iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 8 **Issue:** X **Month of publication:** October 2020

DOI: https://doi.org/10.22214/ijraset.2020.31885

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

A Comparative Study on Automobile Engine Hoist

Herin Lad[1], Jenil Kayastha[2], Hardik Mahyavanshi[3], Dhaval Gupta[4], Jeegar Mistry[5], Dr. K. B. Rathod[6]
[1, 2, 3, 4, 5, 6]*R. N. G. Patel Institute of Technology*

Abstract: ***Engine removal throughout working on the car is one of the most challenging, fascinating, and daunting activities. Although engine removal is a very detailed process that is involved, it is in reality much more normal than one may expect. Some of the more common repairs that include motor removal include replacement of the clutch for some vehicles, reparations of blown head joints, reconstruction of a tired motor, or replacement of rod coats. It takes a couple of tools for pulling your engine out of your car since all auxiliary components such as intake controls and cooling tubs have to be removed to create sufficient space to get the engine out.***
As such, of course, one will need a good socket set and a host of various flathead and Phillips screwdrivers. When it comes to tools, however, the engine hoist is the undisputed core element of the engine removal tool arsenal. Therefore, this review paper concerns about the study of automobile engine hoists.

I. INTRODUCTION

An engine hoist also is known as an engine crane, a cherry hoist or engine lift is a device that can be used for raising or lowering loads via wrapping rope (which is part of a hoisting device) or chain wrapping by means of a drum or lift-wheel. 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 connexons 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 via a hook to the hoisting unit. The operator can raise the motors from his compartments and run them in the workplace [1].
Hydraulic, electrical and chain hoists are the three fundamental types of lift devices widely used for load lifting purposes. Every type of hoist system has its advantages and disadvantages, but they can all be used to achieve a common goal in terms of the repair engine and vice versa.
In the sense that the mean engine weighs about 400-600 lbs, engine hoist is necessary and can be highly burdensome when human effort is engaged in the process of removal [2].
Also, when the engine is pulled outside the engine seat after losing the bolts and nuts, the least safe act in a motor removal process is and suddenly the engine is free to fall at any speed [3].
Studies showed that manual handling of heavy loads such as the car engine and its parts can lead to serious health problems, including musculoskeletal problems, hand tremors, pelvic slip disc misalignment, lumbar scoliosis, etc. studies have shown [4, 5].
Time and safety are nevertheless essential engineering practices, and this time savings for engine swaps and the energy and danger to auto mechanics for complex tasks involving heavy-duty engines and their equipment [6].

II. CLASSIFICATION OF ENGINE HOISTS

There are mainly three types of engine hoists available. Hydraulic engine hoist, Chain engine hoist, and Electric engine hoist. The brief discussion is shown below.

A. Hydraulic Engine Hoist

The most widely used hoist in vehicle repairs and engine lifting is the hydraulic hoist. These hydraulic cylinders operate with these hoists. The hydraulic cylinder uses liquid fluid for lifting jobs.
Regular special oils are this hydraulic fluid often referred to as the hydraulic fluid. In various mechanics, hydraulic systems can be found. For instance, car brakes are one of the most popular hydraulic systems [6]. Cars use a high-speed hydraulic braking system because it is a high speed, precision, power, and reliability. Hydraulic systems for lifting extremely heavy loads are also used in various factory equipment and robots [7].
Hydraulic systems are also available at car service stations. These devices are referred to as automotive hoists. This system or tool has the purpose of lifting a car so that mechanical repairs can be made. Contrary to motor hoists, automatic hoists can be operated, so virtually no manual labor is needed to operate with this method. Car hoists normally include a special remote control that enables the hoist to be controlled [8].

