

STUDY ON THE TECHNOLOGICAL PROCESS OF ASSEMBLING THE CAR WIRING AND IMPROVING THE WORKPLACE

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Rezumat. *Obiectivul principal al acestei lucrări este de a evidenția importanța îmbunătățirii continue pentru a obține performanțe înalte, oferind o imagine a modului de dezvoltare, evoluție și gestionare a fluxului de producție, scoțând în evidență metodele de creștere și îmbunătățire a eficienței producției în cadrul organizației.*

Abstract. *The principal objective of this paper is to focus on the significance of non-stop development to gain excessive performance, supplying an picture of the way to develop, evolve and control the manufacturing flow, bringing to mild a few strategies to improve and enhance manufacturing performance within organization.*

Keywords: Technological assembly process; Car wiring; Improving the workplace.

1. Introduction

A technological procedure is a sequence of steps and sports which are used again and again to create a services or products or to gain a selected goal. When a procedure works properly, it could enhance the overall performance of the corporation, each in phrases of performance and productiveness, and with the aid of using elevating patron satisfaction.

Although methods have usually guided moves and decided enterprise outcomes, the procedural method is turning into an increasing number of vital as corporations understand the relevance of development methods. Improving a era procedure or a computing device often calls for vast funding in time, monetary assets, and human assets to be recognized and implemented. Before making an funding, for you to enhance a procedure, it should be cautiously considered, whether or not it's miles the maximum suitable for the corporation's approach or not. In order to gain vast outcomes withinside the procedure of enhancing a procedure, we should first pick out the ones methods that upload fee to the corporation.

In order to fulfill the productive objectives of the organizations, they perform with some of running equipments, such as: strategies and strategies for prioritizing and gathering data, strategies and strategies for reading troubles and synthesizing

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answers for development, standards and equipment of the Lean control system, paintings standardization strategies, strategies for figuring out running time and procedure overall performance, Just-in-Time (JIT) approach, Kanban kind strategies, Heijunka approach for leveling procedure capacity, approach "Bucket Brigades" for non-stop glide corporation for typically guide sports, SMED approach to lessen adjustment time to alternate manufacturing, Poka-Yoke approach for paintings development, Kaizen approach and 5S approach for non-stop procedure development, along with the global preferred EN ISO [1], [2].

The take a look at of this elements became completed inside a multinational company, car manufacturing, electric and digital wiring, for a numerous organizations of customers: Renault, Nissan, Lotus, Mercedes-Benz, Maserati, Lamborghini, Opel, Ford.

This paper presents a top level view of the way manufacturing glide is developed, evolved, and managed, and a few strategies for growing and enhancing manufacturing performance in an corporation. At present, it's miles acknowledged that a excessive stage of productiveness can best be carried out and maintained with the aid of using the involvement of all actors concerned withinside the manufacturing procedure. Production performs a completely vital position in making sure that the product is made to excessive standards [3], [4].

In the paper, answers could be brought that cause the development of the computing device and the manufacturing glide on the automobile wiring meeting line. To gain this, the wiring meeting line has been monitored for an extended time, and the technological meeting procedure has been carefully monitored. This evaluation will enhance jobs and growth the first-class of manufacturing according to unit of equipment and manufacturing area. It is important to systematically perform moves and analyzes for all workstations included into the system.

2. The cutting-edge stage

In organizations, no matter the kind of technique they adopt, its size, improvement over the years and allotted resources, you may see one of a kind defining traits for a technological technique. They ought to make a technique staggered, flexible, adaptable, purposeful, prioritizing innovation and non-stop development.

Improvement, a technique or a job may be described as a better performance than the preceding one. The employer ought to decide and pick out possibilities for development and put in force any motion important to fulfil client necessities and growth client satisfaction. The latter ought to encompass an development of merchandise and services, save you and decrease unwanted effects, and enhance the overall performance and effectiveness of the great control system.

Improving the place of work has a tendency to grow to be a manner of thinking, an strive via way of means of managers to apprehend what goes on inside a technique as a way to be capable of make selections that result in advanced man or woman and common overall In order for a technique to be efficiently implemented, it's far vital that the collection of sports may be correlated with a imaginative and prescient of non-stop development and using current overall performance practices [5], [6].

Most machines and technological installations encompass a sequence of components and subassemblies. In many cases, they ought to fall inside positive limits of dimensional deviations, which might be associated with each the development and the manner they paintings collectively.

The layout of an meeting line, a vehicle wiring and the wide variety of stations, is executed beginning from a specification given via way of means of the client, the outcomes are meant to be as aggressive as possible, in phrases of price and great, on the way to outperform any competition withinside the vehicle wiring market.

