Design of Automated System for Adjusting the Span between the Bundles of Idlers/ Rotators for Supporting Heat Exchanger Shells

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Abstract- *Idlers and Rotators are used for supporting and rotating the heat exchanger shell during its manufacturing process. The shell is rested on Bundles which needs to be adjusted according to the diameter of the heat exchanger shell. The distance between the bundles is adjusted by rotating a lead screw manually with spanner or striking it with hammer, thus an automated system is needed to be design to automate this process in order to ensure safety of this operation, reduce the cycle time and fatigue caused to workmen to perform this activity.*

Keywords- Automated system, Heat exchangers shell, Idlers, Rotators.

I. INTRODUCTION

Manufacturing industries nowadays prioritise to improve machine efficiencies and reduce cycle time to maximize outputs. Higher the efficiency the more is the cost cutting and energy savings. Hence, designing an automated system will directly increase the profits and efficiency. The existing methods for adjusting the span between the bundles of idlers and rotators with their limitations are mentioned in the table below.

Sr No.	Methods	Limitations
1.	Using Spanner and Hammer.	This method requires hitting of hammer on the spanner attached to the lead screw of the idler. Sometimes in order to avoid the use of hammer the workmen stands on the spanner and pushes it down, which compromises the safety of workmen. Also the spanner which is not at all designed to be subjected to shock load is subjected to the same compromising the tools life. At the same time the if the hammer slips the workmen holding the spanner may get seriously injured. Sometime in order to save time and effort the workmen don't use a hammer instead they stand on the spanner in order to rotate the spanner.
2.	Using Nutrunner.	Pneumatic Nutrunner is a device which is used for the tightening the nut and bolt using compressed air. The Nutrunner is designer for low Rpm and high torque application. The use of nutrunner sometimes causes fatigue to the operator due to vibration and high torque. Pneumatic shut-off nut runners may produce large reaction forces to the operator's hand, especially at the end of the securing of threaded fasteners. The workmen also need to bend down and be in an awkward position for performing the same activity.
3.	Using Hydraulic Nut Torqueing Unit.	A hydraulic system is always required for the system, all the attachment and connections made to the nut torqueing needs to be secured and inspected properly before operation in order to avoid any accident due to high hydraulic pressure. The device also needs to be properly mounted on the nut in order to avoid slip. Considering all the factor its becomes tedious and time consuming to use this device for the rotation of lead screw of the idler. The hydraulic nut torqueing unit may sometimes slip and can cause accident.

Thus a new system is needed to be designed in order to overcome the existing limitations.

II. OBJECTIVES

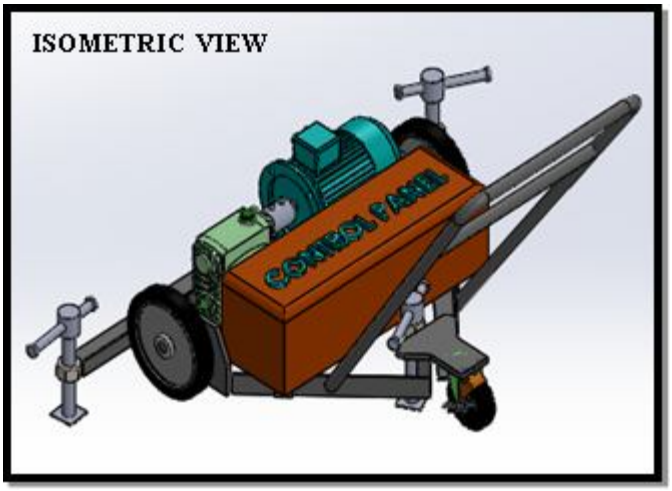
- To reduce cycle time.
- To reduce Human effort and fatigue.
- To improve safety of the operator.
- Simple in Construction and portable.
- Eliminate need of two workmen.
- To reduce cost of the process.

