucial role in studying these complex structures, enabling accurate design analysis and structural Diagnostics. This study proposes an efficient approach for modeling, calculating, and designing a jib crane structure, aiming at both local and global optimization through CAD tools. The crane structure's static and dynamic behavior analysis yielded very useful data. Additionally, this study presents a novel structural idea for jib cranes, improving both their dynamic and static properties within the same operational area. By altering the geometry to satisfy certain design goals, structural improvements are made In order to analyze crane jibs, the research article "Design and Optimization of Crane Jibs for Forklift Trucks" introduces a new calculation methodology based on the Finite Element Method (FEM).

This technique is applicable to a variety of crane jib types, including telescopic, lattice, and closed beam cranes, and it assesses the crane jibs according to strength and stiffness parameters. The creation of an efficient technique for the design, analysis, and ptimization of crane jibs especially for forklift trucks marks the study's conclusion. Since the UNE-1726 rule was deemed to be less restrictive, the current UNE-58536 standard for mobile cranes was modified to do this. For precise analysis and design, the process entails identifying crucial elements including load instances, boundary conditions, applied loads, material parameters, and welding models. Standardization of Jib Crane Design by "F.E.M. Rules" and Parametric Modeling Sandip D. Shinde's 2009 paper emphasizes the importance of standardizing jib crane design procedures to facilitate the development of automated design modules. By creating a comprehensive component tree and defining independent design modules for each crane component, the study integrates computational methods and the widely adopted "F.E.M. Rules." This systematic approach enables automated access to these rules within any design procedure through parametric modeling. The resulting parametric model offers versatility, allowing for application across various jib crane design scenarios and serving as a foundation for further optimization efforts.

Subhash N. Khetre et al. (2014): carried out a study emphasizing the design and static analysis of an I-section boom specifically developed for a rotary jib crane utilized in material handling operations. The research evaluates key parameters such as yield strength and deflection of the I-section through static stress and displacement analyses. Addressing the challenges associated with moving heavy loads, the study designs, analyzes, and develops the jib crane system, highlighting the importance of selecting appropriate materials and structural configurations to ensure safety and efficiency in load-bearing applications.

(Amreeta R. K et al., 2015): Amreeta R. K and her team, in their 2015 research, aim to enhance the reliability of single girder wall-mounted jib cranes, which typically require biannual maintenance. By analyzing various beam sections (MB150, MB125, MB100, and 140×80 rectangular sections) using both analytical methods and finite element analysis (FEA) with ANSYS 14.5, they determine that the MB150 I-section beam is optimal for a working load of 1000 kg. The study finds that this beam section exhibits minimal deformation and stress, making it suitable for harsh Environments and contributing to an extended operational lifespan with reduced maintenance needs.

(K Suresh Bollimpelli et al., 2015): In 2015, K. Suresh Bollimpelli and his team conducted static, modal, and harmonic analyses of a 1.5-ton capacity column-mounted jib crane using ANSYS software. The crane was modeled in CATIA and then imported into ANSYS for detailed

RESULT ANALYSIS:

The result analysis of various literature reviews on Jib crane design, CAD modeling, FEA analysis, construction procedures, material, and cost optimization reveals several critical findings: 1. Jib Crane Design: Studies highlight the importance of optimizing the crane's structural configuration for load-bearing efficiency, ensuring stability under dynamic and static loads. Design considerations focus on boom length, pivot points, and counterweights to enhance operational performance.

Stress Analysis:

1. This focuses on determining the distribution of stresses within the crane's components (jib arm, column, base, etc.).
2. Bending Moment, Bending stress analysis, is often used to assess whether the material is within its yield strength, ensuring the crane's structural integrity.
3. Analysis The objective is to locate regions with elevated stress levels, as these areas are more susceptible to potential failure.
4. Deflection Analysis:
1. This evaluates the amount of deformation (bending, displacement) that occurs under load.
2. Excessive deflection can affect the crane's functionality and accuracy.
3. Limits are set to ensure the crane operates within acceptable tolerances.
5. Stability Analysis:
1. This assesses the crane's resistance to overturning or buckling.
2. Factors like the base design, column stiffness, and load distribution are crucial.
3. Especially important for free-standing jib cranes.