The layout of the manufacturing line may be executed for the maximum complicated version, the opposite variations can later be labored at the equal manufacturing line. After finishing those enter records from the specifications, we pass directly to the following level, namely, the layout of the operations important for the conclusion of this vehicle wiring.

The layout and bodily execution of a vehicle wiring is executed in near collaboration with the client. Its bodily execution is executed withinside the first segment withinside the prototype stage, the wiring being sooner or later established via way of means of the client, as a way to deliver his attractiveness following the necessities for which it changed into designed.

The mission is going thru numerous levels of change till it reaches the very last form, so the layout and assimilation takes among one and years.

The execution of the prototype wiring is executed via way of means of specialised personnel (engineers), in areas that aren't a part of the manufacturing facility wherein the same old vehicle wiring may be obtained.

Upon finishing touch of the prototype wiring, the client will conform to the wiring and make a brand new layout of the automobile wiring for a small series. The drawing is transferred collectively with the documentation concerning the unique records of this wiring to the manufacturing facility wherein it is going to be produced, observed via way of means of a grasp wiring (wiring that has the label and great documentation signed via way of means of the This wiring harness is the same old wiring harness to be manufactured.

The layout of the manufacturing line, for the conclusion of the favored wiring, may be executed in line with the important operations for its execution.

3. General records on Bumper Front wiring meeting

The vehicle wiring we're relating to is known as the Bumper Front and is a part of a sequence of wiring harnesses for the Mercedes SL vehicle. The precise records for this wiring, which we discover within the specifications, are the following:

- ordering one hundred vehicles in line with day, so there should be not less than one hundred wiring in line with day;
- the wide variety of capabilities executed with the aid of using the wiring, this being completed relying at the preferred vehicle variant (Bumper Front wiring is completed in 10 variants).

The meeting line has 10 stations (Figure 1), along with the product electric checkpoint and the packing/conditioning table. Regarding those 10 positions, there may be additionally an operator from the great branch who exams the goods with the aid of using sampling, proper within the vicinity of the packing table. After checking the product, it'll visit the packing station.

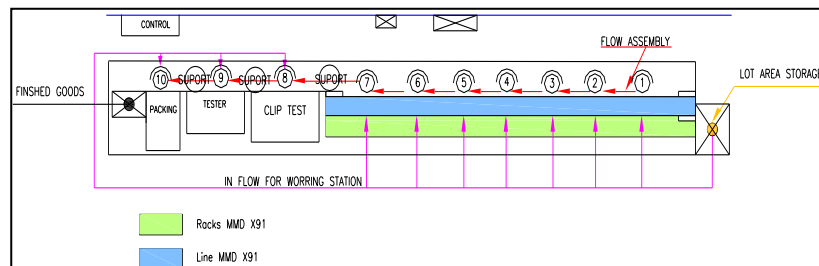


Fig. 1. Wiring assembly line

In order with the intention to collect the auto wiring, an intermittent rhythmic mounting machine is used within the factory. In order to maximise the productiveness of the meeting, it's miles vital to regroup all operations so that every one the mounting stations are loaded as frivolously as possible. This meeting line is positioned into operation and will become beneficial for manufacturing with 10 operators plus the road supervisor and the nice operator.

In order with the intention to collect the wiring of the machine, an intermittent rhythmic mounting machine is used within the factory. In order to maximise the productiveness of the meeting, it's miles vital to regroup all of the operations so that every one the meeting stations are loaded as frivolously as possible.

The predominant elements which are analyzed within the development of the administrative center are:

- function of the operator;
- the glide of moves accomplished through the operator within the notebook;

- the content material and association of the gadget in the station;
- the surroundings wherein the paintings method took place;
- pleasure of the paintings accomplished through the operator.

The function of the operator should be approached from the start of the analysis, as a consequence making sure the operator most consolation on the notebook. When doing the analysis, we should remember each the model of the administrative center to the anthropometric dimensions of the operator, to the physiological opportunities of the operator and to the paintings capability of the operator.

The glide of moves accomplished through the operator withinside the paintings method determines, to a big extent, the needs of the operator withinside the paintings method. The decrease the wide variety of moves accomplished on a simple, low-attempt trajectory, the decrease the operator's fatigue.

Another technique this is carried out to enhance the notebook is the recording method, greater exactly the direct commentary this is used to take a look at the motion of the operator withinside the notebook. This is the best method used to document the operator's moves all through the paintings method. The observer should comply with all of the moves of the operator carefully, and relying at the issues suggested to the operator, the location could be improved.

