

# Enhancement of productivity by ergonomic design for radial piston pump assembly workstation in an industry.

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**Abstract-** With the increased global competition enhancement in productivity for an industry has become the need of the hour. One of the solutions for this can be application of ergonomic design of the existing assembly workstations. The present paper focuses on the ergonomic design of a radial piston pump assembly line so as to obtain improved design with enhanced productivity for a typical industry chosen. The work has resulted in increased productivity, reduce assembly setup time, reduce unnecessary movements and reduce wastage of floor space. The layout is designed on the basis of product flow in U-shape with centralized storage system which is implemented for higher productivity. U-shaped configuration allows the work cell to be laid out using fairly small footprint. This layout reduces space and travel distance by men and material and thus provide proper utilization of workforce and minimizes total cost. The work involves the assembly process of pumps, parametric analysis and designing an assembly workstation to optimize the assembly time and increase productivity. **Keywords – Productivity, radial piston pump, ergonomics, assembly line.**

## I. INTRODUCTION

A Pump is a device that moves fluids (liquids or gases) or sometimes slurries by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps. A radial piston pump is a form of hydraulic pump. The working pistons extend in a radial direction symmetrically around the drive shaft, in contrast to the axial piston pump. These are made up of valve-controlled pump cylinders arranged in radial star-shape. They supply pressurized oil reliably up to 700 bar. They can produce a very smooth flow under extreme pressure. Generally they are variable- displacement pumps.

Various researchers have worked on increasing the productivity in an industry using ergonomics technique. Ibrahim (2001), conducted an exploratory study on get together workstation considering agronomical issues and examined the impacts of get together of an item on administrator execution. The fundamental commitment of the work was focused on how to quantify the creation rate of manual sequential construction system in view of ergonomically planned get together workstation. Yeowa and sen (2006), directed 'Efficiency and quality upgrades, income augmentation, and dismissal cost diminishment in the manual part insertion lines through the utilization of ergonomics' in a Printed Circuit Assembly (PCA) production line. Live investigations were led on generation lines. In total eleven issues were recognized, i.e., long look for materials from the stores, inefficient manual park checking, hindrances and insertions, segment tumble off while the PCA board was going on a U- moulded transport. Francesco et al. (2006), directed 'Powerful outline of a mechanical Production system utilizing displaying and reproduction' developed work with respect to the powerful plan of a get together line of warmers generation. The viable outline of mechanical production system workstations by method for joining between ergonomic examinations and demonstrating and reproduction. Santos and Sarriegi (2007), directed 'utilizing ergonomic programming as a part of non-dreary producing forms: a contextual analysis'. This paper reveals, by method for a case study in view of a genuine procedure, the points of interest and the down to earth hindrances included in the execution of 3D recreation apparatuses in SMEs. Shikdar and Al-Hadhrami (2007), led 'Brilliant workstation plan: an ergonomics and strategies building methodology' and this exploration was to outline and build up a savvy workstation for performing modern gathering assignments. A completely customizable ergonomically composed workstation was produced. Battini and Faccio (2011), directed 'New methodological system to make strides profitability and ergonomics in get together framework plan'. This work break down how ergonomics and get together framework outline strategies are personally related. It too builds up another hypothetical structure to survey

a simultaneous designing way to deal with gathering frameworks plan issues, in conjunction with an ergonomics advancement of the working environment. Gurunath and Jadhav (2012a) led ‘Ergonomic examination of a get together workstation to recognise tedious and exhaustion bringing on components utilizing use of movement think about’ and explore heaps of cash on man, machine, material, technique(4m), enhancing ergonomics of work environments is cost sparing. Ergonomics discovered extraordinary need when market interest is high and makers require more yield inside brief period. [8] Das and Grady assessed the idea of workspace outline and used of anthropometric information. They suggested that a flexible seat and workbench of standard size were exceptionally attractive at the work environment. In any case, a standard stature for the workbench couldn’t be characterized without the anthropometric information of the client populace. It is hence attractive that the worktable ought to likewise be customizable. Cimino et al. gave an account of viable ergonomic outline of gathering workstation described by a few ergonomic changes as far as vitality use and process time. Flexible workstation outline for the most part centred on PC workstations and Video Display Terminal (VDT) arrangement unit. Shikdar and Al-Hadhrami[13] attempted a study to build up a completely flexible and ergonomically planned workstation (savvy workstation) for dreary get together undertakings. Singular administrator could tailor the workstation as indicated by his/her own needs and it could be utilized as sit, stand and sit-stand workstations. Labourer efficiency on this workstation was fundamentally higher, 42.8% contrasted with the current non ergonomically outlined and altered workstation.

*1.1 Work Done:*

The preliminary study of the problem has been carried out. Data of assembly workbench, and cycle time of existing assembly workbench has been collected for 3 months. From this data it’s found that the cycle time at the assembly work bench was maximum because of improper layout of assembly workbench. The earlier layout at the industry was as shopwn in figure 1.



Figure 1: Earlier layout of the plant.

After introspection at the industry the proposed layout is as follows:

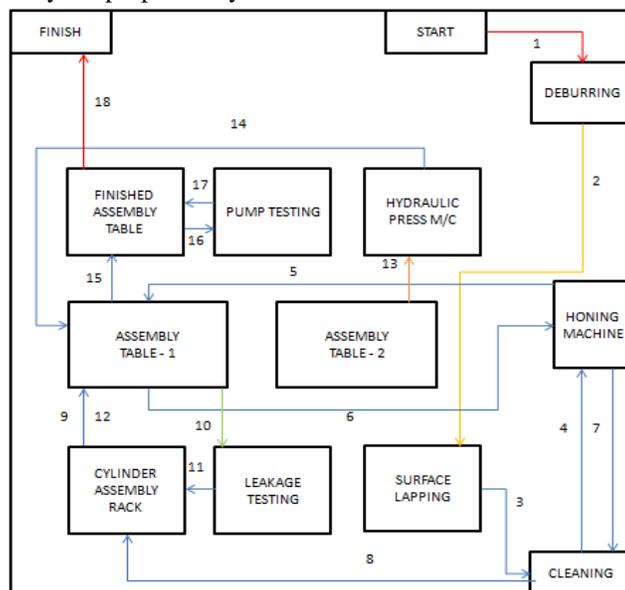


Figure 2. Proposed layout for efficient productivity on the assembly line.

The work done with regards to the earlier method and present method is as follows:

## II. EARLIER METHOD

1. Sorting time of components found to be maximum during assembly of components.
2. Employee fatigue while assembly of pump leading to more wastage of time.
3. Improper storage arrangement.
4. Low productivity.
5. Wastage of floor space for sorting of components.
6. Assembly process time is maximum.

## III. IMPROVED METHOD

1. Sorting time was reduced
2. Minimum fatigue for the employees.
3. High productivity.
4. Less wastage of floor space.
5. Assembly process time was minimum.

The proposed radial piston pump assembly design is as shown in figure 3.

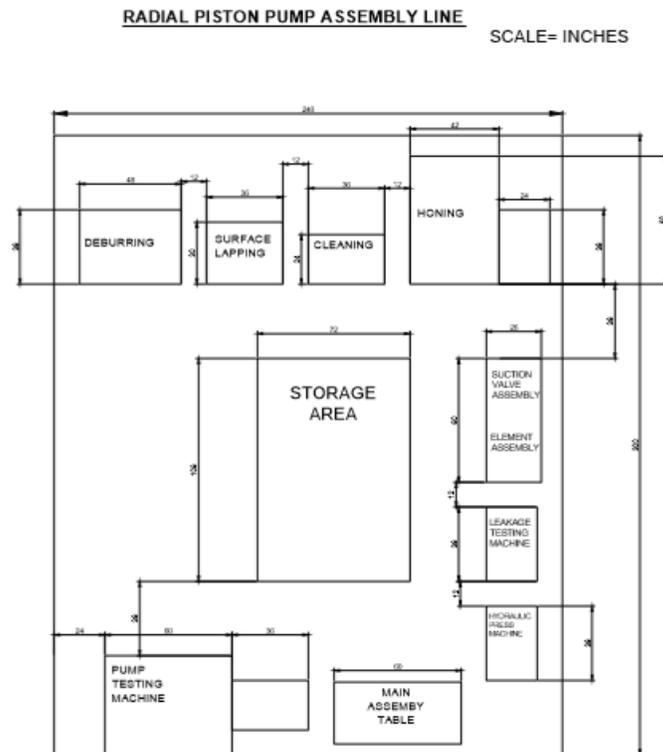


Figure 3. Proposed Radial piston pump assembly design.

## IV. CONCLUSION

With the proposed design of new assembly workstation, the workstation has been fabricated and implemented in the assembly section. Thus it has been used for a month and cycle time is carried out, and thus the cycle time is reduce due to new design of assembly workstation. Parameters achieved after implementation of new assembly workstation.

- ✓ Increased productivity
- ✓ Reduce assembly setup time
- ✓ Reduce unnecessary movements
- ✓ Reduce wastage of floor space

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