PRODUCTIVITY IMPROVEMENT IN MODULES PRODUCTS THROUGH EFFECTIVE UTILIZATION OF RESOURCE USING VALUE STATIC MAPPING (VSM) CONCEPT

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ABSTRACT

*LEAN principle has become an important factor for improvement of any product in all companies to make the transition from traditional production method to lean manufacturing system. It often implies relationship with sub-contractors, suppliers and transportation companies. This project originates from company "**NCR Corporation Pvt. Ltd, MWC –Chennai**" that manufacturing different type of ATM machines like Self-Serve, SDM2 and SCPM. The purpose of this project has been to identify and analyze Sub assembly movement from one stage to another stage so that will get some time delay to complete the product. To modulated sub assembly stage to avoid unwanted moments from one stage to another stage it has given more production compare to previous case. Identified SDM-2 main line assembly stage to found material shortage and not arrangement of proper material in the respective bins so that case has affected in the production. As per the observed problems has been a designed storage bin with capacity and find where it has been placed in the line. Easy to identified parts and quantity in upcoming production, save production time and avoid wrong parts assembly in the SDM -2 main lines. Designed various type of fixture like Timing sensor fixture, lower bearing assembly fixture and Tray fork assembly fixture using parts assembly in the easy ways and reduce assembly time and damage while during assembly.*

keyword: *productivity improvement, modules products*

I.Introduction

The NCR CORPORATION (National Cash Register) is an American computer hardware, software and electronics company that makes self-service kiosks, point of sale terminals, automated teller machines, check processing system, barcode scanners, and business consumables support services. They also provide IT maintenance support services.

NCR Has 6 Manufacturing Plant

- Columbus - USA
- Manaus - Brazil
- Pondicherry - India
- Tamilnadu - India
- Budapest - Hungary
- Beijing - China

It's from this unique position that NCR boldly invites businesses and consumers to "**Experience a new world of interaction".**

NCR Corporation, the global leader in consumer transaction technologies, inaugurated its state-of-the-art manufacturing facility in Chengalpattu, close to Chennai. The new facility at the Mahindra World City is built over

an 117,079 square-foot area, with a single roof design structure that allows NCR to introduce innovative technologies faster to the market and expand to new growth industries like retail and hospitality

2. Objective

A value stream includes all activities required to transform a product from raw material into the finished goods. Value Stream Mapping scrutinizes business processes from beginning to end and a visual representation map is drawn of every process involved in the material and information flows. Then a future state map is drawn to show how things should work for best competitive advantage. Value Stream Mapping helps to identify the current flow of material and information in processes for a family of products, highlighting the opportunities for improvement that will most significantly impact the overall production system. In this research paper we addresses method of value stream analysis, which is a tool for helping manufacturing companies to go lean and to achieve larger control of their value stream.

3. Literature Review and Theory

3.1 Introduction

Lean Manufacturing can be defined as "A systematic approach to identifying and eliminating waste (non- value-added activities) through continuous improvement by making the flow of the product as pull to the customer in pursuit of perfection."

After the Second World War, Japanese were acing decline in human, material, and financial resources. The problems they faced in manufacturing were vastly different from western counterparts. Early Japanese leaders such as Toyota Motor Company's Eiji Toyoda, Taiichi Ohno, and Shigeo shingo developed a single, process-focused production system known as **"Lean Production**". The objective of this production was to minimize the wastes and the consumption of resources that add no value to a production

3.2 Literature review

a.Value Stream Mapping (VSM)

A value stream includes all activities required to transform a product from raw material into the finished goods. Value Stream Mapping scrutinizes business processes from beginning to end and a visual representation map is drawn of every process involved in the material and information flows. Then a future state map is drawn to show how things should work for best competitive advantage. Value Stream Mapping helps to identify the current flow of material and information in processes for a family of products, highlighting the opportunities for improvement that will most significantly impact the overall production system. In this research paper we addresses method of value stream analysis, which is a tool for helping manufacturing companies to go lean and to achieve larger control of their value stream.

b. Inventory:

This refers to any excess inventory that is not directly required for your current customer orders. It includes excess raw materials, WIP, and finished goods. Keeping an inventory requires a company to find space to store it until the company finds customer's to buy it. Excess inventory also includes marketing materials that are not mailed and repair parts that are never used

c. The 7 wastes

Waste is the use of resources over and above what is actually required to produce the service or product as defined by customer. An activity is categorized a waste if the customer will not pay for it; It could include labor, material, processes or machines. Taiichi ohno's 7 wastes is not a lean tool itself, because it does not directly tackle the problems within the production system, however, it allows the company to categorize such problems and focus its attention in the appropriate problematic areas already identified, this way, it plays a key role in tackling inefficiency and cost issues.

