



## IJRTSM

### INTERNATIONAL JOURNAL OF RECENT TECHNOLOGY SCIENCE & MANAGEMENT

#### "A REVIEW ON MANUAL OPERATED STACKER"

Rakesh Singh <sup>1</sup>, Yogesh Kumar Mishra <sup>2</sup>

<sup>1</sup> M Tech Scholar, Department of Mechanical Engineering, NIIST, Bhopal, Madhya Pradesh, India

<sup>2</sup> Assistant Professor, Department of Mechanical Engineering, NIIST, Bhopal, Madhya Pradesh, India

#### ABSTRACT

*In this thesis, study has been carried out on the manufacturing process and functional activities of Manual operated pallet truck and came across with the various problems and handling in the current system. After thorough studies, careful static analysis and reviews of the various manufacturing systems and technologies. Manual Pallet Truck are robust in construction and are smooth in operations. Manual Pallet Truck are able to work efficiently for pallets on high rack, smooth control of precise lifting and lowering. By this project man power effort and time can reduce. We design and analyze of carriage fork. Our aim is design and develops a model of Manual Pallet Truck .This system has a significant importance in the equipment and material handling. 2 D and 3D modeling has done by Solid work 2021 software and simulation has done by ANSYS 19.2 software.*

**Key Words:** Manual Pallet Truck, manufacturing, pallet, lifting, static analysis, ANSYS.

#### I. INTRODUCTION

Material taking care of (MH) includes "short-remove development that for the most part happens inside the limits of a building, for example, a plant or a distribution center and between a building and a transportation agency." It can be utilized to make "time and place utility" through the taking care of, capacity, and control of material, as particular from assembling (i.e., manufacture and gathering activities), which makes "frame utility" by changing the shape, shape, and cosmetics of material. It is frequently said that MH just adds to the cost of an item, it doesn't add to the estimation of an item. Despite the fact that MH does not furnish an item with shape utility, the time and place utility gave by MH can enhance an item, i.e., the estimation of an item can increment after MH has occurred; for instance:

- The esteem included by the medium-term conveyance of a bundle (e.g., Federal Express) is more prominent than or equivalent to the extra cost of the administration when contrasted with general mail benefit—generally consistent mail would have been utilized.
- The esteem included by having parts put away by a bottleneck machine is the investment funds related with the expansion in machine use short the cost of putting away the parts at the machine.

##### 1.1 Design of MH Systems

A typical way to deal with the outline of MH frameworks (MHSs) is to view MH as a cost as limited. This approach might be the most suitable as a rule in light of the fact that, while MH can increase the value of an item, it is typically hard to distinguish and measure the advantages related with MH; it is substantially simpler to recognize and evaluate the expenses of MH (e.g., the cost of MH hardware, the cost of aberrant MH work, and so forth.). The suitability of the utilization of MHS cost as the sole rule to choose a MHS configuration relies upon how much alternate parts of the generation procedure can be changed. On the off chance that a totally new office and creation process is being outlined,

[http:// www.ijrtsm.com](http://www.ijrtsm.com) © International Journal of Recent Technology Science & Management

at that point the aggregate cost of generation is the most fitting model to use in choosing a MHS—the least cost MHS may not bring about the least aggregate cost of creation. On the off chance that it is too exorbitant to considerably consider changing the essential design of an office and the creation procedure, at that point MHS cost is the main basis that need be considered. By and by, it is hard to consider the majority of the segments of aggregate creation cost at the same time, regardless of whether another office and generation process is being planned. Parts of the plan that have the biggest effect on add up to cost are sooner or later settled and progress toward becoming requirements concerning the rest of the parts of the outline.

### 1.2 Principles of Material Handling

In spite of the fact that there are no unequivocal "tenets" that can be taken after when planning a viable MHS, the accompanying "Ten Principles of Material Handling,"<sup>3</sup> as aggregated by the College-Industry Council on Material Handling Education (CIC-MHE) in participation with the Material Handling Institute (MHI), speak to the refining of numerous long stretches of collected understanding and learning of numerous experts and understudies of material taking care of:

