Automated Storage And Retrival System

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ABSTRACT

This Project deals with the applicability of vertical stacking system are maximum quantity of product store in the system that are used for the storage and retrieval of product in both distribution and production environments. Vertical stacking system are composed of motor, chains, working table that are attached on a shuttle carrier, shelves, programmable logical controller-based control system and storage racks. Vertical stacking system Increase the throughput capacity of the product as compared to conventional storage system. This system has very benefit such as saving in labour cost improved material flow increase productivity better space utilization, safety and ergonomic optimized load balancing, maintenance cost also low. By using this system in the company then production rate is increases.

Key words: Vertical stacking system, increase throughput capacity of product, saving in labour cost, Increase production Rate.

ARTICLE INFO

I. INTRODUCTION

In this scenario industry need higher production rate so to minimize some drawback like larger floor space picking rate of product, time required for assembly then this new concept is introduced known as vertical stacking system. The large floor space is occupied in the company, then the new concept invented in 1898 by Sir. James Henry Rand was designed steel cabin to store index card make them easier to sort an access. He founded the American Kardex company in 1915. This company made the Kardex shuttle system also known as vertical stacking system. It is the type of automated storage and retrieval system. This system is defined as the storage system that uses fixed path storage and retrieval machine running on one or more rails between fixed arrays of storage racks.

It is used for distribution in production industry and ware house system to store and retrieve unit loads without interference of an operator. Today's world of rapidly changing customer demands, small internet order tight delivery schedules, high competition and high service level requirements then that condition are satisfied so this new system is introduced. The main advantages of vertical stacking system are saving in labour cost and floor space, increased production rate. To meet this demand in throughput capacity and constraint with regards to delivery times in storage system are developed in automated material handling industry. In general, compact storage system are popular for storing product with relatively low unit load demand and characterized by high space efficiency.

Atlas Copco is a Swedish company founded in the year 1873. It mainly involved its manufacturing of machines that goes underground. Machines used for drilling and mining are the main interests of the company. Almost 100 years later after forming the company in the year 1972, production of water well rigs started. This was mostly used for drilling gas along with CBM wells.

The concept adopted for this project is the Kardex shuttle concept [1], which is generally used for inventory management. It can be defined as modular structured

computer managed robotic vertical lift, storing along with the recovery system. Every part works with its own computer and electronically managed extractor which moves and provides the required tray or bucket to the small entrance of the location allocated for its storage in a very small duration of time. All the materials are stored on the plates or trays on the forward facing and backward facing side of the tower. This Kardex shuttle extractor does the work of getting the required material from their storage location to the trays and placing the material back to its previous location after use. This extractor is given the motion with the help of belts of two toothed type, which is also the latest technique and is noiseless working characteristics.

In conventional system product are stored on a pallet or rack then this system increases the large floor space area also the picking of any product is time consuming process also production rate of company reduces. To minimize the drawbacks of conventional system to study of the vertical stacking system is used.

We can find many techniques of automated retrieval systems that are discussed by many authors. This paper provides an overview of literature from the past 20 years. A comprehensive explanation of the current state of the art in automated retrieval systems design is provided for a range of issues such as system configuration, travel time estimation, storage assignment, dwell point location, and request sequencing. The majority of the reviewed models and solution methods are applicable to static scheduling and design problems only. Requirements for automated retrieval systems are, however, increasingly of a more dynamic nature for which new models will need to be developed to overcome large computation times and finite planning horizons, and to improve system performance. However, in today's world of rapidly changing customers' demand, small internet orders, tight delivery schedules, high competition and high service level requirements, it will be increasingly difficult to maintain a good performance when using existing static solution techniques. The research in the field of automated storage and retrieval system.

II.   LITERATURE SURVEY

Pooja C. Patil et.al.[1] Studied the phenomenon of material stored in the warehouse of the company utilizes a lot of space. With the help of this project the space management of the company's warehouse is done and the floor area is made available. In the present research work, Kardex shuttle system was introduced which is a vertical storage or stacking system and the production rate of the company was raised to the desired level. Also, by using vertical stacking system it possible to reduce the floor space used for storing

the material and use that area for production purpose the area initially used for assembling only one machine, now can be utilized for assembling three machines at one time. Then production rate of company is increases.