The 7 wastes are

- Over production

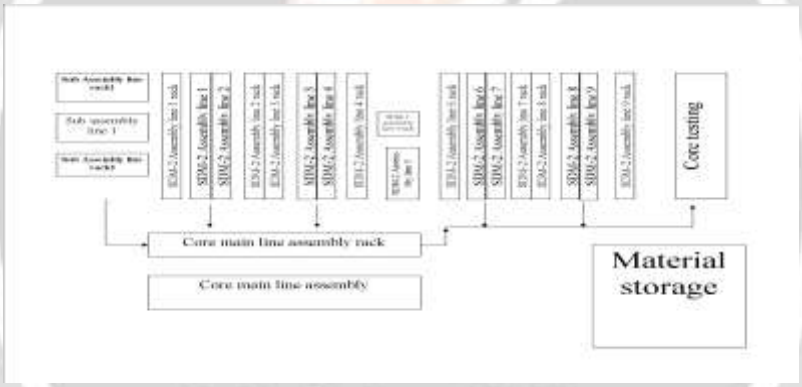
- Over-processing
- Waiting
- Reworks
- Defects
- Inventory
- Transportation & Motion

d. Pull:

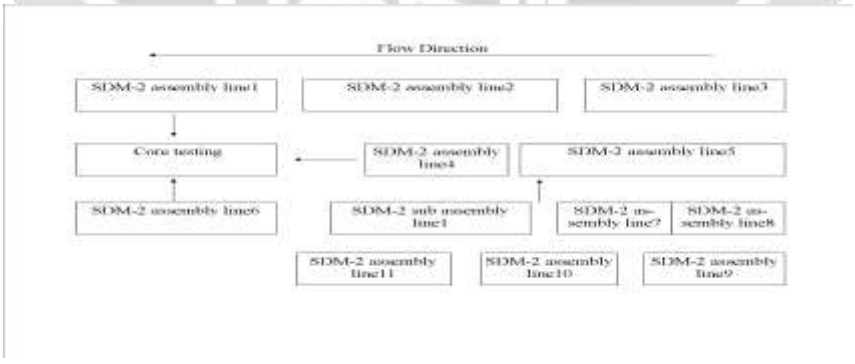
The term push and pull are used to describe two different system of moving through a production process. A push system is used when the work is finished at a work station and pushed to the next work station or the final inventory .conversely, a pull system is used even each workstation pulls the output from the proceeding workstation as it needed. In the pull system, production is pulled or determined by the customer's demand or the masters schedule, in a push system ,production is regardless of the next stage In the process, hence production is pushed to next stage without any reckon if the stage is ready for the production or not. As a result, work may pile up the bottleneck work station that experience any form of problem thereby encouraging high level of work in progress and a general high level of stock in the production process.

4. Design and Description

4.1. Analysis of current state map



CURRENT STAGE FORMAT OF SDM-2 MAIN LINE



FUTURE STAGE FORMAT OF SDM-2 MAIN LINE

The current state map is a fancy way of saying, "what happens now" or the "as-is" process. The current state map should show all the process steps and sufficient detail on how each step is completed and what happens to the items being processed. This will enable us to spot the causes of problems and thus the means to improving the flow, efficiency, reliability and flexibility of the process.

In current state map for the S2 and SDM2 dispenser line the reduction of the cycle time was analyzed and some kaizen ideas where shown in future state mapping. We analyzed in our current state mapping that production lead time for assembly process could 150sec& 1380 sec.

4.1.1 Problem identification

- Process flow at a few areas (S2 Assembly line 3, S2 Assembly line 4 & S2 Assembly line 5) is little bit complicated
- Location per part, Identification is not available hence it leads to searching parts
- Floor area not Underutilized at SDM -2 assembly's
- Unbalanced assembly sequence at a few stages work delay is there to meet TAKT

4.1.2 Solution

- Improved Process flow developed and attached the same for reference.
- To make bins in a standard design and arrange the only need materials parts at the particular stage.
- To reduce unwanted racks and refill all the parts in the required stages.
- To use a fixture for reduce the work time delay in some of the stages.

4.2. Time study data collection

Data collection is the process of gathering and measuring information on targeted variables in an established systematic function, which then enables one to answer relevant questions and evaluate outcomes. Regardless of the field of study or preference for defining data **(Quantitative or Qualitative),** accurate data collection is essential to maintaining the integrity of research. Both the selection of appropriate data collection instruments (Existing, Modified (or) newly developed) and clearly delineated instructions for their correct use reduce the like hood of errors occurring.