1. Planning Principle. All MH ought to be the consequence of a consider arrange for where the requirements, execution targets, and useful particular of the proposed techniques are totally characterized at the beginning.
2. Standardization Principle. MH techniques, hardware, controls and programming ought to be institutionalized inside the points of confinement of accomplishing general execution destinations and without relinquishing required adaptability, particularity, and throughput.
3. Work Principle. MH work (characterized as material stream increased by the separation moved) should be limited without relinquishing profitability or the level of administration expected of the activity.
4. Ergonomic Principle. Human abilities and impediments must be perceived and regarded in the plan of MH undertakings and hardware to guarantee protected and compelling activities.
5. Unit Load Principle. Unit loads might be suitably estimated and arranged in a way that accomplishes the material stream and stock destinations at each phase in the production network.
6. Space Utilization Principle. Successful and proficient utilize must be made of all available (cubic) space.
7. System Principle. Material development and capacity exercises ought to be completely incorporated to frame a planned, operational framework which ranges accepting, review, stockpiling, creation, get together, bundling, unitizing, arrange determination, delivery, and transportation, and the treatment of profits.
8. Automation Principle. MH activities ought to be motorized as well as mechanized where plausible to enhance operational proficiency, increment responsiveness, enhance consistency and consistency, diminish working expenses, and to dispense with dreary or possibly hazardous difficult work.
9. Environmental Principle. Natural effect and vitality utilization ought to be considered as criteria when outlining or choosing elective hardware and MHS.

### 1.3 Characteristics of Materials

The characteristics of materials affecting handling include the following: size (width, depth, height); weight (weight per item, or per unit volume); shape (round, square, long, rectangular, irregular); and other (slippery, fragile, sticky, explosive, frozen).

Table 1.1 Material Categories

Material Category	Physical State		
	Solid	Liquid	Gas
Individual units	Part, subassembly	—	—
Containerized items	Carton, bag, tote, box, pallet, bin	Barrel	Cylinder
Bulk materials	Sand, cement, coal, granular products	Liquid chemicals, solvents, gasoline	Oxygen, nitrogen, carbon dioxide

The impact of the material category listed in Table 1 on the type of MH equipment is as follows:

- Individual units and containerized items  $\Rightarrow$  discrete material flow  $\Rightarrow$  unit loads  $\Rightarrow$  unit handling equipment
- Bulk materials  $\Rightarrow$  continuous material flow  $\Rightarrow$  bulk handling equipment

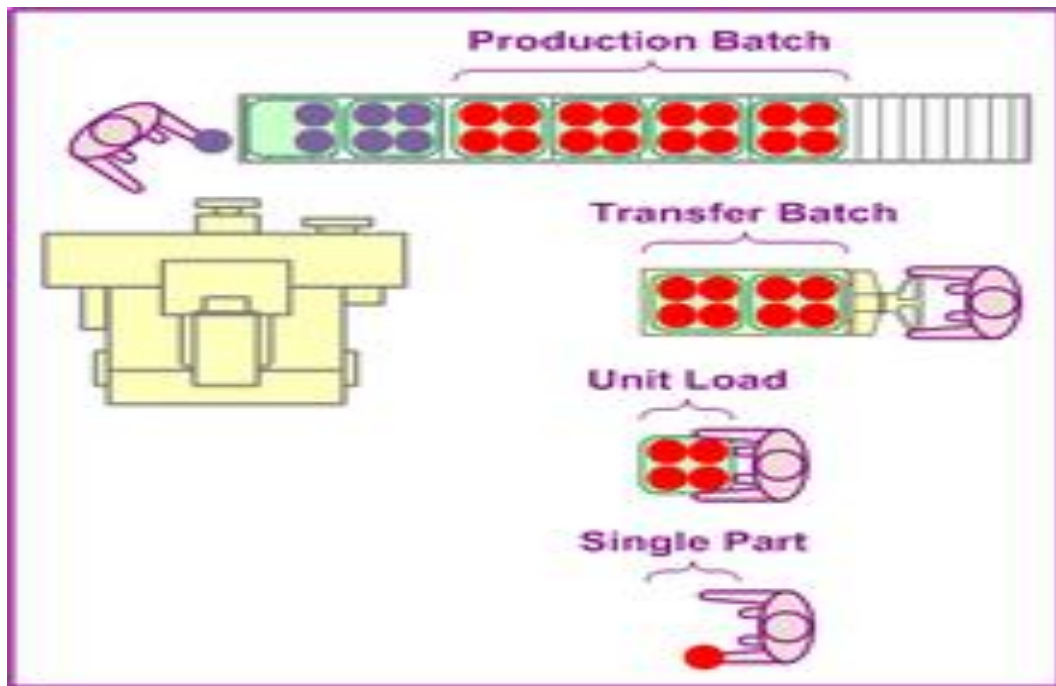
Figure 1 shows an example of alternate ways of handling a dry bulk material: as containerized (bagged) items on pallets handled using unit handling equipment (boxcar, pallet, fork truck), or as bulk material handled using bulk handling equipment (hopper car, pneumatic conveyor, bulk storage bin).