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

Figure 1: Hydraulic hoist

The hydraulic motor hoist is another tool in most car service stations. The engine hoist or engine lifter is responsible for the removal of the engine from the car. With the same idea as other hydraulic systems, a hydraulic engine hoist operates. It has got a hydraulic cylinder in the middle of the hoist, which can lift heavy loads. The engine is attached to the boom and can be lifted in the hydraulic cylinder by increasing pressure. This process is performed by a person who pumps a special winch on the base of the cylinder. This process raises oil pressure into the cylinder and that force can raise the engine hoists boom with a load that is attached to it. The entire lifting process of an engine can take a lot of time, so the hydraulic motor lift is not used as the quickest engine lift method. However, hydraulic engine hoists benefit enormously [9].

There are very heavy loads of hydraulic systems and hydraulic hoists. These machines typically have a maximum lifting capacity of 1 to 4 tonnes and even up to 8 tonnes. This high lifting power allows almost every engine to be lifted out of the vehicle. To lower the load, the man with a hoist must turn on the engine hoist a special bleed valve. This reduces the cylindrical pressure and decreases the boom and burden. The process of lowering is much faster than lifting, so additional caution is required. Hydraulic engine hoist can take up a lot of garage space, so the majority of the current engine lifts are foldable and can be folded to more compact storage dimensions [10].

B. Electric Hoist

The electric hoist may not be so popular with elevators because other objects are to be lifted. In places such as scimills, shops, and different factories these hoists are particularly common. They are also used at car service stations to carry heavier loads and carry them too heavy to carry human beings. Electric hoist will operate completely automatically as opposed to hydraulic hoist or chain hoist. Thus, no manual force is required. In opposite to the hydraulic hoist where the operator has to pump the windscreen to raise the lifts boom or the chain stays, the electrical hoist operator has to control the raise with remote control, when the operator has to lift the lift [11].

Figure 2: Electric Hoist

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

The electric hoists are perfect in areas where loads of less than 500 lb must be lifted since they can be used much more quickly and efficiently as hydraulic elevators. However, they are not that strong with heavier loads. This is also valid for motor lifting. Larger engines are more than 500 lb, making them much more powerful than hydraulic mounts of the same load size. Another downside of the electric hoist is that it has to be installed on a special spot. You can almost anywhere on the ground a hydraulic hoist unless the surface is firm. The electric hoist must be positioned over the ground. This typically means that a roof or special scaffolding is connected to an electric hoist. This is important. Electric hoists cannot be used outside without special scaffolding [12].
The e-hoist will also be static and cannot be moved (no special facilities) so that a repair car is always placed on the same site. The hydraulic hoist may be pushed around the garage or the workshop, so the car must not be placed in a single position every time. Another disadvantage is that an electric power source is required for the operation of an electric hoist. The electric hoist has an electric motor that works with electric power. Hydraulic or chain motor hoists must be operated manually [12, 13].

C. Chain Hoist

Chain hoists are quite similar to electric hoists, but the chain hoists must be operated manually instead of automatically operating with the electric motor. The person operating the hoist must pull the hand chain to raise the load is no remote control. In shops and shopping centers for elevation machining machines, in some workshops and factories for elevating heavy parts, and also in car service stations for elevators, engines, gearboxes, and body parts [14].

Figure 3: Chain hoist

A chain hoist is the simplest of hoists and the mechanism behind this hoist is very easy. A hand chain hoist is made up of a chain with an axle, cog, and sprockets, lift chain, and a lifting mechanism. The hand chain must be pulled to lift a load hoist operator. The pin and smaller sprocket in the lifting process are relocated in this method. The smaller pipe pushes the whole axle, pushing the larger pipe. Smaller pipe going faster and less force to drive this pipe needs to be applied. The larger pipe moves much more slowly, so the load lifting is also extremely slow. In short, a person who works on the hoist draws the hand chain, spinning a smaller pipe linked to the axle. This axis rotates with the lifting chain mounted on a larger sprocket. If the height chain has the load on the hook, then the load is raised slowly when the heightener pulls the hand chain. However, chain hoists can lift very heavy motors rather than the electrically operated hoists or hydraulic hoists [12-14].
The disadvantage of the chain hoist is mentioned above, as with the electric hoist, slow lifting speed, and limited areas, where chain hoist can be installed. Chain hoist should be mounted over the surface, on a ceiling mount, or scaffolds specially made. But unlike electric hoists, electricity or any other supplementary resources are not necessary to work. A chain hoist is a very easy and affordable tool on the plus side. It's much cheaper than a hydraulic holder and much cheaper. The average hydraulic hoist lift capacity of the chain hoist is 2 tonne at a full lift capacity [14].
However, normally after the engine is lifted from the car, the vehicle needs to be relocated away from the car and stocked on an engine stand to make repair work, so you will need an additional installation to move the chain hoist with load from one position to another.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