4. Signification of the stations

The automobile wiring meeting line includes 10 stations, and every computer is represented with the aid of using positive operations.

Stations 1, 2 and three are comparable stations, wherein operations are executed to insert circuits into connectors and set up them in well-described orientation and solving devices, referred to as bushes.

In stations 4, 5, 6 and 7, splicing operations are achieved by way of operating devices, referred to as worktops, which make certain the solving and orientation of the secondary branches to the primary department. With those operating devices, the operators make certain that the technological measurements of the wiring are according with the ones withinside the execution drawing.

Station eight is the placement wherein the operator has as operations: solving the placement and orientation of the clips, that have the position of solving the wiring at the machine, and geometrically checking the wiring. For every segment of mounting the clips at the wiring are unique: the range of the clip, the department in which it's far to be set up and the space from a connector or different unique constant point.

Station nine is the computer wherein the operator plays electric trying out of the finished automobile wiring, extra exactly the placement of the connectors withinside the housings, the presence of a quick circuit, circuit reversals

withinside the connectors, securing the terminals withinside the connectors, damping check (unique splicing, sponges, etc.), the presence of clips (Fig. 2).



Fig. 2. Electric workbench

The final post, station 10, has as operations: visible manipulate of the wiring and its packaging.

Like any technological machine, the meeting line is in non-stop technological transformation. It have to usually be studied so one can discover feasible improvements. Thus, at some point of the supervision of the meeting line, the subsequent deficiencies of the manufacturing waft and implicitly of the meeting line have been observed:

- shutdown of the road because of non-final touch of operations associated with the workstation (balancing of positions);
- needless actions that don't upload fee to the electric wiring;
- needless time misplaced while taking the additives from the garage boxes.

The deficiencies offered above are definitely associated with the time misplaced because of the incorrect area of a few additives at the meeting line, however additionally to the shortage of ok devices. Thus there's a want for improvement, ie the improvement of latest answers that in the end want to enhance the workstations and therefore the working parameters of the meeting line.

Improvement answers are primarily based totally at the classical idea of dividing the paintings of creating a product, considered as a whole, right into a massive variety of man or woman operations.

The improvement of latest answers is basically primarily based totally at the improvement of ok equipment. The operator does now no longer must tour with the subassembly he's running on the meeting line, which has an intermittent tactile rhythm, he chooses the important components and additives from constant garage factors on his route. The meeting traces are pushed robotically and managed via way of means of programmed networks.

5. Proposed solutions for enhancing the workspace

Following the evaluation executed at the Bumper Front vehicle wiring meeting line, the subsequent workspace development answers have been proposed:

1. Introduction of a manual tool to the go back belt;
2. Insertion of a welding station withinside the meeting line;
3. Balancing the manufacturing line with the aid of using standardizing meeting instances at workstations.

The implementation of the toufix steerage tool (Fig. 3) is finished in station 5, due to the fact the operator on this role wasted a number of time thru needless frame movements, which caused a totally excessive fatigue factor.

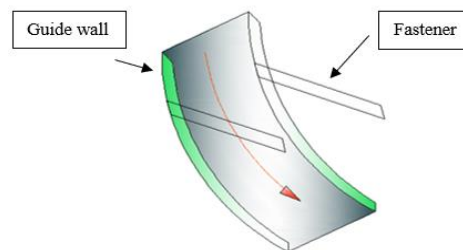


Fig. 3. Toufix guide device

Initially, the welding station become outdoor the meeting line, extra exactly withinside the instruction phase. Following the evaluation of the defects, there has been a waste of time to go together with the wiring withinside the welding area. It has been proposed to transport the ultrasonic welding station set up to the cease of the meeting line. Thus, the goods that require this operation not want to be transported to some other phase and are made proper subsequent to the meeting line, extra exactly at its cease. The welding station can be placed proper at the start of the meeting line, subsequent to station 1.

The new configuration of the meeting line, with the welding machine, placed a brief distance from station no. 1, is presented in the Figure 4. It need to be stated that now no longer all automobile wiring will must undergo the welding station, however the ones merchandise which have troubles with the welded circuits. This is depending on the development era of the completed product. In those cases, the welding operator can be used for different operations at the meeting line, electric tester or packaging.