### 1.5 The Unit Load Concept

A *unit load* is either a single unit of an item, or multiple units so arranged or restricted that they can be handled as a single unit and maintain their integrity.

Advantages of unit loads:

1. More items can be handled at the same time, thereby reducing the number of trips required and, potentially, reducing handling costs, loading and unloading times, and product damage.
2. Enables the use of standardized material handling equipment.



**Fig. 1.1 Unit vs. bulk handling of material**

Disadvantages of unit loads:

1. Time spent forming and breaking down the unit load.
2. Cost of containers/pallets and other load restraining materials used in the unit load
3. Empty containers/pallets may need to be returned to their point of origin.
- 4.

Basic ways of restraining a unit load:

- Self-restraining—one or more units that can maintain their integrity when handled as a single item (e.g., a single part or interlocking parts)
- Platforms—pallets (paper, wood, plastic, metal), skids (metal, plastic)
- Sheets—slip sheets (plastic, cardboard, plywood)
- Reusable containers—tote pans, pallet boxes, skid boxes, bins, baskets, bulk containers(e.g., barrels), intermodal containers.
- Disposable containers—cartons, bags, crates.
- Racks—racks.
- Load stabilization—strapping, shrink-wrapping, stretch-wrapping, glue, tape, wire, rubber bands.

Basic ways of moving a unit load:

- Use of a lifting device under the mass of the load (e.g., a pallet and fork truck).
- Inserting a lifting element into the body of the load (e.g., a coil of steel).

- Squeezing the load between two lifting surfaces (e.g., lifting a light carton between your hands, or the use of carton clamps on a lift truck).
- Suspending the load (e.g., hoist and crane).

### 1.6 Unit Load Design

Unit burdens can be utilized both for in-process dealing with and for circulation (accepting, putting away, and shipping).

Unit stack configuration includes deciding the:

1. Type, size, weight, and setup of the heap.
2. Equipment and strategy used to deal with the heap.

Methods of framing (or building) and separating the heap. Choosing unit stack measure for in-process taking care of:

- Unit burdens ought not be bigger than the generation clump size of parts in process—if the units stack measure is bigger, at that point a postponement would happen if the heap is compelled to hold up until the point that the following group of the part is booked to begin creation (which may be days or weeks) before it can be transported.
- When parts are exchanged between nearby tasks, the unit load might be a solitary part.
- When activities are not neighboring, short separation moves  $\Rightarrow$  littler unit stack sizes, and long separation moves  $\Rightarrow$  bigger unit stack sizes.
- The pragmatic size of a unit stack (cf. the Unit Load Principle) might be restricted by the hardware and walkway space accessible and the requirement for safe material taking care of (as per the Safety Principle).

Choosing unit stack measure for conveyance (see Figure 2):

- Containers/beds are normally accessible just in standard sizes and arrangements.
- Truck trailers, rail freight cars, and plane load bayous are restricted in width, length, and tallness.
- The existing stockroom format and capacity rack arrangement may confine the quantity of doable compartment/bed sizes for a heap.
- Customer bundle/container sizes and retail location rack limitations can confine the quantity of possible compartment/bed sizes for a heap.

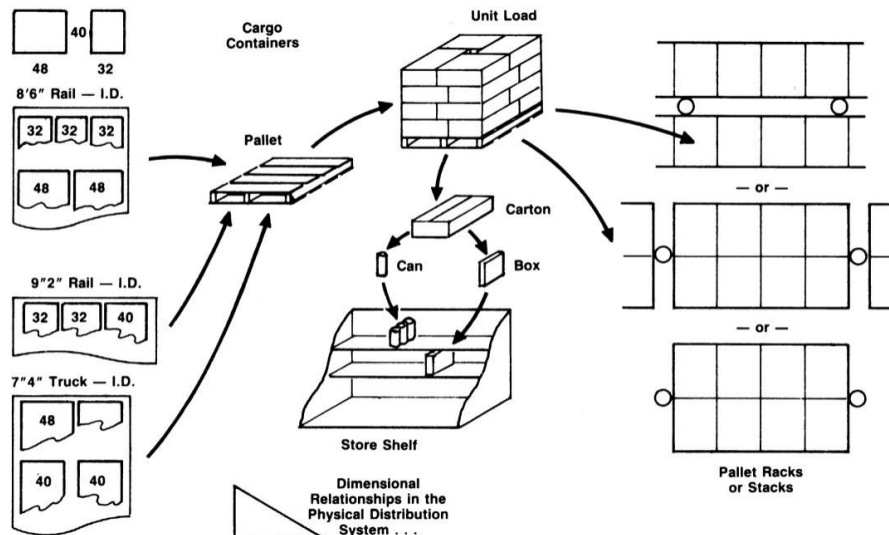


Fig 1.2 Material Handling Equipment

**1.7 Classification:****1.7.1 Manual stacker**

Manual Hand Stackers are simple economic solution for storage and retrieval of pallets at vertical storage spaces at the least cost.