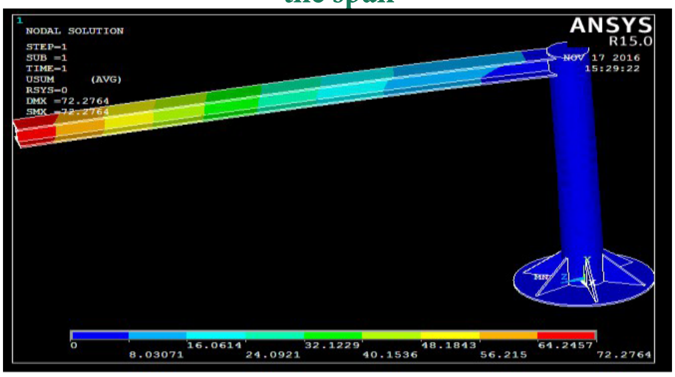
6. Modal Analysis:
1. This determines the crane's natural frequencies and mode shapes.
2. This is important to avoid resonance, which can amplify vibrations and lead to structural damage.
3. Ensuring the natural frequencies are sufficiently separated from operating frequencies is vital.
7. CAD Modeling: Literature emphasizes the role of Computer-Aided Design (CAD) in improving precision, reducing design errors, and allowing for virtual prototyping before manufacturing. CAD models enable stress analysis, motion simulation, and collision detection, improving overall design efficiency.

2. RESULTS AND DISCUSSION

2.1 Jib crane load at end of the span

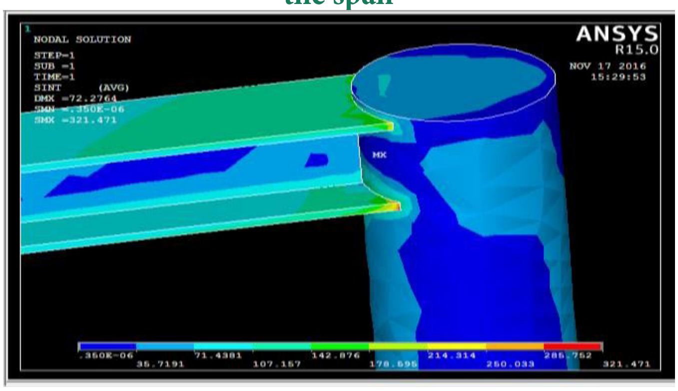
A. Structural Steel

Fig. 17: Deformation of structural steel at end of the span



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

Fig. 18: Stress intensity of Structural steel at end of the span

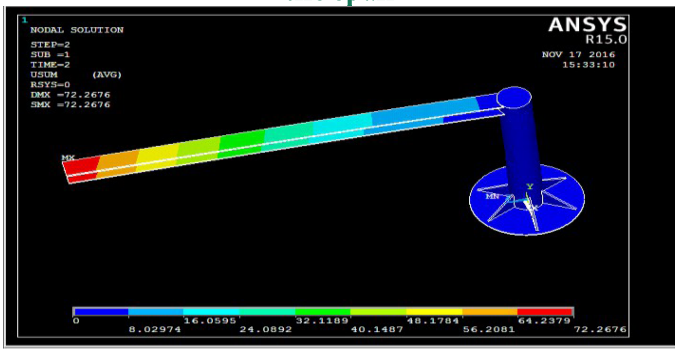


The figure 18 represents the jib crane at end of the span of Stress intensity occurs at 321.47 N/ mm^2 in structural steel

A. ASME A36 Steel

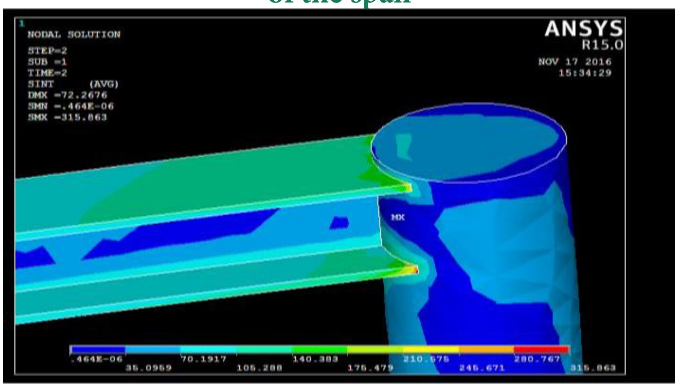
The figure 19 represents the jib crane at end of the span of deformation occurs at 72.26mm in ASME A36 steel