III. REVIEW OF VARIOUS HOISTS

Some commonly used and most preferred engine hoists are reviewed here.

A. Torin Foldable Engine Hoist

It is almost capable of everything but the biggest with a size of 2 tonnes. It has an additional foldable land. Even for close spacing of the garage, it is compact and storable enough. It also comes with a telescopic boom that can increase the hook over the motor. At the extending stage, which is indeed abundant for most vehicles, lifting ability will gradually fall to 1000 lbs. The lifting range is 1 "to 78/75" and is thus wider than that used to detach SUV motors or vehicles. The six wheels of this cherry picker have great versatility and stability [15].

Figure 4: Torin foldable engine hoist

B. Wimmer Air Hydraulic Shop Crane Foldable Engine Motor Cherry Picker Hoist

It has a quick lift of 2 tonnes. For those with smaller garages, it is conveniently portable and storable. It makes things easier as it folds vertically so that when it is time for wrapping, its footprints are very small. It is fitted with an intelligent hydraulic system that offers users mechanical advantages to lift the hoist 6 times faster than other rotor cranes. It can save a lot of time because it pumps fewer cycles before the final removal of the engine when changing the height of the crane. The heavy-duty engine hoist manages most automakers and truck motors without problems at a size of 2 tonnes with the retracted four positions adjustable booms and 750lbs with fully expanded booms. The low-profile casters with a low minimum height often help for the mechanics [15].

Figure 5: Wimmer Air Hydraulic Shop Crane Foldable Engine Motor Cherry Picker Hoist

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 8 Issue X Oct 2020- Available at www.ijraset.com

C. OTC Folding Floor Crane

It has the capacity of 4000lbs. This lifter is perfect for lifting any average vehicle like a low-cost car, sedan, or truck, with an ideal capacity of two tonnes. The low-profile rollers are suitable for traveling underneath the low-height cars. With a strong range of heights and a telescoping boom, it gives you the flexibility to remove motors, whether a small car likes Honda S200 or a big car like a Cherokee jeep. The construction is exceptionally strong with clean welding and alignment.

Figure 6: OTC Folding Floor Crane

D. Vestal Shop Crane Engine Hoist with Folding Legs

It is compact and mainly designed to elevate engines. With the recovered bloom, this hoist has a capacity of 2000 lbs, which increments to 500 lbs with the increased boom. The telescoping boom also makes it possible to stretch the chain to make it easier without restricting its size, to reach your engine. This is enough for both small and medium-sized car engines. The solid steel building is highly durable. The pin that supports each leg can easily be removed to fold it [15, 16].

Figure 7: Vestal Shop Crane Engine Hoist with Folding Legs

IV. ENGINE HOIST SAFETY

An engine host is very easy to use for simplifying the complex tasks, however, few items must be able to use the tool safely. Some protection measures are discussed below.

A. Using Proper Lifting points while Attaching the Hoist to the Engine

Knowing about the engine can be of great benefit, particularly before attempting to remove the engine to find a bolted bracket with a high eye. Observing the engine more effectively. Collection of some rare, structural bolts with the hoist. They can only thread into the engine block with a diameter of 1/2 "or greater. Monitoring temptation in attempting to connect it to a variety in parts, for example, to any tired panel or array, since these cannot support your motor weight [17].

