

# Design and Fabrication of Low Energy Motorized Hydraulic jack

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## ABSTRACT

With the advancement in the engineering technologies, almost every operation is being automated to perform operations efficiently, effectively and quickly. Keeping this concept in my mind I developed a mechanism to operate the Hydraulic jack electronically using DC motor and battery. Electronic jacks which are already available in market works on Lead Screw mechanism which has certain limitations and disadvantages. The jack which I have developed consumes less power and provides more mechanical advantage as compared to currently available electronic jack.

**Keywords:** - DC motor, Electronic jack, Hydraulic jack, Lead screw,

## 1. Introduction :

According to the current situation, scarcity of LABOUR, SALARY, and for automatic operation elimination of labor work is necessary for the future days. In current situation, car tyre is removed for repair work, a jack is must and it is operated manually and not so easy to handle. Thus to tackle both situation which is mentioned above [1]. So we selected "MOTORIZED HYDRAULIC JACK". Operation of MOTORIZED HYDRAULIC JACK is described; it consists of a DC motor. The electric power is used to run the motor by integrating 12 Volt DC (direct current) supply. One end of jack lever is connected to DC motor output shaft through the crank wheel. The DC power is equipped to the motor from the vehicle battery. From the analysis of problem mechanism is shown through project in the market, dual advantage is obtained - one is the easy operation and second is usage of manual work is avoided.

## 2. Literature Review :

Mohammed Siddique Ahmed, et.al (2014) - A jack is a device that uses force to carry significant load. The primary mechanism with that force is applied varies, depending on the specific type of jack, but is typically a screw thread or a hydraulic cylinder. Categorization of jack is based on the type of force they employ: mechanical or hydraulic. Mechanical jacks, for example car jacks and house jacks, lift weighty equipment and are rated based on lifting capacity (for instance, the number of tons they can lift) [2]. B. McGhee (1986) - provides an outline of the Adaptive Suspension Vehicle. The vehicle uses a legged, instead of a wheeled or tracked, locomotion principle, and is planned to demonstrate the feasibility of systems of this type for transportation in very rough terrain conditions. The vehicle is presently under test, with installation and validation of software system modules for different operational conditions regular for completion by the end of 1986 [3]. N.K. Mandavgade (2012) - studied that Automobile hydraulic jack often simply be operated by a one push button provided on the dash board. The jack will be installed on either sides of chassis according to the weight distributions of the car. The system operates on hydraulic drive which consists of three main parts: hydraulic pump, driven by an electric motor, hydraulic cylinder to raise the vehicle. The car gets lifted and load gets distributed on three point i.e., plunger or ram of hydraulic cylinder and two tires opposite to side which is lifted [4]. Dr. Ramachandra, C G et.al (2013) - research have conferred that whenever any vehicles undergo a tyre failure, it becomes a really cumbersome task for the person to raise the vehicle from the foundation level and lot of manual effort is required even though a jack is used [5]. Musa Nicholas et.al (2016) - studies have shown that in order to mitigate the problems associated with the use of a single jack and other lifting devices to raise cars completely off the ground to effect repairs, analyzes the modification of the existing motor screw jack by incorporating an electric motor in the screw in order to make load lifting easier. Modification of design, power screw is rotated by connected in prime mover through universal

coupling, plugged to the automobile 12 V battery source to generate power for the prime mover (motor), which transmits its rotating speed to the power screw to be rotated with required speed reduction and increased torque to drive the power screw [6]. Blaise Pascal (2013) researched have concludes on the basis principle of hydraulic power and 12 Volt DC current supplied, to solves the all major dilemma on maintenance of all automobiles specially the heavy vehicles like truck and bus [7].

### 3. Principle of operation and Working :

#### 3.1 Principle :

The complete mechanism works on the principle of kinematic linkage which is used to convert the rotating motion of the shaft of the motor to the reciprocating motion of the Ram of the hydraulic jack.

This mechanism consists of the following links:

- 3.1.1 Crank wheel,
- 3.1.2 Connecting Rod with slotted link attached to the crank wheel,
- 3.1.3 Holding rod on the Crank wheel to support motion to the connecting rod,
- 3.1.4 Ram of Hydraulic Jack ,

Rotary motion of the Crank wheel is converted into the oscillating motion of the connecting rod, then this oscillating motion is converted into the reciprocating motion of the Ram of the hydraulic jack.

#### 3.2 Description of Components:

The complete model consists of the followings components;



Figure 1 Base plate, Crank wheel, Connecting rod



Figure 2 DC (direct current) motor



Figure 3 Holding



Figure 4 Hydraulic jack



Figure 5 Extension rods for pressure release

#### 4. METHODOLOGY

Preliminary survey to determine which type of car jack is preferred.

Determining the number of components which are going to be bought and which are going to be manufactured.

4.1. Application of SOLIDWORK software for providing a detailed 2D and 3D drawings, material selection and simulation for the car jack.

4.2. Manufacturing all needed components at the workshop.

4.3. Testing the project so as to check it.

##### 4.4. Restrictions

4.4.1. Financial support to buy motors,

4.4.2. Financial support to manufacture the different parts and

4.4.3. Difficulty of designing the electrical circuits.

##### 4.5. The obtained results are

- Designed and manufactured an electrical car jack with the least amount of components at the least cost
- Designed and manufactured an electrical car jack that works in efficient way.

#### 5. CONCLUSION

The objective of this project was to Design and manufacture an electrical car jack works through the cigarette lighter receptacle power output with a button system to raise and lower the car height level.

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