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Design And Analysis Of Material Handling Mechanism For Lifting And Transporting Of Propellar Shaft By Fem

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ABSTRACT:*The material handling plays a important role in the manufacturing systems hence material handling affects overall system performance. The main aim of the project is to design a mechanism for lifting of propeller shaft from storage area to working area. The major problem in manual handling is due to the length of the propeller respectively are 1000mm to 1500mm and 25-50kgs weight. Hence two persons are required for the purpose of lifting. This manual handling has to be totally replaced by perfect transporting and lifting mechanism. So we use sliding arms mechanism is proposed for the purpose of lifting.*

The designing of the mechanism is carried out by using a mechanical software such as CATIA and meshing is done by hypermesh software and the analysis is done by ANSYS software. The automatic material handling mechanism for transporting propeller shaft sigificantly decreases producton time and the labour cost in the present manufacturing approach. Also the automatic material handling improves the production efficiency and reduces the human effort. The FEM analysis describes that, the mechanical stresses and deformation are within safelimits and hence the design is safe for both strength and rigidity point of view and hence the manufacturing is carried out by using automatic material handling.

1.INTRODUCTION:

1.1.Material Handling

In manufacturing, there is necessity of material movement from one step of the manufacturing process to another or that operators move to the materials. The most common practice in manufacturing is movement of materials. This movement of materials from department to department and one processing area to another necessitates the use of material handling equipments. Consideration for the handling of work-in-processes materials, as well as raw material and finished goods, has always been a part of the production systems design process. Basic price accounting evaluation of the price of manufacturing products reveals that when materials handling costs are separated from other costs, they can be seen to be significant. Recently the materials handling function has been undergoing significant changes in both

concept and implementation. Now a days, management changed its view of materials handling as the routine transfer of materials from place to place and is beginning to think of it as part of a total materials flow system. This change in thinking of management has come about largely as a result of new automatic material handling and storage equipment and systems that are integrated closely with automatic processing and involving a great deal of management information and control systems.

1.2 Problem Statement

The major difficulty in manual handling is length and weight of the propeller respectively are 1000mm to 1500mm and 25-50kgs weight. So we require two persons for lifting and transporting. This manual handling has to be totally replaced by suitable transporting and lifting mechanism. And the time consumption for transporting the propeller shaft will be less than the manual handling time.

2.MATERIAL HANDLING

In a broad sense, manufacturing involves all movement of materials. According to Materials Handling Division. American Society of Mechanical Engineers, defines as follows: "Materials handling is the art and science involving the moving, packing, and storing of substances in any form." This is an all inclusive definition and can include both fluids and semi-fluids, and also discrete items. Simply, we are going to discuss in this chapter the movement of discrete items, such as gears, tires, castings, and boxes. Similarly, we shall consider only the movement of materials within the plant or storage areas. Movement of materials between plants- particularly when common carriers are used is generally considered a problem in traffic and is commonly handled by a suitable traffic department.

2.1 OBJECTIVES OF MATERIALS HANDLING

For the material handling problem the simplest solution is - "No movement, no cost" is hardly practicable for a complete manufacturing process. It is basically sound approach when one attempts to improve a complete production cycle and when the number of handling can be decreased. It is also a better solution in the manufacturing of heavy industrial equipment.

Later, the situation it is often more possible to bring the tools and operators to the component than to transport the component to the machine or work area. In addition to the objective of decreasing the overall costs of materials handling by reducing the number of handling involved, the following can be considered as

objectives of the problem of the engineer in his or her approach.

Lower the unit materials handling costs :

It is clear that if the overall material handling costs decreases the unit costs also decreases . This approach requires the costs of handling to be allocated or recognized with the units of product, or its component parts that moved .

Reduce the manufacturing cycle time :

The total time required to manufacture a product from the state of raw material to finished product can be decreased through effective materials handling. The flow of goods :

Proper material handling effects the control of goods particularly in continuous manufacturing makes easier. Here operators are "tied together" by the material handling plan.

Provide for fewer rejects :

Material handling system improves safety and safe handling of materials these reduces the rejection in the industry and improves the productivity.

2.2 Principles Of Material Handling

A better materials handling engineer will have proper experience so that he can obtain the solution of material handling problems or the design of material handling systems.

The following list which is adapted from two of these sources:

1. Eliminate wasteful methods by

a. Decreasing to a less the number of handlings of materials.

b. Removing unwanted mixing and subsequent sorting.

c. The hand labor are reduced by using mechanical aids.

d. Unnecessary material transfer is to be avoided.

e. The speed of handling is increased.

f. Containers and unit loads are to be employed.

g. Gravity is used as a moving force wherever practicable.

