

# Review of Mechanical Torque Wrench

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**Abstract-** Flat tyre damage problems on heavy vehicles require a long time and use a number of labour. This is caused by loosening lug nut job requires heavy vehicle tyres high torque value. The mechanical torque wrench is designed to reduce the time and labour in the process of changing heavy vehicle tyres. The project is in accordance with various environment, climate & fulfill safety features as well as smoothing the heavy transport-industry. This project is more focusing to facilitate the automotive owner with simple accessories that will give helpful hand when facing situation on truck tyre replacement.

**Keywords-** mechanisation, torque wrench, lug nut, automotive maintenance kit.

## I. INTRODUCTION

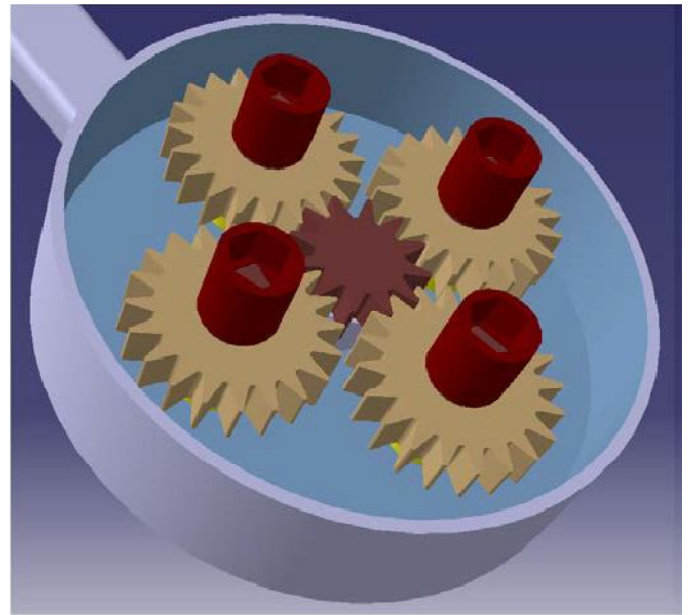
Trucks drive great on roads, but when due to some reason tyre breaks either due to punctured tyre or some other reason requiring the change of tyres, it directly impacts on the transportation time which in turn hampers the income coming out of it. Presently removing lug nuts out of the wheels is quite a headache without any instrument other than manual lever. Although pneumatic and electrical torque wrenches are available but due to its high cost & unavailability of electricity its generally not preferred in India. Torque multipliers only have a fraction of the final torque pressure on the drive tool making them a safer choice. Hand torque multipliers are the ideal tools for applications where air and electricity are not easily accessible. Torque multipliers typically employ an Epicyclic gear train having one or more number of stages. Epicyclic gear systems torque is applied to the sun gear. A number of planet gears are arranged around and engaged with this sun gear, and therefore rotate inside the ring gear. Output shaft connected with the planet gear of first stage which is the input of second stage to connected with the sun gear. Without the reaction arm to prevent rotation of the outer casing, the output shaft cannot produce torque.

## II. LITERATURE REVIEW

### [1] Mohd Azman, Nurfarahin Sulaiman

As the standard of living has increased, most of the families have at least one vehicle, typically, car, to move easily and quickly. With the increment of the number of cars

in the road, the number of cars' problem due to tyre failure has increased. Often, the car is provided with tyre wheel nuts remover and jack for instance spare tyre replacement. Nevertheless, due to the difficulty in applying the required torque to remove the nuts, most of the time, driver rely on the



tow truck and available nearest mechanic to solve the problem. This always happen to the elderly or female drivers. Based on the capability of torque application by these drivers, a vehicle all-wheel-nuts remover is designed. The remover is designed to be ergonomic to be used, easy maintenance, easy storage, easy to handle and able to remove all nuts at once.

### [2] M. F. Abd Rahim

With the improved volume of cars on road each day, it shows that that kind of transportation has becoming crucial. With a statistic like that, then the idea to improve the lug wrench comes about. The new design of lug wrench has to be easy in usage, ergonomics, and can solve the common problems for the available lug wrench in the market. The design has to be compact, so it will answer the problem from the mostly nowadays lug wrench that is very space saver. Lug wrench which is used to loosen or tighten the lug nuts on car's rim is compulsory for every car's owner in case of emergency. For that, some research and findings has to be done about lug wrench and the cars rim composition. Most of car owner has

facing their main problem on lug nuts that are too tight to be loosened. So, with a 3:1 ratio on its input/output rotation, it will at least reduce the torque three times less theoretically. The epicyclic gearing used is suitable in having such a compact design. The prototype built will be used in trial to show its compatibility in all sizes of cars rim.

### [3] A. R. Abd Aziz

Car maintenance is of the major factor in keeping the life span of the car. Therefore, car manufacturers will equip the wheel nuts removing tools and a car jack for tire replacement in emergency case. The wheel nuts remover is design to help the users during the removal or loosen of the wheel nuts before tire replacement activity. The existing wheel nuts remover has been designed to remove all the four nuts together at a time. But, it is too heavy and the weight has reached up to 9.5 kg which is not convenience for the users to remove to wheel nuts. Therefore, a research has been done on the improvements of the existing wheel nuts remover in terms of the design, material used and also the weight of the wheel nuts remover. During the studies, 100 PCD wheel nuts size has been identified to be the most popular types of wheel nuts used by Malaysian's car. In this research, the wheel nuts remover has been designed by using the commercial CAD software with the 100 PCD wheel nuts size as reference. Life cycle analysis has also been done in this research to quantitatively assess the environmental impact of a product throughout its entire lifecycle.