Features and Specs

- Hand Stacker fully manual operation.
- Manual Hand Stacker has Latest Technology of Hydraulic Pump.
- Manual Hand Stacker has special light mast.
- Manual Hand Stacker Saves time and manpower.
- Manual Hand Stacker is light and easier to handle, ensures stability of operation.



Fig 1.3 Manual Stacker

### 1.7.2 Hydraulic Stacker

A Hydraulic Stacker Lift is large machine equipment used in bulk material handling applications. A lift stacker's function is to pile bulk material such as limestone, ores or any other material onto a stockpile.



### 1.8 PROBLEM DEFINATION

In the existing design of pallets the metallic pallets are used. These metallic pallets are oriented in such a manner that the bending strength of the pallet reduces. In this Project I am addressing this problem by suggesting a new design.

### 1.9 RESEARCH OBJECTIVE

In this thesis, a detailed investigation of existing industrial pallets (metal) used in fork lift truck. After that I will analyze the existing design and modify it to reduce the weight and cost. The modified design will be further analyzed and validated to confirm that it can take the design loads.

### 1.10 RESEARCH METHODOLOGY

- Getting details of existing design.
- CAD modal generation of existing design.
- F.E.A of existing design.
- Modification to reduce weight and cost,
- F.E.A of modified design.
- Optimization.
- New product drawing release

[http:// www.ijrtsm.com](http://www.ijrtsm.com)© *International Journal of Recent Technology Science & Management*

## II. LITERATURE REVIEW

**Vamsi Krishna and Porchilamban et al [2014]** created and fundamentally broke down a twin blast stacker masthead for better efficiency Bulk material taking care of assumes an essential part in the powerful activity of process businesses. In Visakhapatnam steel plant is one such shore based process industry working at 120% of appraised limit of 3.0 MT/annum. Fluid steel is growing its ability to 6.3 million ton for every annum, around 24MT/annum of mass materials are to be taken care of in Visakhapatnam steel plant(VSP).. The dependability of the twin blast stacker is most extreme vital for stacking the materials in the capacity yard for better coordinations. The maturing of twin blast stacker with the delayed activity brought about uneven loads or jolts on MAST HEAD. This has brought about regular disappointments of MAST HEAD. The plan alteration has been confirmed by demonstrating the MAST HEAD utilizing SOLIDWORKS Version 2012 and broke down utilizing FEM bundle ANSYS 14.5. The Necessary pressure fortifying has been made in light of the primer examination by expanding the thickness of the spacer and watched that the anxieties are inside as far as possible and are talked about in the subject RESULTS. In this way the plan has been solidified and the created drawing has been discharged for execution.. [1]

**Sivasubramanian et al [2014]** planned a change to the traditional self-loader stacker utilizing CAE The fundamental point of this paper is to outline and alter stacker component for a seal squeezing machine. In a direction producing organization, stacker frameworks are critical types of gear used to deal with materials which are in mass e.g. seal, confine and so on. Seal squeezing machine is utilized to put the seal on the bearing which shields the bearing from outside particles and keeps the grease from spilling. The ebb and flow stacker framework being utilized is a solitary stacker framework in which just 60 seals can be set at once which gets over in 10 minutes. So a system is required which can oblige more seals with the goal that the reloading time increments from 10 minutes to 2 hours. For such a reason, more stackers would be required and in this way such a framework would be known as a multi-stacker. By utilizing a multi-stacker instrument the man/machine association is lessened, specialist weakness is diminished, machine sit without moving time is decreased and general misfortunes are diminished.. [2]

**Vianen et al [2014]** built up a reproduction device to reschedule the stacker-reclaimer task to enhance efficiency of a dry mass terminal. They accomplished noteworthy decrease in holding up times of freight trains at the mass load terminals. [3]

**Miao et al [2013]** built up a passage stacker multi organize fork demonstrate utilizing PC supported outline. They enhanced the stacker security and dependability utilizing transient powerful examination in Ansys. [4]