Kalyanaraman p. et al.[2] have made a comparative study between automatic storage/ retrieval system and vertical stacking system are warehousing systems that are used for the storage and retrieval of products in both distribution and production environments. It is observed that the shuttle-based storage/retrieval systems increase the throughput capacity of the systems compared to automated storage/retrieval systems. In general, compact storage systems are popular for storing products with relatively low unit-load demand and are characterized by high space-usage efficiency. They eliminate or reduce the need for travel aisles, leading to smaller and therefore cheaper, buildings.

Girish Dalvi, Sanjay Rukhande et.al. [3] The concept which eliminates the process of manually carrying the items, the need of the workers carrying the items and to maximize vertical space utilization is suggested. The design of an electronically operated vertical storage system is carried out and tested successfully. The design principle is based on the adaptation of vertical carousel system. The 'Automated Shelves' is a motor-driven vertical storage equipment that brings shelves up and down so that they can be easily available for the user. Design drawings are prepared and based on functionality, durability, cost and local availability, the components/materials selections is done. The system performance was tested on fabricated model. It has wide applications in material handling for industrial, domestic and commercial purpose.

Antonio Gabriel-Santos et.al. [4] The number of design parameters in a vertical carousel-type storage device is larger than the number of functional requirements, which makes it a redundant design. The usual design approach for this kind of mechanical systems is based on trial and error. The aim of this paper is to present a method that leads to the most appropriate sequence in the design of these machines. With this propose in mind, the design equation of the system was examined and subsequently rearranged, so that it reveals that its motion subsystem could be regarded as a decoupled design This allowed establishing a set of rational footsteps that were used to design the aforesaid system, as described in the paper. In the beginning of the process of designing a new machine, the designer is usually faced with some common situations, such as the number of design parameters is too large the number of design parameters is greater than the number.

PROBLEM STATEMENT:

From the above literature survey, we come to the conclusion that the problem of storage / inventory facing in the industry. This could be overcome by using vertical storage System. "Automated Storage and Retrieval System"

Objective:

- Better space utilization.
- To protect the product or components from Environmental damage / hazard i.e. rusting of metallic components misplacing of components or product & protective from momentary damages in storing
- To reduce the labor cost and maintenance cost.

III. METHODOLOGY

In every company the main issue faced is space management on the shop floor. The area available is to be utilized for material storing as well as the production of the machine, both are required to be on the same floor so that this system is installed in the company. This system requires less floor space area then time requirement for moving the material to required site is less and production rate is higher.

After the floor area was studied, the next task was to find out the Kanban quantity. This was done to make sure, the flow of material is right in time and the production should not get affected due to any kind of delay in the availability of the material. For deciding the Kanban system, the two-bin system is followed. The quantity of material in each bin is to be calculated and accordingly the order is needed to be placed. For calculating the quantity, the parameters required are lead time, monthly production, the daily requirement of the material.

There were various machines and companies that provide this kind of machines. It is made to the requirement of the company, the height, width, placing on the shop floor. This concept makes the storing of material having different sizes possible. The material can vary from smaller parts to the material on the trays in one entire single unit. It benefits to improve the working techniques in the storerooms or warehouses.

With the help of good motor, the initiating and stopping of the extractor and trays becomes very smooth and jerk free. Addition of the speed controller feature make starting and stopping routine more reliable and smoother by managing and transporting speed and also change the situation of the changing load strain. This is ensured the time required for transporting also reduced. Methodology details shown in fig 1.
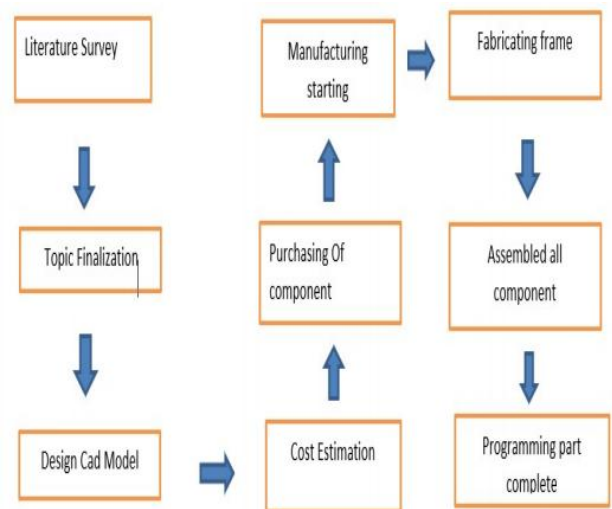

