Scientific Journal of Impact Factor (SJIF): 4.72
e-ISSN (O): 2348-4470
p-ISSN (P): 2348-6406

International Journal of Advance Engineering and Research Development

Volume 4, Issue 9, September -2017

Obtained Different Solutions To Prevent Damege Of Hoisting Equipments In Manufecturing Industry By Fresh Review

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Abstract: *Cranes play important role in heavy industries. It is important to design and install a crane properly for safety of persons and other equipment s in industry. Continuous use of crane hooks and hoisting equipment s increases the magnitude of wear and stresses and eventually results in failure of the hook and crane. It may be prevented if the stress concentration areas are well predicted and some design modification is made to reduce the stresses in these areas. Thus the aim of this work is obtained different solutions fordesigning a crane and hook. different solutions are suggested based on technical analysis are in following review papers.*

Review of Literature

[1] Dhaval H. Kanjariya

In this review paper, about various parts of hoisting mechanism are described. In EOT crane, there are different components used to perform function. Generally, there is one rope drum, gearbox and motor used in hoisting mechanism. Single drive mechanism is used for lifting purpose & displacement of an objects. EOT crane involved failure of components & mechanism so it cannot perform function and it may damage an object.

[2] A. K. Paul, M. Gangadaran, *S* . Mazumder and N. Neogi

This paper focuses on application of variable voltage variable frequency drive in crane application. Conventional AC operated EOT crane uses slip ring induction motor whose rotor windings are connected to power resistance. Speed control is done by changing rotor resistance in 3 to 4 steps by power contactors. Reversing is done by changing the phase sequence of the stator supply through line contactors. Braking is achieved by plugging operation. A crane control system has been developed using Variable Voltage Variable Frequency drive and a programmable controller which has an advantage of continuous speed control and reversing is achieved by changing phase sequence through inverter. The main advantages are precise positioning, energy saving and increased motor life.

[3] Rabindra Nath Sen and Subir Das

Ergonomics studieswere carried out on the machine control and the resultant movements of the cabins and the hooks in 51 electric overhead travelling cranes in a heavy engineering factory, showed that control-movement compatibility is absent in most of the cranes. The layout of the groups of controls and the orientations of each of the individual controls with respect to the operators' seats varied from one crane to another. As the operators were shifted from one crane to another every week, there was a high chance of making mistakes during moving the controls, which might have resulted in severe accidents, especially during periods of high workload. A number of low-cost ergonomics solutions have been recommended to minimize these problems.

[4] Y. Torres, J.M. Gallardo , J. Domínguez and F.J. Jiménez E

The objective of this work was to identify the causes that led to a failure of the crane hook in service. The study of the accident included : (1) a summary and analysis of the peculiarities inherent to the standards that determine the manufacture and use of this type of device, (2) metallographic, chemical and fractographic analyses, (3) assessment of the steel mechanical behaviour in terms of Vickers hardness profile, its tensile strength and fracture energy, and (4) simulation of the thermal history of the hook. The visual and micro structural inspections reveal some evidences that a weld bed was deposited on the hook surface. Several cracks grew from that area into the material. Fracture surface shows features typical of brittle failures). The unalloyed, low-carbon steel contains a relatively low aluminium (<0.025%) and high non-combined nitrogen (>0.0075%) content. All the gathered evidences are in agreement with a strain-aging process triggering the embrittlement of the material, with the fracture starting from a crack generated at the heat affected zone of an uncontrolled welding of the hook. The results strongly suggests that the accident was caused by the strain-aging embrittlement of the used steel and that the brittle fracture originated from a crack in the material, generated during the welding performed on the lifting hook.

[5] Shyam Lal Sharma, Dr.Tasmeem Ahmad Khan, Md. Parvez and Kamlesh Kumari

In the designed hoist model trapezoidal section show less stress. The modified section should show less stress but due to reduction in area it shows more Stress. Using more no. of rope falls divide the load and make the tension less. Also it makes the work faster. E.g if we use 4 rope falls then using the same force 4 times work is done. But increase in rope fall increase the rope length by that times, which is expensive . Also the rope lengths determine the drum length. Increase in drum length increase the volume of setup to reduce the volume we can double winding of rope on the drum can be adopted Motor power required depends on lifting speed and load applied. The angular speed of drum and the motor are different so a gear box is used for power transmission.

[6] Pradyumna keshari maharana

In this project an overall design of the hoisting mechanism of an EOT crane was done. The dimensions of the main components have been determined for a load capacity of 50 ton crane having 8 rope falls . Various dimensions for cross sections of various shapes for crane hook have been found. After the system was designed ,the stress and deflection were calculated at critical points using ANSYS and optimized. Declensions for rope - drum , wire-rope motor and brake specifications were finalized using standard procedure.

[7] yogi rawal

The wheel assembly is an integral part of Electric Overhead Travelling Crane systems that are intended to move in a guided path. There is research gap of optimization of track wheel.Optimization techniques carried out for track wheel to find out the optimum material distribution. Based on these optimization outputs, new practical designs were generated and FE analysis was carried out for the optimized design to verify the stress induced on track wheel. It was compared with original design. A solver mode in analysis software calculates the stresses, deflections, bending moments. The finite element method as well as optimization techniques were included as basis of mathematical simulation. With these tools, optimization of track wheel carried out.

