

360 Degree Rotation of Forks in Manual Stacker: A Review

Patel Rahul¹, Shah Neel S², Sureliya Nisarg³, Dave Dhvanil M⁴

Gajjar Ujas⁵

^{2,3,4,5} Student, Indus Institute of Technology and Engineering, Ahmedabad, Gujarat, India

¹ Assistant Professor, Dept. of Mechanical Engineering, Indus Institute of Technology and Engineering, Ahmedabad, Gujarat, India

Abstract - In today's life, there is a wide variety of manual stacker, from the large heavy loading truck to the one that works among narrow aisles. Stackers have become one of the basic transportation tools we use in our lives. With all the stackers in existence, we find that there are some improvements that can be made to bring the stacker to a better performance. Existing stacker design has its limitation in rotation and the structure has potential safety risk. Our new design has 360 degrees rotating forks attached to truck body on both ends.

Key Words: Material Handling Equipment, Human Safety, Hydraulic piston, Roller chain, load centre, Bearing, Forks

1. Introduction

Because of the varieties, different shapes, different packaging of the goods, loading and unloading has always been a heavy process during transportation. Forklifts were naturally invented and became the solution to this problem; they save time and space. If cargos are being organized properly, the use of forklifts with the right attachments would be the best way to load and un-load, which would make the whole process less time and consumes less labour intensive. In addition, stacker will optimize the use of storage space by eliminating the need for many people to handle the loading and unloading operations and enabling the stack-up of goods.

The stacking height of goods can be up to 4~5m, some even can be as high as 10m, which brings up the utilization of warehouse by least 40%. Now, most of the transportation operations are using stackers. They fall under the category of lifting and transport machinery. A forklift has a lifting system for loading packages and a mobile system for moving around, like a truck. A stacker is also called a forklift truck. It is

mainly used for loading and unloading common packaged goods.



Figure1: Assembly of Manual Stacker

2. Working Principle

Stackers use the combination of hydraulics, a pulley system and other things to lift heavy materials across different distances. They are commonly used in warehouses, construction sites and other places that need to transport a lot of heavy materials in the working environment. Our research will focus on design, analysis and simulation of a fork mechanism that rotates 360 degrees, attached to the body on both ends.

Our manual stacker uses hydraulic jack system for lifting mechanisms. This contains motor, pump and the hydraulic cylinder. One end of piston rod will be attached with the chain pulley mechanism one end of chain with forks and another end on stationary plate. This mechanism gives us double hydraulic advantage, which means when a cylinder moves up to one centimetre forks will move twice. Hence there will be a double advantage of using this hydraulic system. Now Forks will have horizontal linear movement with help of rollers inside ISMC channels. After the lifting mechanism, we introduced a new concept which would help forks have 360 degrees rotation around horizontal axis. This

whole arrangement will be mounted on twin circular plates arranged in such a way that they can rotate in one another by restricting their linear motions with in themselves. This whole system will help forks rotate at 360 degree and would help saving time and work more efficiently.

Our research model is based on counter balance narrow aisle forklift. The basic idea is that, in order to save the aisle space for the body to move or turn, the forks attached to the device would be designed to be able to rotate and face either direction of the aisle. In this way, a forklift can drive into a very narrow aisle and turn the forks aside to lift the cargo without turning the entire body.

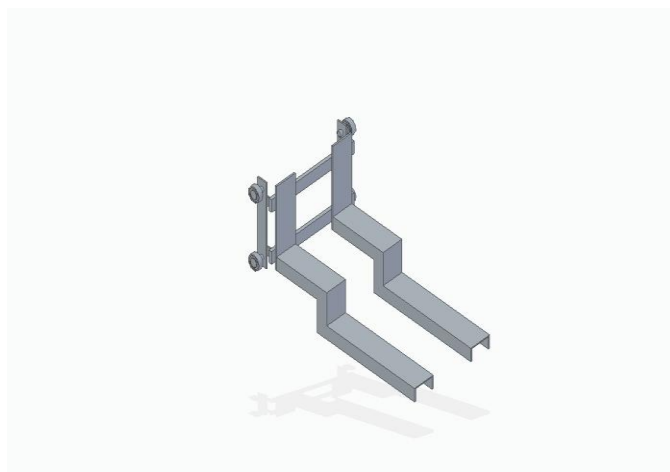


Figure 2: Forks (main assembly)

3. Advantages

- You don't need a forklift licence to operate one, though you still need to be aware of how to safely operate it.
- They emit no exhaust fumes or noise so they're ideal for indoor use.
- They're very easy to manoeuvre so they are great for lifting jobs in restricted spaces.
- Because stackers are smaller, operators have better visibility when handling goods.
- They can provide a less expensive alternative to forklift trucks where extra materials handling capacity is needed.
- Increased storage capacity
- High versatility
- To reduce human efforts
- To reduce injury while heavy weight lifting

4. Literature Survey

- 1) **Ugale Sachin et al** has done the research in the field of the Forklifts. This paper reports the part of the results of the basic characteristics of this device. They fabricated a forklift by using ratio frequency technology. The project made the system fully wireless so that it can move easily without any hesitation. Thus, the chance of accidents gets reduced and better flexibility can be obtained.
- 2) Material Handling Equipment Selection Using Weighted Utility Additive Theory by Prasad Karande, Shankar Chakraborty using weighted utility additive method to solve material handling equipment solution. This method is compare with drive by the past research will provide its potentiality, applicability and accuracy to solve machining problem.
- 3) High Risk Work, A Guide to forklift safety by Government of South Australia counter balance forklift are usually supported at three points called 'triangle of stability'. The front left wheel the front right wheel and middle of rear axle at the pivot pin connected to the steer axle make an imaginary triangle. This is important because the centre of gravity must remain within this triangle of stability.
- 4) **Prof. B.Nangare Patil et al** did the research for the development of the forklift, an important material handling tool designed to lift transport the goods in the industry. Hence they developed a human powered forklift for a small scale industry going towards high quality of product with minimum cost and also minimize material handling cost. So, human powered forklift is the better option. This forklift is easy to operate with less cost and indirectly it saves the labor cost.
- 5) **Prof. Sachchidanand Nimankar et al** made the research for the working of the existing forklifts. This is the pedal operated system, pedal provided at the middle side of the forklift. When operator operate a paddle as rope are wounded on pulley and load which are place which can be move upward at specific level. The main specification of this system is that it is totally mechanical, as it do not require any type of the electrical supply.
- 6) Matthew Sparkers For companies trying to be sustainable and carbon neutral, warehousing and distribution can be difficult. It's fine to make green products, but it is more difficult to find a green way to get them into store. If you are serious about

reducing emissions, and your product does not weight too much, then this human powered forklift may good option. You can move and lift pallets entirely with human power and get that gas or diesel forklift out of your warehouse.

- 7) Aashishkumar L Sharnangat, M.S. Tufail We describe the development of the robotic intended to operate alongside human personnel, handling palletized material within existing, busy, semi structure outdoor storage facilities. The robot operates in minimally-prepared, semi structured environment, in which the forklift handles variable palletized cargo using only sensing, and transports it while interacting with other moving vehicles.
- 8) Chunshan working device is an important part of the forklift. When the forklift is loading and unloading Handling, it is directly under all the cargo weight and finished the good fork, handling, lifting, etc. It is mainly composed of the motor, battery, frame, outrigger and cargo, guide wheel, and lifting hydraulic jack, etc.

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