Fig. 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

Fig. 20: Stress intensity of ASME A36 steel at end of the span



2.2 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

Fig. 21: Deformation of structural steel at end of the span

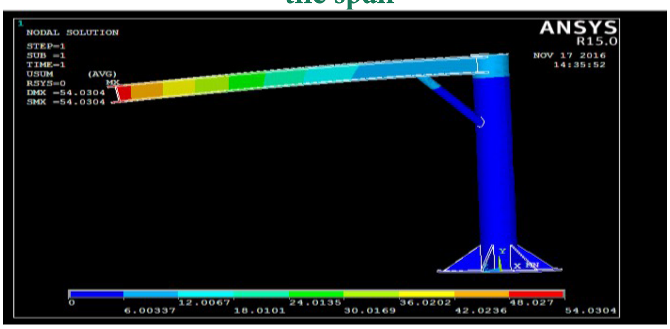
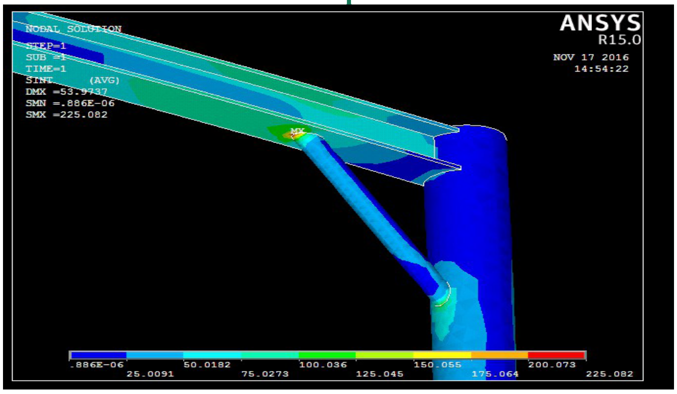


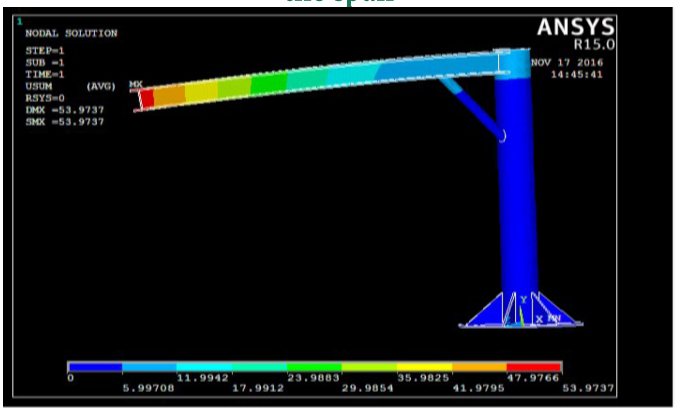
Fig. 22: Stress intensity of structural steel at end of the span



The figure 22 represents the Reinforced jib crane at end of the span of Stress intensity occurs at 225.08N/ mm^2 in structural steel

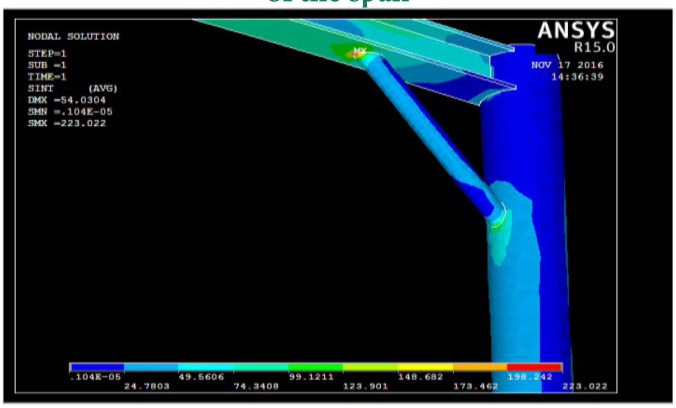
ASME A36 Steel

Fig. 23: Deformation of ASME A36 steel at end of the span



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

Fig. 24: Stress intensity 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/ mm^2 in ASME A36 steel

2.3 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/mm2)	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/mm2)	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/mm2)	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/mm2)	103.9	103.04

2.4 Deformation analysis

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

Fig. 33: load at end of the span (Units mm)

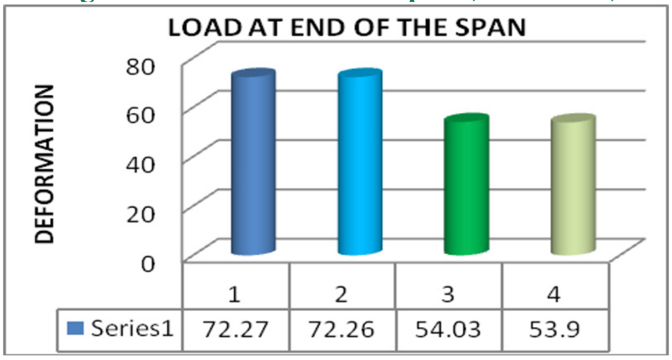
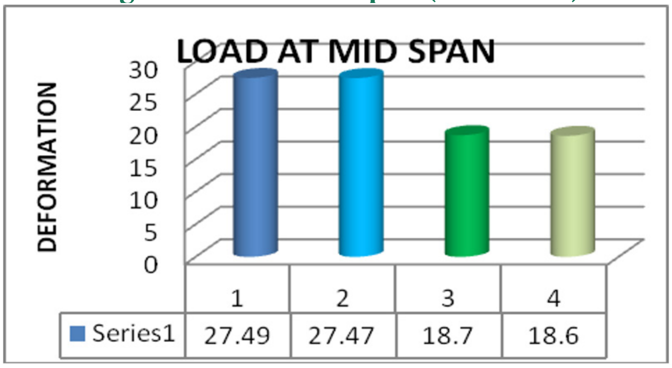


Figure 34 represents the load at mid span of a Deformation Results Analysis.

Fig. 34: load at mid span (Units mm)



2.5 Stress Results Analysis

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

Fig. 35: load at end of the span (Units N/mm²)

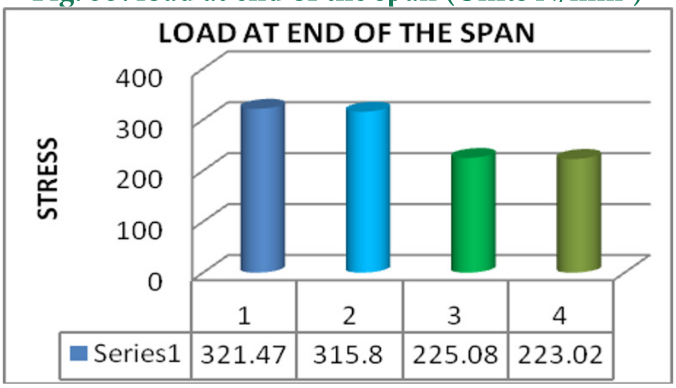
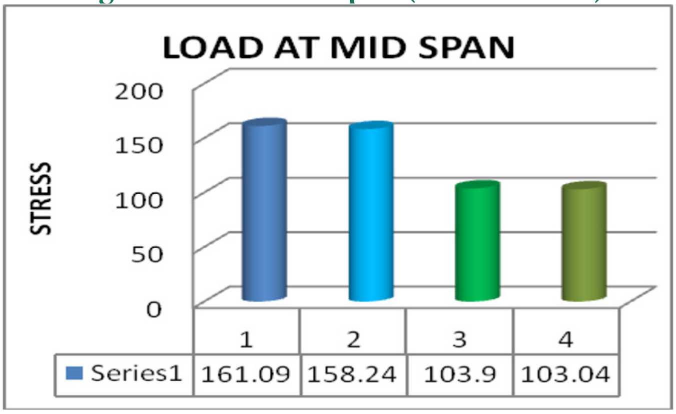


Figure 36 represents the load at mid span of Stress Results Analysis.

Fig. 36: load at mid span (Units N/mm²)



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.

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