B. Ensure the Hoist has Enough Capacity to be able to Lift the Engine

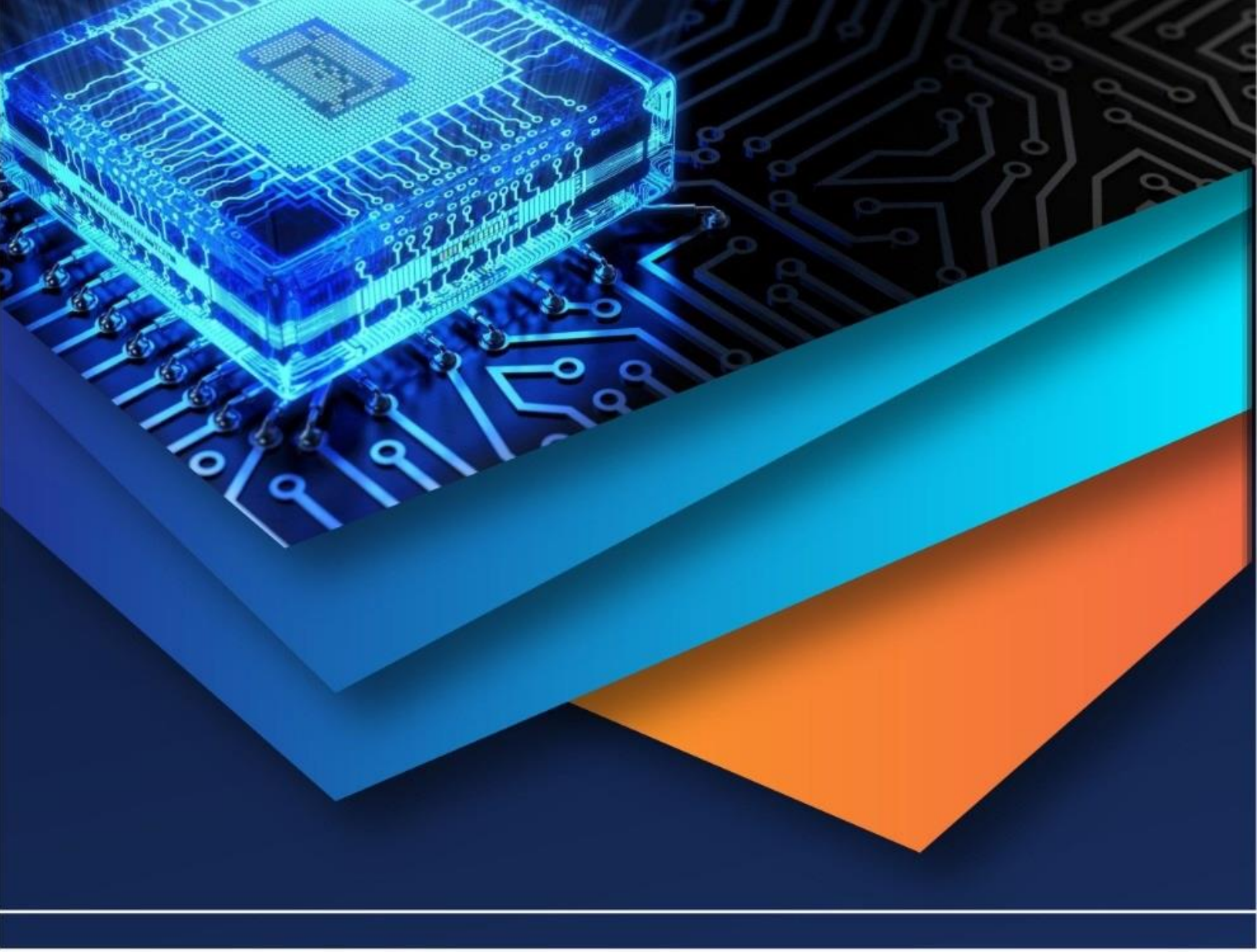
In other words, the engine hoist must have the proper requirements to raise the engine weight. The exact weight of the engine can never be knowns written. Although checking the weight information through internet discussions. It should not be a major question most of the time, because of the ability to do more than the requirement for regular travel vehicles, such as a car or sedan. Also, the information about that should have a high rating to assist the engine with an extra engine lever or chains [17].