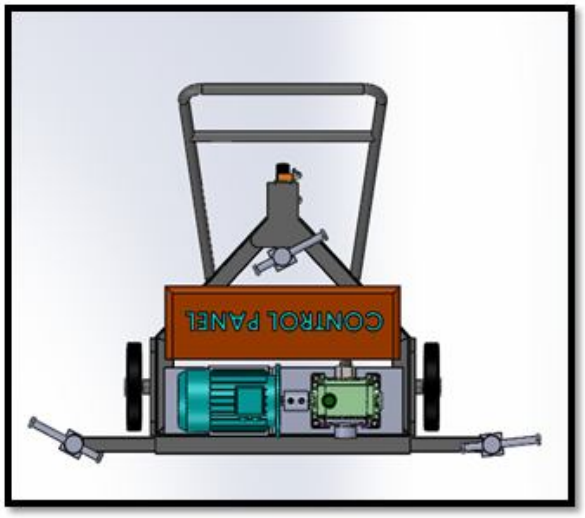
III. CONSTRUCTION

The new system will be consisting of the worm and worm wheel gearbox coupled to a motor which will be mounted on a trolley for its easy transportation. The device can also be used for various nut size ranging from 46mm to 52mm at various heights ranging from 170mm to 250mm from ground. The motor used is connected to the control panel for its forward and reverse motion and is also provided by a remote for its operation. The main advantage of this new system is that it is easy to move and will require only a single worker to perform the activity resulting in saving time as well as manpower. It also causes very less fatigue to the workmen, and the most important thing is that it is very safe to use.

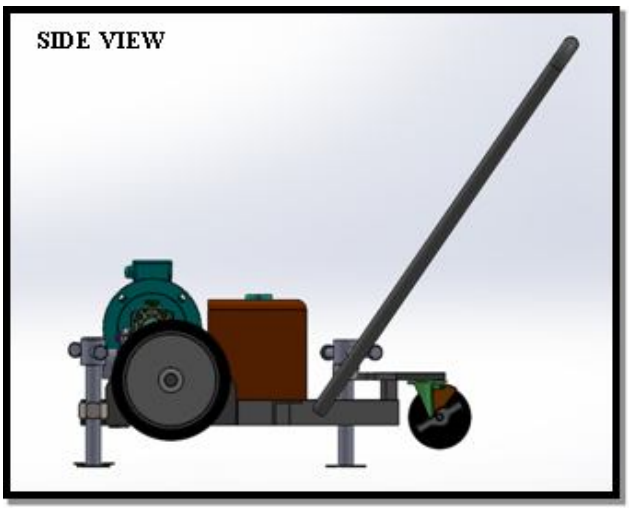
3.1 Technical Parameters

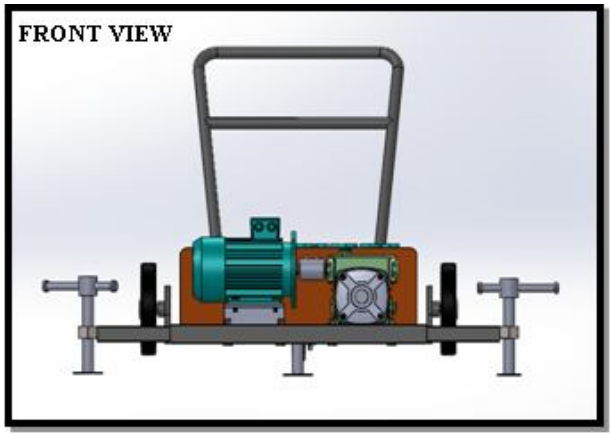
1. Motor- 2 HP Three Phase A.C Motor 1440 rpm.
2. Gearbox- Worm and worm wheel gearbox with reduction ratio of 40.
3. Overall dimensions- 900mm X 750mm X 1200mm.





TOP VIEW





IV. CONCLUSION

Thus this design of automated system can be implemented in order to reducecycle time, human fatigue and cost of the process. The new machine also eliminates the need of two workmen and only one workmen is required for the

process. The new system created is also very safe for operation thus eliminating the danger of accident.