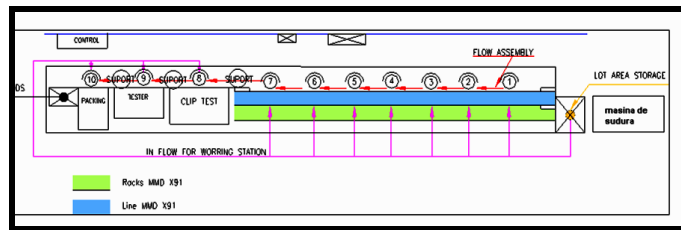


Fig. 4. Modified assembly line

The manufacturing cycle is that succession of technological operations and sports that make up the manufacturing method via which the gadgets of labor byskip in an prepared manner in order that they may be converted into completed products. In order to attain an about consistent time on all workstations, the technological method changed into intervened through shifting a few paintings operations from the loaded workstations to the least loaded ones, see Figure 5.

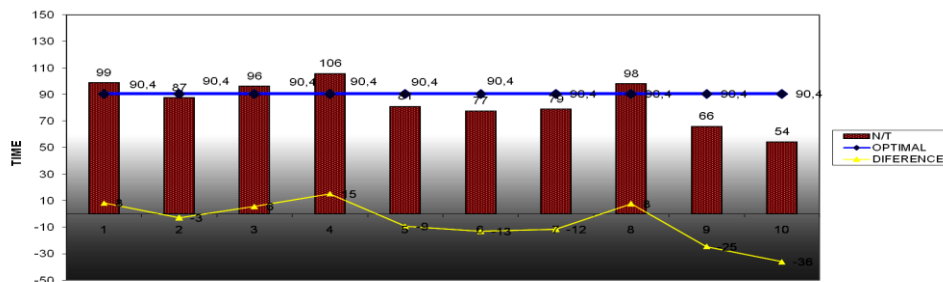


Fig. 5. Diagram of times before swinging

The operations which have been moved are proven in Table 1.

Table 1. Assembly line balancing actions

No	The action
1	Moving a thread from Station 1 to Station 2
2	Moving an adhesive tape spot from Station 3 to Station 4
3	Moving a 150mm splicing from Station 4 to Station 5
4	Moving a 20mm sponge from Station 5 to Station 7
5	Moving two moments from Station 8 to Station 9

The manufacturing cycle for every computer, after balancing the line, is highlighted in the Figure 6.

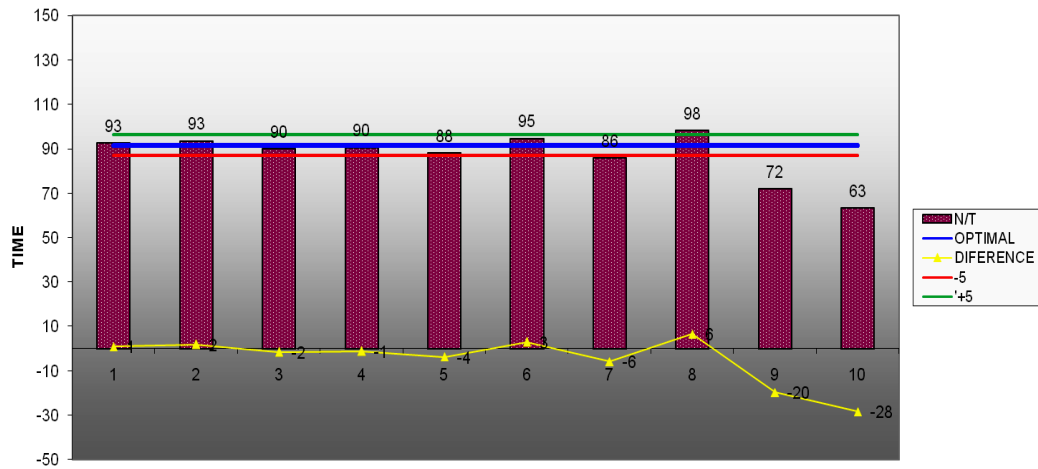


Fig. 6. Time diagram after line balancing

By making use of the proposed solutions, we are able to shorten the lead instances to the gain of reducing expenses and growing manufacturing capacity, we are able to enhance the flow.

6. Conclusions

This paper indicates that non-stop development is wanted in any manufacturing machine today. The 3 modifications made to the meeting line have delivered apparent upgrades withinside the running parameters of the meeting line, withinside the ergonomics of the station and withinside the growth of productivity.

The purpose of this research is to spotlight the significance of non-stop development for improving performance.

By imposing the proposed new solutions, it is possible to introduce from now directly to the brand new initiatives for modern-day improvements in phrases of technology and technical gadget solutions. It is possible to reduce the costs and the cut-off dates for execution after which the operation of the funding objectives, while making sure the first-class necessities asked via by the client.

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