V. CONCLUSION

After the comprehensive study of engine hoist, the finding states that engine hoist is one of the most appreciable and needful tools for the automobile user. It saves time along with omitting the wear and tear on human resources as heavy engine lifting is very intimidating and difficult work. They also offer some flexibility in storage options and often can be used to double the effective floor space they cover. Depending on the requirement of engine hoist, any of the electric, hydraulic, or chain type of hoist can be preferred. All of the types of hoist offers the advantage and disadvantage. Selection should be done by studying these engine hoists that are covered in this paper. However, usually, there is a need for lifting or moving the vehicle to install or uninstall the engine. Therefore, the future scope of the engine hoist can be explored in the direction of developing such an engine that omits this requirement.

REFERENCE

[1] SK Adzimah, AS Akinwonmi and B Bentum-Mensah, Improvement in the Design of Engine Crane for Modern Industries, Research Inventory: International Journal of Engineering and Science, 2013, 2 (9), 1-9.
[2] Floorjacked, Buyer's Guide: Choosing the Best Engine Hoist, [online] available at http://floorjacked.com/buyers-guide-choosing-the-best-engine-hoist/, 2017.
[3] B Miller, Different Engine Hoist Types and What They Are Used for Knock Out Engine, [online] available at http://www.knockoutengine.com/different-engine-hoist-types-and-what-they-are-used-for/, 2014.
[4] L Cveticanin, Dynamic Behaviour of the Lifting Crane Mechanism, Mechanism and Machine Theory, 1995, 30 (1), 141-151.
[5] AE Ikpe, I Owunna and P Satope, Design of a PorTable - Carrier System for Transporting Basic House-hold Utilities in Hatchback Family Cars, European Journal of Advances in Engineering and Technology, 2017, 4 (2), 90- 97.
[6] RG Budynas and JK Nisbett Shigleys, Mechanical Engineering Design, Eighth Edition, McGraw-Hill, 2008.
[7] JM Hu, WH Ding and H Deng, Dynamic Modelling and Analysis of Lifting Mechanism for Forging Manipulator, Applied Mechanics and Materials, 2013, 278-280, 633-640.
[8] S Hutcheson, Design and Construction of a Portable - Gantry Hoist, California Polytechnic State University, San Luis Obispo, USA, 2013.
[9] National Aeronautics and Space Administration, Safety Standard for Lifting Devices and Equipment, Office of Safety and Mission Quality Washington, D.C. 20546, NASA-STD-8719.9, NSS/GO-1740.9B, 1991.
[10] V Suresh, and KJ Vijay, Analysis and Design of Machine Elements, IK International Publishing House Pvt Ltd, India, 2010.
[11] BJ Hamrock, SR Schmid and BO Jacobson, Fundamentals of Machine Element, 3rd Edition, CRC Press, 2013.
[12] RS Khurmi, A Textbook on Engineering Mechanics, 20th Revised Edition, S Chand and Company Ltd, New Delhi, India, 2009, 171.
[13] GF Limbrunner, C D'Allaird and L Spiegel, Applied Statics and Strength of Materials, 6th Edition, Pearson, 2015.
[14] PK Yadav, MD Abbas and S Patel, Analysis of Heat Affected Zone of Mild Steel Specimen Developed Due to MIG Welding, International Journal of Mechanical Engineering and Robotic Research, 2014, 3 (3), 399-404.
[15] US Department of Labour Occupational Safety and Health Administration, Ergonomics: The Study of Work, OSHA 3125, 2000.
[16] R Avantika and A Shalini, Back Problems Due to Heavy Backpacks in School Children, IOSR Journal of Humanities and Social Science, 2013, 10 (6), 22-26.
[17] O Ikechukwu and I Aniekan, Design of Automotive Engine Hoisting Device for Mechanical Applications, European Journal of Advances in Engineering and Technology, 2017, 4 (6): 478-487.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY