

SUMMARY

This thesis is about INDUSTRY 4.0 impacts on industries. INDUSTRY 4.0 is commonly referred to as fourth industrial revolution. In this thesis I tried to show about different scenarios of production system.

DIGITAL FACTORY: This part is divided in to 3 parts. Namely “Initial” , “Later” and “Industry 4.0”.

MAIN GOAL:

- Experimenting the concept of flow and its impact on productivity in assembly through the application of Industry 4.0
 - Operations knowledge and practicing the method and tools to create a dynamic process that is self adapting to events
 - Experimenting the route map for lean digital transformation
- The product is cart with many variants, 2 fixed brackets and 4 rotating brackets, connecting bracket and spring, secondary frame on primary frame.

INITIAL SCENARIO:

In initial scenario our product to be made/assembled is on workbench. A position is assigned for the operator. The tools box is on floor. When operator works he needs different tools so he bends and then finds tools from tools box. Due to bending he faces ergonomics problems (MURI) and the time which is being spent in searching of tools he has (MUDA) and is doing non value added activities. Non value added activities can be waiting, handling, over production, inspection, material transport, walking, waiting in process etc.

Work instructions for each workstation are displayed in the form of theory which are not so clear. Different operators do different operations after reading same instructions. Each workstation is under supervision and we do analysis at the end of process. In this scenario total added value activities were found 49% while 51% were non value added activities.

LATER SCENARIO(IMPROVED)

This is improved scenario as compared to previous. We will have less non value added activities and more value added activities as compared to initial scenario.

Material is in golden zone in the range of hands so it means operator does not have to walk to take material. Tools are present on the workbench instead of on floor. This is good as compared to initial scenario because the operator does not have to bend or to walk to pick tools so we are eliminating non value added activities. With the help of pneumatic pedal material comes in golden zone and empty boxes go down so operator is saving his time in walking and material taking and then returning to workbench. In initial scenario we had paper instructions but in this improved scenario we have visual instructions and it is easy to understand instructions in the form of pictures which reduces the chance of poka-yoke.

After analysis we got good results as compared to initial scenario. Non value added activities and cycle time are reduced while value added activities are increased due to which productivity is increased.

DIGITAL FACTORY:

Digital tracking

Pull system

Zero handling

Material in golden zone

One-piece flow

Synchronized material feeding

Material is fed in golden zone through fully automated flip-flop. Tools are in golden zone and positioned according to real need at each location. To feed materials we follow JIT, JIS, Digital Kanban and two bin concepts. Work instructions are displayed on the monitor automatically synchronized with the production sequence. To control quality we use image processing technology. Image processing/recognition technology is being used in quality control by following the programmed instructions for process. In case of right step and wrong step we get notification. At the end of process we are being informed. The system notifies if a wrong operation is performed and stops the line (ERROR PROOF)

Instead of normal screw driver we use self-controlling screw driver in which we can control torque and angle during bolts tightening. Wrong fastening is notified and the system stops the process.

After analysis we get best results so far. Non value added and cycle times are very much reduced and productivity is highly improved.

LOGISTICS:

INITIAL SCENARIO: MATERIAL FEEDING

In initial situation logistics is done by patrolling.

Boxes are present on the floor

No synchronized material feeding

Extra handling and extra movement

IMPROVED SCENARIO

Synchronized manual feeding

Manual logistics

No extra handling

Frontal feeding

Logistics operator collects empty boxes

Cycle time is reduced by 25% and productivity is increased by 33%

Digital logistics 4.0

DIGITAL PULL: The line is fed in function of and synchronized to the real consumption of the line by digital sequence control. which follows the Takt time.

SYNCHRONISED DIGITAL SEQUENCING: Right Material is available with the help of MES in right quantity, right sequence when and where needed.

SELF ADAPTING: The right material right sequence is adapted in real time to the instantaneous state of the line and quality problems.

Instead of logistics operator, logistics is done by AGV-MIR. Synchronized material front feeding.

Automatic digital just in sequence is done by robot kitting.