**Sahu and Bhatele [2014]** contemplated the execution of a stacker-reclaimer over long separation drive activities. [5]

**Tian and Hu e al [2013]** improved the pivot point position of luffing system in a compartment achieve stacker. The luffing instrument of achieve stacker is the center of enormous arm lifting component. The pivot point position in it impacts specifically the far reaching exhibitions. The numerical model of three pivot focuses was built up through the power investigation of luffing instrument, which plans to diminish the greatest power of hydro-chamber and lessening the oil weight of pressure driven framework. A progressive requesting strategy was used to enhance the multi-target issue. The enhancement computation was introduced by utilizing the hereditary calculation in Matlab. Exploratory outcomes show that the streamlining upgrade the extensive execution of achieve stacker. What's more, this likewise gives critical establishment to the parameters plan of luffing component[6].

**Xiao et al [2013]** directed limited component basic examination of the trolley casing of a stacker-reclaimer running system. Keeping in mind the end goal to plan and improve the trolley edge of stacker-reclaimer running instrument, it is extremely helpful and proficient to exploit ANSYS, which can guarantee security as well as diminish time and cost. The stacker-reclaimer is a typical constant and productive mass materials stevedoring and transporting gadget on the planet, running instrument is situated in base of the entire machine, which assumes an essential part of supporting the machine and the running capacity of the machine. In this manner, the security and unwavering quality of the running instrument is extremely huge and basic in the protected activity of the entire machine. To ensure firmness and hardness of the steel structure, it is done that the static examination of the key segments the trolley outline by utilizing limited component investigation programming. Through watchful investigation and research, it demonstrates that the plan of

the parts meets totally prerequisites of genuine conditions. The Finite Element Analysis of Trolley Frame of Stacker-Reclaimer Running Mechanism Based on ANSYS. [7]

**Daniel et al** [2015] examined the resultant worries in the pulley of a stacker-reclaimer. The primary point of this venture is to lessen the pressure follow up on the pole. This venture prompts the pressure improvement of the pole. By creating a center plate we lessened the pressure created on the pole. In this way, that there is increment in shaft life. By applying different thickness of the center plate we increment the life of the pole. There is a possibility for lessening the heaviness of the part by utilizing light weight material. The heap appropriation on the pole is even with the supporting circles. Along these lines, that we lessen the aggregate load follow up on the specific contact on shaft. The fundamental segments are shaft, plate, barrel, and center. Outlining units of this kind requires exact counts of all heaps in static conditions. In this paper the part cross area was investigated. The pressure examination utilizing ansys is performed on the cross area of get together of the reclaimer pulley considered as a kind of perspective for the current outline and notwithstanding for the changed plan which is the primary undertaking of this venture. The cross segment of the model was investigated with the straightforward stacking conditions. With that the barrel avoidance is limited in the cross segment examination [8]

**Singh et al** [2015] executed limited component examination to lessen stacker weight by considering the anxieties following up on the stacker base plate. Be that as it may, they didn't totally outline another multi stacker framework for enhancing efficiency. In a course producing organization, stacker frameworks are vital types of gear utilized for taking care of mass materials. In this work, another multi-stacker plan has been intended to supplant a traditional bearing seal stacker framework. The new framework can oblige 720 seals at any given moment. This course of action expanded the time hole between two stacking cycles to upto 2 hours when contrasted with only 10 minutes in the more established setup. Likewise, the normal machine sit out of gear time was decreased by over 85%. This brought about an efficiency upgrade of more than 7%. Subsequently, a multi-stacker system demonstrates very helpful to decrease man/machine connections, specialist exhaustion and machine sit still circumstances in the bearing business seal squeezing machine profitability. [9]

**Syed Sajid et al** [2015] involved in quickly developing mechanical age each industry needs speed in assembling to adapt up to client's necessity. The essential target of this undertaking is to build up a base weight and minimal effort modern beds for taking care of motor squares. From this we accomplish quicker transportation. Material dealing with is an exceptionally wide point of science talk, consequently the fundamental thought behind growing such a plan to show the circumstance of beds usage in enterprises and related influencing factors. The last model is a blend of institutionalize process and the effortlessness ideas.[10]

