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Modeling And Analysis Of Hoist In Workshop In CAE Tool: A Review

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Abstract: Heavy duty tasks in any industry or workshop are managed by several mechanical equipment's like cranes, hoists, lifts etc; it involves loading/unloading of goods, shipping of heavy materials, lifting and dropping heavy equipment's. Heavy duty tasks such as engine removal from vehicle for repairing/rebuilding and restoring, likewise complex operations that involves the movement of heavy engine parts in the workshop from one place to another. The task usually requires time depending on the hoisting device employed. Chain hoist requires more time as it is operated manually by human efforts and has certain limitations, like it is fixed with some constructed beam or tripod on other hand, hydraulic hoist has more capacity to lift heavier engine than chain hoist and electrical hoist. However, Electrical hoist has lifting capacity up to weight of about 200-250Kg but has adequate speed than other lifting devices like chain hoist and hydraulic hoist. In this servey, several design concepts are considered for hoisting/lifting heavy engine assembly more than 250kg and we planned to test the portable lifting hoist by modeling the assembly in Creo Parametric and analyze it in Ansys Workbench with prescribed engineering data and different loading conditions to optimize various failure stages, equivalents stresses and other optimistic findings.

Index Terms **- Engine Hoist, Crain, Hydraulic Lifting Device, Chain Hoist, Electric Hoist, Hoisting Device**

I. INTRODUCTION

The hoisting process has become a very essential system for the transportation of heavy equipment as well as personnel. According to design the hoist consists of several components in which there are winders, ropes hydraulic actuators, chain, grabbing hook, electric motors, structural frame etc. The safety and reliability of the hoist depends on its design, therefore proper and accurate design of a hoist is very important. The engine hoist consists of a solid support system that typically consists of welded or aluminum steel. It includes an expanding beam from the frame that is fitted with chain connections built to link the tool to the engine anchor. It can be used manually, electrically, and pneumatically when raising a certain load from one stage to the other, using the wires, fibers, or wire ropes. The load is connected with a hook to the hoisting unit. The operator can easily lift the heavy load and can drop it wherever needed.

Fig -1: Portable Engine Hoist

It incorporates a cantilever beam that extends from the frame that has chain attachments designed to connect the tool to the anchored point of the engine. Its operation may be achieved manually, electrically or pneumatically and may use chain, fiber or wire rope while lifting a given load from one point to another. The load is anchored to the hoisting device by means of a hook. Some hoist enables the operator to lift engines out of their compartments and maneuvers them into work areas.

In this survey, we found the design of each element assembled with hoist was performed thoroughly. Different types and configurations of hoisting systems were considered and compared regarding their suitability to small scale workshops. The three basic types of hoisting devices commonly used for load lifting applications include:

- Hydraulic Engine Hoist
- Electric Hoist
- Chain Hoist

All three types of hoisting devices have certain merits and demerits with similar task to perform as taking out the vehicle engine for repairs/replace. Engine hoist is important in the sense that the average engine weighs about 400-600lb (182-272Kg), and may be highly cumbersome to achieve if human effort is employed in the removal process. Also, the least safe act in an engine removal process is when it is being lifted outwards from the engine seat having loosed the bolts and nuts, and the engine suddenly experience free fall from a certain height. Studies have shown that manual handling of heavy loads such as the automotive engine or its parts can result in severe health problems such as Musculoskeletal disorders, tremors of the hand, misalignment of slip disc in pelvic region, Lumbar scoliosis etc