2. In laying out the plant:

a. For materials flow and combine handling we have to plan a system.

b. Supply continuous and proper intermittent flow of materials.

c. The optimal flow of materials between operations is to be provided.

d. The plant layout of the work area is to be minimum for material handling.

e. The quantity and size of weight handling is to be maximized.

f. The entire plant material handling is to be coordinated.

g. Safe handling and equipment are to be provided with information and

control system.

h. Adequate receiving,storage and shipping facilities are to be planned.

i. Optimum usage of building cubage is to be made.

j. Adequate aisle and access areas are to be designed.

3. The selection and application of materials handling equipment:

a. Plan activities and identify equipment needs before considering the purchase of new equipment.

b. The equipment which is being used is checked effectively.

c. Simple equipment that is adaptable to the problem is to be used, avoiding critical mechanisms and controls.

d. Standard equipment is used, special equipment is purchased to economical

e. Equipment which is flexible is to be adopted.

f. Costs of equipment are to be purchased are determined before purchasing.

g. The need for different equipments are to be identified for different jobs.

h. Alternative methods are to be adopted in emergencies.

i. Consideration to the maintainence of the equipment.

2.3 General Types Of Materials Handling Equipment

Materials handling equipments are classified into five types by the Tompkins and White. They are as follows:

1. Conveyors

2. Monorails, hoists, and cranes

3. Industrial trucks

4. Containers and supports

5. Auxiliary and other equipment

3. ABOUT PROPELLER SHAFT

Propeller shaft connects a propeller to an engine. Also the british english term for the drive shaft, this shaft connects an automobile gearbox to a rear differential. It is generally mentioned to as a "propshaft".

In motor vehicle the propeller shaft consists of universal joint and sliding piston. These are made to contact an auxiliary engine and differential. The main motive of the propeller shaft is to transfers the torque from engine to differential. The engine has extended bolts and propeller shaft have holes plats at tow ends. In these one aligns with engine bolts where as other one aligns with differential, the bolts tightened with nuts.

3.1.2 Propeller Shaft Construction

In the propeller shaft construction, it consist of a propeller shaft, a slip joint , and one or more universal joints. This construction provides a flexible connection through which power is transmitted from the transmission to the live axle.

The propeller shaft may be solid or tubular, a solid shaft is stronger than a hollow or tubular shaft of the same diameter, but a hollow shaft is stronger than a solid shaft of the same weight. In shaft housing solid shafts are used that encloses the total propeller shaft assembly. These are called torque- tube drives.

In the propeller shaft, slip joint is the one end to take care of end play. The driving axle, which is attached to the springs, moves freely up and down, while the transmission is connected to the frame and cannot move.

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Fig 3.1 Centrifuge construction of propeller shaft

In the propeller shaft construction, it consist of a propeller shaft, a slip joint and one or more universal joints. In which the engine and axles are separated from each other, as on four the drive and rear wheel drive vehicles, The transmission of drive force is generated by the engine to the axle through the propeller shaft. For its usage the optimal shaft is a shorter, bar like product. the longer the bar , the more liable it is to sag, and these sagging is again promoted when rotation is applied . Sagging causes vibration and result in an increase in noise, to such an extent when the critical speed is more the shaft itself breaks. The propeller shaft is designed such that not to break when it is used in the service limits. In addition, propeller shaft designed to control vibrations arising from a broad range of causes. To eliminate all the vibrations the propeller shaft has to be connected with a flexible coupling.

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Fig 3.2 Propeller shaft of vehicle after assembly

The following thin cylindrical members are made of cast iron, cast iron and steel: steel and chromo –nickel steel. The propeller shaft outer portion is made with cast iron liner with a steel back. In this case, the steel provides the strength while the cast iron inner surface liner having a high coefficient of friction dissipates the heat more rapidly in certain front wheel brakes a cast aluminum alloy drum with a cast-iron liner is also used.

Fig 3.3 Propeller shaft in workplace

. Manual handling of propeller shaft is replaced by an automated mechanical trolley for handling, lifting and transporting of propeller shaft. The company will experience minimum usage of man power, save in labor cost and increase in production rate.

2. We can reduce the human effort and damages caused by the propeller while transporting.

3. The time taken for automatic material handling mechanism is less than the manual handling time.

4. Total material handling equipment is flexible to move from other place while extension of the company.

5. The FEM Analysis showed that the mechanical stresses and deformation are within safe limits.

6. Hence we conclude that design is safe for both strength and rigidity point of view and hence manufacturing is carried out and performance of the material handling trolley is satisfactory.

In future we can see the world in which Manual Handling is completely overtaken by fully automated mechanism. Where in the manpower is just utilized to operate these automated mechanism.

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