**Soumya Bhattacharjya et al** [2019] A stacker-reclaimer shape (SRS) is a large shape used for bulk cloth exploration. Performance of SRS is touchy to the impact of uncertainty which might also additionally cause catastrophic failure consequences. Thus, on this paper a relatively new sturdy layout optimization (RDO) method for layout of SRS is explored. The concerned parameter of SRS e.g., cloth loading, incrustation, regular digging, etc., won't have well-described opportunity density capabilities and may be expressed as unsure however bounded (UBB) kind parameters. Hence, RDO is explored for probabilistic in addition to UBB cases. Solution of such RDO hassle in complete simulation method might require huge computational time. Hence, reaction floor method (RSM) primarily based totally metamodelling method has been followed right here to relieve computational burden. Also, as traditional least squares method (LSM) primarily based totally RSM can be a supply of error, this look at adopts a relatively new shifting LSM (MLSM) primarily based totally adaptive RSM in RDO. The RDO outcomes depict that UBB kind uncertainty is greater vital than the probabilistic case. The proposed MLSM primarily based totally RDO method yields moderately correct layout answers in a computationally green way. The proposed MLSM primarily based totally RDO method yields layout answers which guarantees secure overall performance of SRS even withinside the presence of uncertainty.[11]

### III. CONCLUSION

This paper has described the threats that computer viruses to research and development multi-user computer systems; it

has attempted to tie those programs with other, usually simpler, programs that can have equally devastating effects. Many author were investigated how anti-virus software analyzes the infected file and shows pro-missing approach for malware detection in the future. To combat the never ending virus generation, the anti-virus software company should work closely with researchers to find potential approach that both work efficiency and accuracy.

## REFERENCES

1. K.VamsiKrishna,S. Porchilamban, Development and Structural Analysis of Masthead for a Twin Boom Stacker, International Journal of Engineering Development and Research, 2014, Volume 2, Issue 1
2. Sivasubramanian A., Jagadish M., Sivaram C.,Design and Modification of Semi-Automatic Stacker, Indian Journal of Applied Research,Volume : 4, Issue : 4, ISSN - 2249-555X, 2014.
3. Teus van Vianen,JaapOttjes, GabriëllLodewijks, Simulation-based rescheduling of the stacker–reclaimer operation, Journal of Computational Science, 2014
4. Sen Chun Miao, Yong JiSun, Ting Ting Wang, The Transient Dynamic Analysis of multi-stage Fork of Stacker, Journal of applied science and engineering innovation, Vol.1, No.1 2014
5. Niraj Kumar Sahu, Ram PrakashBhatele, Stacker/Reclaimer Long Travel Drive Operation with Vfd- A Performance Study, International Journal of Science, Engineering and Technology Research (IJSETR), Volume 3, Issue 3, March2014
6. M. H. Tian, S. C. Hu, "Optimization of the Hinge Point Position of Luffing Mechanism in Reach Stacker for Container", Advanced Materials Research, Vol. 694-697, pp. 142-147, May. 2013
7. Yanjun Xiao, Diming Guo, Xinyu Liang and Yuming Guan, The Finite Element Analysis of Trolley Frame of Stacker-Reclaimer Running Mechanism Based on ANSYS, Research Journal of Applied Sciences, Engineering and Technology, 2013, 6(16): 3015-3017
8. Oscar fenn Daniel, A. Hussainlal, Stress Analysis in Pulley of Stacker-Reclaimer by Using Fem Vs Analytical, IOSR Journal of Mechanical and Civil Engineering, Page 52-59,ISSN: 2278-1684.
9. Sarabjeet Singh, Yash Parikh, Finite Element Analysis of Stacker Mechanism used in Bearing Manufacturing, International Journal of Innovative Research in Advanced Engineering, Issue 2, Volume 2, 2015.
10. Syed Sajid Ahmad Syed Nisar , Prof. K. I. Ahmad Prof. M. Sohail Pervez “Design and Optimization of Industrial Pallets for Handling Engine Blocks of Mahindra Scorpio” IJIRST –International Journal for Innovative Research in Science & Technology| Volume 3 | Issue 01 | June 2016
11. Soumya Bhattacharjya, Mithun Sarkar, Gaurav Datta and Saibal Kumar Ghosh “Efficient Robust Design Optimization of a Stacker–Reclaimer Structure Under Uncertainty “International Journal of Reliability, Quality and Safety EngineeringVol. 26, No. 02, 1950009 (2019)
12. Anil A. Sequeira, Saif Mohammed, Avinash A. Kumar, Muhammed Sameer, Yousef A. Kareem, Krishnamurthy H. Sachidananda" Design and Fabrication of Battery Operated Forklift" Journal Européen des Systèmes Automatisés , 2019 , 19pp. 569-57