Fig1. – Methodology Process

1. Construction

Automated Storage and Retrieval Systems are composed by motor, motor shaft attached driving gear, chain bucket mechanism, driven gear, rack or shelves, axle shafts, casing or enclosure, Arduino control system, display Numeric panel. The main part of the system is motor and Arduino controller is the brain of vertical stacking system. Motor is having high duty load carrying capacity to minimize the losses in the vertical stacking system the construction of Automated Storage and Retrieval Systems as shown in figure 2.
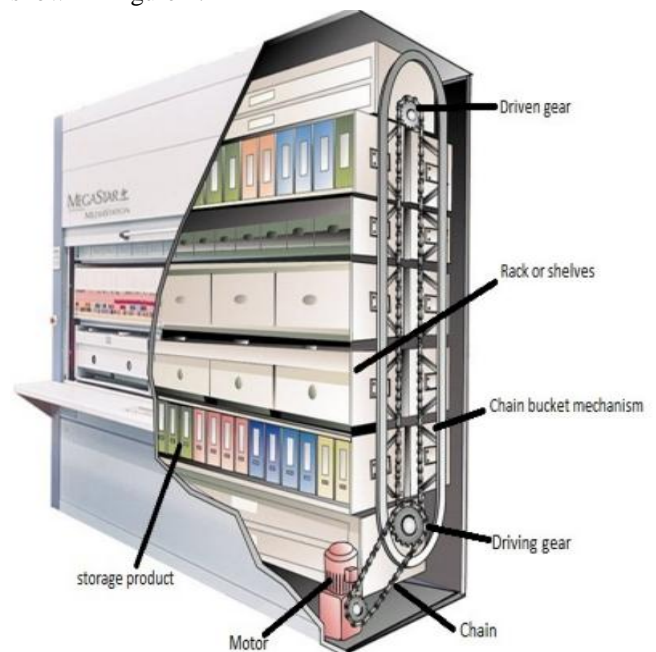

Fig 2- Construction of Automated Storage and Retrieval System

2. Working

The working of Automated Storage and Retrieval Systems is based on mechanical arrangement of that system When

electric supply is providing to motor rotates driving gear are rotated. By rotating the driving gear as well as driven gear shaft rotated with the help of chain drives. So driven gear shaft is connected through chain bucket mechanism that are with shelves. Working of chain bucket mechanism then rotating of shelves moving upward or downward direction with the help of Arduino control panel. By putting some command in numerical control display unit, the working of Vertical stacking system is done. In Arduino program are stored which type of product placed in a rack number. So, it is easily to sort and access the material to reduce the time search of product which place is stored. Every part works with its' own computer and electronically managed extractor which moves and provides the required tray or bucket to the small entrance of the location allocated for its storage in a very small duration of time. All the materials are stored on the plates or trays on the forward facing and backward facing side of the tower.

Advantages

1) Optimize the load balancing.
2) Maximum weight of product is stored.
3) Better Space Utilization.
4) All available vertical height is utilized, reducing floor space requirements.
5) Product Pick Rate is higher.
6) Increase productivity Rate Materials are delivered directly to operator, minimizing walking, climbing, bending or reaching for heavy objects.
7) Space Utilization All available vertical height is utilized, reducing floor space requirements.
8) Work place ergonomics enhancements.
9) Accurate inventory control.
10) Expandable storage options.

Disadvantages

1) It required electric power supply
2) If microcontroller fails system may fail.

Applications

1] In workshop (store different types of tools like (screwdriver chuck keys, toggles, plier), masterpiece.)
2] In library (storing different kind of books.)
3] In industries (storing Nut, bolt, raw material)
4]General stores.
5]Optical lenses and frames.
6]Auto dealerships.
7]Automobile part manufactures industry.

IV. CONCLUSION

In this project it is observing that the area required of Automated Storage and Retrieval Systems is less as compare to conventional storage system, so improving the

space efficiency of any company. Automated Storage and Retrieval Systems has very high throughput capacity or maximum amount of material store in this system. It increases customer delivery yields and to grow overall as a company. It was opportunity for growth and chose the right system, which aligned with the corporate goals of the company. When the Vertical Stacking system was introduced, with some amount of investments, it was possible for the company to increase their production rate of company. This is also help to increase their sales accordingly. This system increases the throughput capacity of the system.

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