Design and Fabrication of Self Weighing Truck with Free Rotation

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Abstract— The purpose of this project titled DESIGN AND FABRICATION OF SELF WEIGHING TRUCK WITH FREE ROTATION is to minimize the paper work and to reduce the time consumption at weighing bridge to make transportation more convenient in country like India.

Index Terms— Self Weighing, Truck, Free Rotation, Weighing Bridge, Trailer, Transport

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1 INTRODUCTION

The transport system is the backbone of Indian economy India individual directly or indirectly depends in commercial vehicles. In day today life commercial vehicles has to go through may obstacles like Police checkpoints, paper works, long waiting time at weighing bridges, many transporters do overloading for more profits which ends up at accidents, poor road quality, fatigue to drivers and reduction of vehicle life. Our project will help in reducing all this problem to transport companies, to roads and it will also reduce the rate of accident as well as the condition of roads. To achieve this goal high level of automation is required. Automation can be achieved through computers, hydraulics, pneumatics, robotics, electronics etc., of these sources, pneumatics is for low cost automation. Automation plays an important role in automobile. Vehicle manufacturers and suppliers of (on- board) weighing systems want to make money by providing their customers with highly functional, productivity enhancing and distinctive products.

In current scenario there is a lot of difficulties when coming to loading and unloading of goods. Certain ways currently used in a truck are as follows.Tractor-trailer truck is the combination of a tractor unit and one, or more, semi-trailers to carry freight.It is variously known as a transport truck, semi-trailer truck, tractor- trailer truck, se-tractor truck, semi-truck, trailer truck, tractor truck transfer truck, articulated truck, artic,single truck, semi tractor-trailer, semi-trailer, tractortrailer, semi-tractor, semi, trailer, tractor, big rig, eighteen- wheeler and articulated lorry, depending on country. Cost analysis of transporting forest chips and forest industry by products with large trucks by Juha Laitilaa Antti Asikainena Tapio Ratan,2016.

1.1Problem Identification

At the current scenario, the truck has to be passed through the weigh bridge for the load estimation and this uses time, which also increases the cost, thereby reducing the efficiency. Areas which are highly populated might also need to have a que for the weigh bridge.

Certain loads such as sand, cement, vegetables which are being transported in remote areas where roads are narrow, the truck or the tractor faces lot of difficulties in unloading in certain directions. So for unloading the goods, the vehicle has to be kept in a particular direction only. This may lead to damage of vehicle due to terrains and also loss of time minimize these loses and hence improve efficiency

2. METHODOLOGY

The weighing of the vehicle are done manually at weighing bridge which consume lots of time, affects productivity and increase the risk of accident and when it comes to unload the goods the vehicle need to turn which is it self a heavy task to trun so heavy vehicle.

This project attempts in making a self weighing truck having free rotation. The cost of the project is less which make it affordable and time saving in terms of conventional method. The fig below 1 explain the process

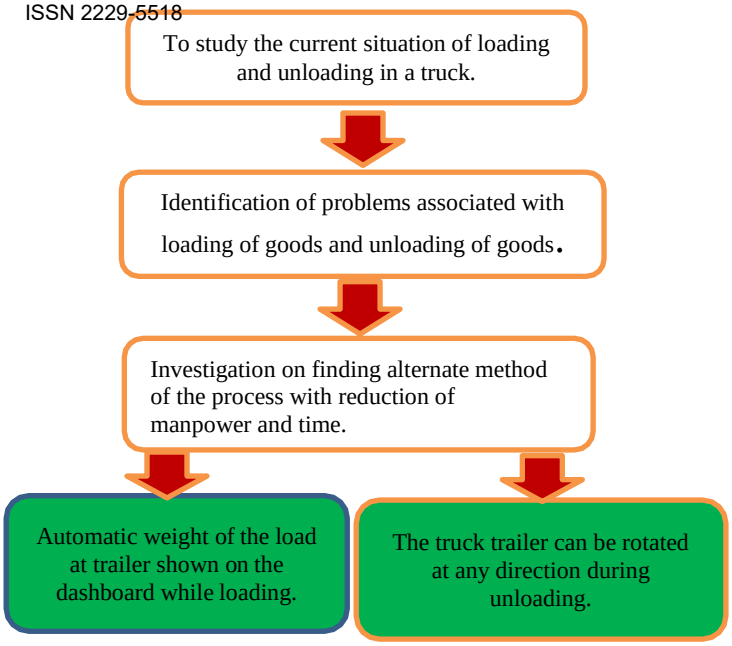

Fig 1:Methodology

3. Software And 2D, 3D Model

Catia V5 software has been used to design the model and assemble the parts.Catia enables the creation of 3D parts, from 2D sketches, sheet metal, composites, molded, forged or tooling parts up to the definition of mechanical assemblies.The software provides advanced technologies for mechanical surfacing & BIW. It provides tools to complete product definition, including functional tolerances as well as kinematics definition.CATIA provides a wide range of applications for tooling design, for both generic tooling and mold & die.In the case of Aerospace engineering an additional module named the aerospace sheetmetal design offers the user combine the capabilities of generative sheetmetal design and generative surface design CATIA offers a solution to shape design, styling, surfacing workflow and visualization to create, modify, and validate complex innovative shapes from industrial design to Class-A surfacing with the ICEM surfacing technologies. CATIA supports multiple stages of product design whether started from scratch or from 2D sketches(blueprints).