### [4] Ahmad Farudzi Bin Azib Shamsuddin Bin Abdullah Mohd Sobri Bin Hussien



This Relationship the extension hydraulic wheel wrench with modern or common using in loosening and

tightening is very close. Usually force and torque require for loosening and tightening the nut and screw. For lug nut many wrench can doing the loosening and tightening using man power to produce the force or power tool be related fluid power. Fluid power as air and fluid or electrical energy to produce torque energy. Lug wrench or a socket wrench used to turn lug nuts on automobile wheels. For lug wrench or wheel wrench heavy vehicle different light vehicle as strength, material and size socket. Furthermore, the lug nut for heavy vehicle extremely built tough because "torque value" (torque is the twisting force applied to a threaded component such a bolt or nut) for lug nut around 450Nm to 600Nm. Generally, human power cannot produce against the torque value lug nut heavy vehicle. Excluding lug wrench connection with long hollow pipe and more than one human power. These process harm or weary to human and taken a time.

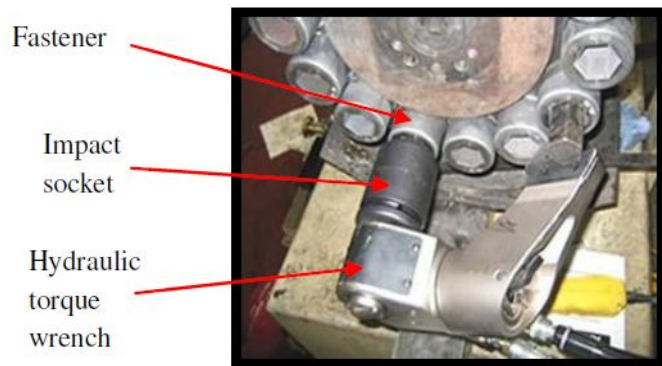
### [5] M.Mukhtar, M H.P. Hilmie Hussainie, C.I. Muhd Fathil, S. Na'ain, S. Zainal Ariffin



The project objective is to assist and helped individual in replacing the car tyre by inventing a new wheel nut puller that can loosen four nut simultaneously, power up by car battery. In this study, it will carry out designing new improvement and fabrication to the wheel nut impact wrench into to 4 in 1-wheel nut impact wrench. This tool is expected can reduce time used to dismantle wheel nut during the car tyre replacement process. The process will be included the design, machining and assembly process. The other processes which include electrical wiring or mechanical analysis of the part were not discussed. The objective of the project is to produce 4 in 1 motorised tyre nut puller for car with PCD 100mm with assistance of CADs, CAM, CNC and Rapid prototyping concurrently to reduce time in part assembly and

achieved optimum time in finish product. This product is expected to give a benefit to car owners in overcome the problem with difficulty to replace the tyres manually with consumption of lot of energy and time.

[6] Vinay L. Jiwode, Laukik P. Raut



A hydraulic torque wrench is a tool designed to exert a torque on a fastener to achieve proper tightening or loosening of a connection through the use of hydraulics. A torque wrench is applied to the fastener either directly or in conjunction with an impact socket. Hydraulic torque wrenches apply control amount of torque to a properly lubricated fastener through impact socket. The purpose of impact sockets is to withstand the force applied by impact tools. Impact sockets are used in conjunction with either hand ratchet or impact tool. Impact sockets are interchangeable tools that can allow a single wrench, impact driver or breaker bar to work with a large number of fastener sizes. Problem identified in operational condition of hydraulic torque wrench TWS-100 is used to exert a torque on a fastener to achieve proper tightening in conjunction with impact socket. Male hex end of socket having across flat diameter 35.9 mm is used for tightening of M48 bolts. After tightening of 25 to 30 bolts the play occurs between the male hex of socket and screw head, which progresses and sharp corner at male hex of socket get wear out. Failure initiates at the corner of male hex of impact socket.

### III. OVERVIEW

Torque multipliers are most often used when a compressed air powered impact wrench is unavailable due to remote locations without power, or where cost considerations require manually operated tools which do not require any power supply or power source of any kind There are many instances where screws, bolts and other fasteners are secured so tightly that using a typical lug wrench is not sufficient to loosen them. These include automotive repair, product

assembly, construction projects, heavy equipment maintenance and other instances where high torque output is needed.

A torque multiplier allows the user to generate high torque output without the use of an air compressor or impact gun. A torque multiplier is generally used when there are space limitations that disallow the use of long handles. They are also used as a safer alternative to a cheater bar as lever length and operator effort are both reduced. Finally, torque multipliers allow for more accurate torque. By reducing the amount of effort needed to tighten, a torque multiplier allows for slow and smooth application, ensuring more accurate torque levels.

### IV. PROBLEM IDENTIFICATION

Generally, in India the truck drivers travel with their truck almost across India and when there tyre goes flat. They have to struggle to open the lug nut of the wheel because lug nut of heavy commercial vehicles requires their lug nuts to be tighten on a very high torque. In the above case when the driver has to open its lug nuts on its wheels, most of the time either he will have to call for some help from the nearby garage or will have to struggle to open the lug nuts manually because of the unavailability of proper tools.

### V. ADVANTAGES OF MECHANICAL TORQUE WRENCH

- Hand torque multipliers are the ideal tools for applications where air and electricity are not easily accessible.
- It requires less effort due to Mechanical Torque Wrench
- It requires less time for opening lug nut of the wheel.
- This tool avoids accidental chance.
- It will be hand operated and easy to handle.
- It reduces number of labour to opening a lug nut.

### VI. CONCLUSION

The mechanical torque wrench to reduce manpower and saving time to loosening wheel lug nut heavy vehicle with hydraulic jack bottle and breaker bar when the heavy vehicle breakdown case because flat tire problem. Hopefully, this project was able to generate a product that can be used as truck basic accessory that compulsory included when you buy a new truck.

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