II. LITERATURE SURVEY

Sr. No.	Author	Motive of Research	Findings
1	N. Rudenko	To find out Material handling equipment.	It divided into three parts subject to practical designing work.
2	Yuantal Crane	To gives introduction of working principal of Electric overhead travelling crane.	Due to clockwise and counterclockwise direction of drum sliding and hoisting movement done smoothly.
3	Indian Standard Design (807-2006)	To obtained information of design of structural portion for cranes, hoists, specifics permissible stresses.	cranes have been broadly classified into eight categories based on their nature of duty and duration of service per year
4	Indian Standard Code (3177-1999)	To covers the mechanical and electrical drives of the cranes and uniformity of a product or services.	It covers all selection criteria of components in EOT crane such as lifting hooks, shafts, wire rope, rope drum, flanges, sheaves, bearings, gear boxes, couplings, fasteners, motor, etc.
5	Electromech FZE	To invent a new design as Double decked arrangement of trolley mechanism in single failure proof EOT crane.	He developed a single failure proof EOT crane by using two independent rope drums.
6	Laurids Porse	To find rope relieving system as well as different hoisting machinery of single failure proof EOT crane.	Rope should be duel with each system providing separately the load balance on the head and load blocks through configuration of the ropes and rope equalizer. So, load is equally distributed on rope falls.
7	Rajendra parmanik	To discuss about the history of crane, various types of cranes, application, the design of the hoist of EOT crane.	It results into algebraic calculations and a model design of the various parts of EOT crane.
8	Dr. Frank jauch	To discuss about drum in Care, use and maintenance of wire ropes on cranes.	It results two types of drum, one is single layer drum and other is multi-layer drum, both are used based on lifting capacity of an object.
9	Pradyumna keshari maharana	To find out Computer aided analysis and design of hoisting mechanism of an EOT crane.	It concludes that trapezoidal section show less stress. Also calculated rating of motor, brakes used in hoist mechanism. Motor power required depends on lifting speed and load applied.
10	Z. Domazet, F. Lukša, M. Bugarin	To find out failure analysis of shafts such as overhead drive shaft and gearbox shaft fractured as a result of rotational bending fatigue.	Based on this analysis, the actual service life of shaft can be improved from finite to infinite lifetime.
11	Naresh Chauhan, P. M.	To Improve the durability of the EOT crane structure by finite element analysis and optimize	The resulting stresses are well under the permissible stresses

	Bhatt	the hook material for improving its solidity.	limits.

III. Conclusion

Considering the design criteria and constraints for the design of an engine hoisting device, the requirements were met from the preliminary stage and planning through the embodiment design and then the concept design. Proper assessment of the final design of the system was carried out and a good design efficiency was obtained. However, to swap engines heavier than 2KN, operators will require standby electric source and electric motor of higher capacity which is more expensive but faster than hydraulic and chain hoist.

References

[1] N, Rudenko, Material Handling Equipment.
[2] Yuantal crane, “composition and working principles of lifting mechanism”.
[3] Indian standard Design, erection and testing (structural portion) of cranes and hoists code of practice (second revision). IS 807:2006.
[4] Indian standard code of practice for Electric Overhead Travelling cranes and gantry cranes other than steel work cranes (second revision). IS 3177:1999.
[5] Electromech FZE, “single failure proof EOT crane”.
[6] Laurids Porse, “single failure proof EOT crane for nuclear power plant” U.S. nuclear regulatory commission’s division of Engineering standards Washington , D. C. 20555, may 1979.
[7] Rajendra parmanik “Design of hoisting arrangement of EOT crane” posted on July 26, 2008.
[8] Dr. Frank jauch, “Care, Use & Maintenance of Wire Ropes on Cranes”, Crane Industry Council of Australia (CICA) 2012.
[9] Pradyumnakesharimaharana, “Computer aided analysis and design of hoisting mechanism of an EOT crane”, Mechanical Engineering Thesis 2012.
[10] Z. Domazet, F. Lukša, M. Bugarin, “Failure of two overhead crane shafts”, Engineering Failure Analysis44 2014.
[11] Naresh Chauhan, P. M. Bhatt, “Improving the durability of the EOT crane structure by finite element analysis and optimize the hook material for improving its solidity”, International Conference on Modelling Optimization and computing 2012.
[12] MUNCK_CRANES_INC, http://www.munckcranes.com/overheadcranecomponents.asp
[13] American Society of Mechanical Engineering, “Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)”, December 2005.
[14] Kalpesh R.Salunkhe International Advanced Research Journal in Science, Engineering and Technology Vol. 4, Issue 9, September 2017
[15] Chaitanya Sureddi Design, Material Optimization and Dynamic Analysis on Automobile Wheel Rim Volume 8, Issue 11, November 2018
[16] Aaron Ressa 2013 DEVELOPMENT OF A CARBON FIBER WHEEL RIM
[17] Liangmo Wang Journal of Mechanical Engineering 57(2011)1, 31-39
[18] Sai Yashwanth Kandukuri J. Inst. Eng. India Ser. C (August 2022) 103(4):939–94