[8] P. Sai Samanth, Sreekanth Dondapati and V.G. Sridhar

This particular project was about design and prototyping of modified remote control unit in EOT crane which will include a precise operation level and also a failsafe mechanism. This is proposed to be achieved with a proper data transmission reception and conditioning techniques. The speed control of induction motor is controlled by a technique of Variable Voltage Variable Frequency Source. From above discussion following results are obtained The project has successfully achieved the system of speedcontrol for the EOT crane operation. This was done at anexperimental level to have a compatibility to upgrade the setupwhenever required. The micro controller unit is alsoprogrammed well for the desired task. The variable frequencymethod is successfully implemented. The predefinedpositioning of the crane hoist is also well achieved in operation. As the results are recorded with respect to a motor with a free rotating shaft, they might slightly differ from thatof a mounted shaft. With a better level of hardware and inter face, this application can be taken to an industrial level.

[9] Pratik R Patel1, Bhargav J Patel2, Vipul K Patel3

The work was for optimizing the beam section of crane. It was found that optimum section “700*400”. Following conclusions were made.

1. Weight of the "I" section has been reduced from 26976 Kg. to 24455 Kg whereas the stress is increased from 98.251 N/mm2 to the 117.61 N/mm2 but it is near about the allowable stress limit of the "I" section material. Total weight saving is 9.35% and stress increases by 16.46%.
2. The shear stress is increased from 55.457 N/mm2 to 66.279 N/mm2 but within the allowable limit range. it is increased by 16.32%.
3. The deformation is increased from 9.8844mm to the 12.228mm. Increased by 19.16%.
4. The safety factor is reduced from 0.87734 to the 0.7329. it is reduced by 16.50%.

5. Finally the existing design has a possibility to reduce the weight by 9.35% by increase the performance parameter by 16.50%. But all the performance parameter are is within its allowable limit.

[10] Abhijit Roy, Dr.Anup Kumar Saha

In this paper a Mathematical Model has been developed, to analyze Ladle Crane Dynamics for its economic design. The Model honeycomb includes hoisting and tilting of the ladle.
This paper proposed a simplified formula and the MATLAB software has been utilized for numerical computation and visualization. Based on the analysis of the ladle crane, taking
ladle inertia into consideration and parametric values collected from different ladle cranes of steel plant units which are in good working condition. shows that girder stress increases with the progress of time i.e. with increase of hoisting distance .It is to be noted that the plots clearly represents an over-damped system. the Main and Auxiliary hoist wire ropes undergo a maximum stress of 1.6GPa and 1.32 MPa respectively against a failure limit of 1.96 GPa. The Girder stress peaks at 46.13 MPa which is consistency with that of permissible limit according to design rules. Simulation results represents, little bit transit behaviour in the velocities vs. time graphs of two ropes are subjected to jerk.because at beginning There is further scope of design and development the ladle crane considering swing motion of the ladle in control and can also be considered from graphical analysis methods.

[11] R. KARMAKAR and A. MUKHERJEE

During normal operating conditions, electric overhead travelling (E.O.T.) cranes are subjected to severe dynamic loading. Economical design of such cranes calls for a more realistic study of the dynamic behaviour of crane operation. This paper presents a bond graph simulation of E.O.T. crane dynamics for three critical crane operations namely, load hoisting, braking during load lowering and carriage motion over three types of rail joints.

[12] R.A.Vikranth kumar, M.Harish Babu M.Uthayakumar and K.Murugabhoopathy

This paper analyses the MMH hazards during the replacement of jaw bits in Electrically Operated Tong (EOT) crane in Hot Rolling Mill. Ergonomics risk factors were estimated using Rapid Entire Body Assessment t (REBA) tool. Musculaturedisorders problems from movements such as bending, straightening, gripping and twisting are reduced by implementing lift assistance.MMH risks are assessed by MAC tool and Ergonomic risks are assessed by assessment tools like Rapid Entire Body Assessment (REBA). Due to design and development of Lift - assist device physical conditions of employees are improved. These types of improvements not only reduce the job risks but also reduce the requirements of man power and time.

[13]Abhijit Devaraj

They often undergo failure due to stress concentration. Hence a study on stresses induced in them helps us to understand how to prevent failure in material and save our components .The aim of the present work is to design a crane hook of different materials and calculate the von mises stress distribution and total deformation when load is applied at an ambient temperature of 25C. This work gives us an insight on deformation and stress distribution in hooks of different materials, used for lifting in practical scenarios (under normal working conditions).
In ductile fracture, the crack propagates continuously and is more easily detectable and hence preferred over brittle fracture. In brittle fracture, there is sudden propagation of the crack and the hook fails suddenly. This type of fracture is very dangerous as it is difficult to detect.

CONCLUSION

(1) Precise positioning, energy saving and increased motor life can be achieved by using variable voltage variable frequency drive in crane.

(2) Machine control and movement pattern of cabin can be improved by ergonomics study in a crane. Operational safety and cost-effectiveness can be achieved by ergonomics study.

(3) Strain aging process and heat affected zone of an uncontrolled welding are major reasons of hook failure.

(4) Design improvement in crane can be achieved by using a trapezoidal hook section and optimum numbers of rope falls.

(5) ANSYS tools can be used for finalizing various parameters of crane like rope drum dimensions, motor and brake specifications.

(6) FEM and other optimizing techniques can be used for design optimization of track wheel.

(7) Variable voltage variable frequency source techniques can be used effectively for speed control in EOT cranes.

(8) By optimizing beam section in crane equipment weight and cost can be reduced without affecting the equipment safety,

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