3.1 2D And 3D Model

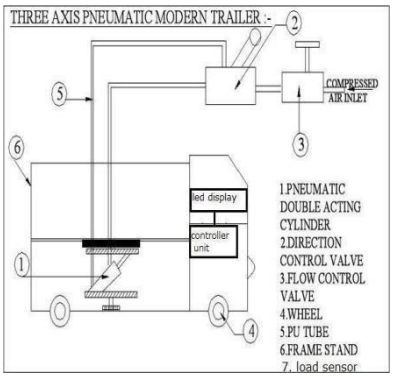

Fig 2: 2D Model

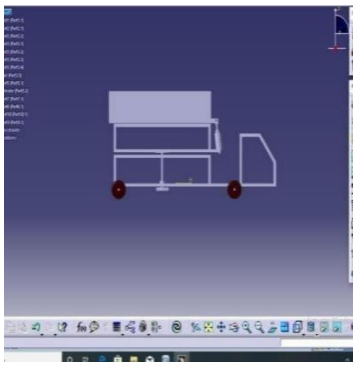

Fig 3: 3D Model

1. Double Acting Cylinder
2. Direction Control Valve
3. Flow Control Valve
4. Wheels
5. DC Motor
6. Frame Stand
7. Load Sensor
8. Spur Gear
9. Shaft
10. Trailer

The fig 2 and 3 shows the designed models.

3.2 DC Motor

Fig 4: DC Motor

Shown in above fig 4 A DC motor is any of a class of rotary electrical motors that converts electrical energy to mechanical energy.In this project DC motor is used to rotate the trailer while unloading.

3.3 Double Acting Cylinder

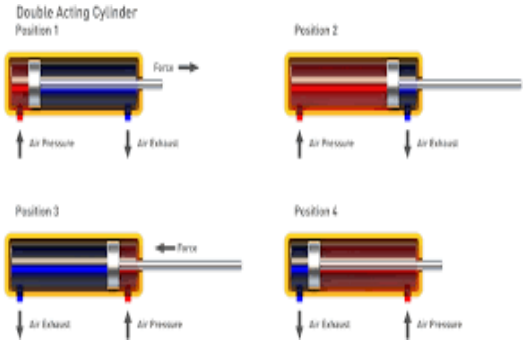

Fig 5: Double Acting Cylinder

As shown in the above figure 5 . A double-acting cylinder is a cylinder in which the working fluid acts alternately on both sides of the piston. In order to connect the piston in a double-acting cylinder to an external mechanism, such as a crank shaft, a hole must be provided in one end of the cylinder for the piston rod, and this is fitted with a gland or "stuffing box" to prevent escape of the working fluid. Double- acting cylinders are common in steam engines but unusual in other engine.In this project the DOUBLE ACTING CYLINDER is used to lift the trailer.

3.4 Shaft

Fig 6: Shaft

As shown in above figure 6, A shaft is a rotating member, usually of circular cross section, used to transmit power or motion. It provides the axis of rotation, or oscillation, of elements such as gears, pulleys, flywheels, cranks, sprockets, and the like and controls the geometry of their motion.

4. Experimental Procedure

a) Designing the prototype using Catia Software.

b) Collecting the required raw materials.

c) Fabrication of frame as per the design by utilizing the metallic bars.

d) Fixing the trailer to the frame.

e) Placing the motor, pneaumatic cylinder,rotating plate at the correct position.

5. Result And Discussion

a) Enhanced Transportation Efficiency:- The efficiency of transportation is increased by reducing the time consumed for a truck which has to be weighed on a weigh bridge. Our system has an arrangement of load cell within the trailer which senses the load in the trailer and displays it in the dashboard.

b) Improved Truck Efficiency:-Our prototype of the trailer is made in such a way in which the trailer can rotate in any direction before unloading. This process avoids the movement and adjusting of whole truck in the narrow roads, which may lead to damage of truck.

c) Work Load Reduction:-Due to the factor that that the truck has self-weighing ability, the que time for weighing is avoided thereby reducing stress of the drivers. The truck unloads in any direction as required, so the need of manual labour to unload or shift the unloaded materials to other direction is avoided.

6. Conclusion And Future Scope

In this modern world the time and cost has more weight age for each and every operation. So a new machine has been designed, fabricated and named as SELF WEIGHING TRAILER WITH FREE ROTATION.

less human effort and the test results substantiate the above.

- He developed trailer is simple, efficient, requires less time and cost effective when compared to the existing available model.
- Importance is given towards user friendly in operation and mainly safety. The rotating elements like cutter.
- The overall efficiency of the truck and the human effort and safety is enhanced.

6.1 Future Scope

- In future we adopt solar panel to save electricity- In future we can use solar panels to run the motor.Solar panel is easily available.
- It can be done using regenerative energy from braking.It can be easily used in villages where roads are narrow

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