Stage/Trail	Trial-1	Trial-2	Trial-3	Trial-4	Trial-5	Pallet moment	Average
Stage-1	130	125	128	120	132	7	134
Stage-2	120	122	115	105	110	7	121
Stage-3	128	137	120	128	130	7	136
Stage-4	98	95	80	85	98	7	98
Stage-5	122	132	120	118	125	7	130
Stage-6	97	95	102	85	88	7	100
Stage-7	120	115	105	132	128	7	127
Stage-8	120	115	128	120	123	7	128
Stage-9	130	125	127	122	118	7	131
Total Time (All times are in Sec)							**1106**
Bottleneck Time (All times are in Sec)							**136**

Current S -2 assembly line 8 time study

Stage/Trail	Trial-1	Trial-2	Trial-3	Trial-4	Trial-5	Pallet mome	Average
Stage-1	130	125	128	120	132	7	134
Stage-2	120	122	115	105	110	7	121
Stage-3	128	137	120	128	130	7	136
Stage-4	99	97	89	87	95	7	95
Stage-5	122	132	120	118	125	7	130
Stage-6	90	86	82	88	81	7	87
Stage-7	120	115	105	132	128	7	127
Stage-8	120	115	128	120	123	7	128
Stage-9	130	125	127	122	118	7	131
Total Time (All times are in Sec)							**1089**
Bottleneck Time (All times are in Sec)							**136**

Future S -2 assembly line 8 time study

4.2.1 S-2 Modules

Suggested Takt time = 2.40 min

Production capacity = Effective Available Time / Suggested Takt time

= 460min / 2.40 min

Production capacity = 191 units / shift

Increased production efficiency = 1.11%

4.2.2 SDM-2

Suggested Takt time = 18 min

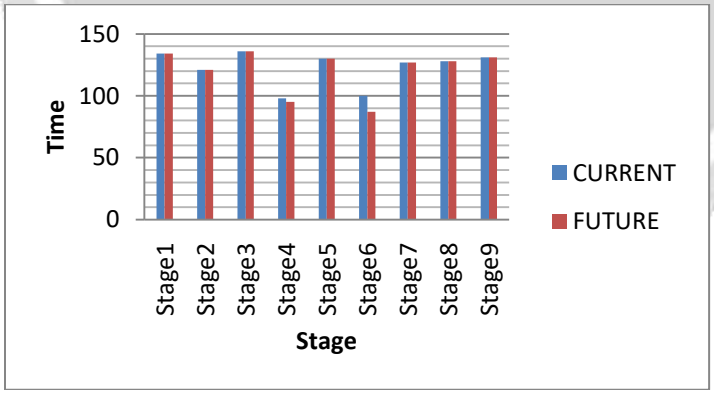
Production capacity = Effective Available Time / Suggested Takt time

= 460min / 18 min

Production capacity = 25 units / shift

Increased production efficiency = 1.25%

4.3. Current and Future Stage Chart



S-2 assembly line 8

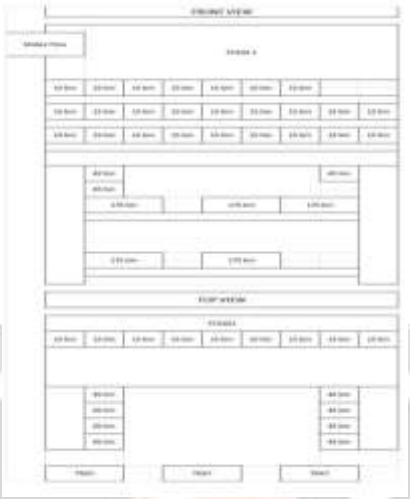
4.3.1 CHART DISCRIPITION

The above explained chart for leap module with the both current and future calculated cycle time was plotted and the result was explained,

- The" BLUE LINE " indicates the standard Takt time = 150 sec& 1380 sec
- The "RED LINE" indicates the reduced Takt time = 140sec& 1080 sec

4.4. Material space optimization

The material space optimization processes has improved more production and avoid unwanted space in the assembly area. Easy to identified require material and quantity as per the build type. It is very help to avoid unnecessary parts assembled in different build type.



4.5 Fixture design

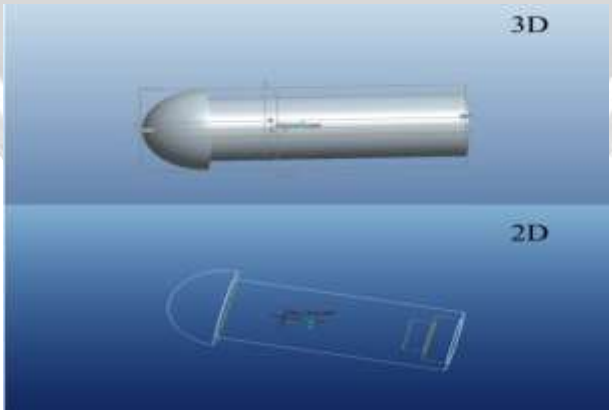
4.5.1 TIMING SENSOR FIXTURE

Problem Observed:-

The timing sensor used in the presenter module. While fixing timing sensor in that particular area through manually it will get some angle change so that reason unable to sensing properly and more change to get damage.

Alternate solution:-

We have designed "Timing sensor fixture" in that case to avoid damage and reduce assembly issues. Easy to handle, weight less easily can able to move one place to another place. Cost wise low



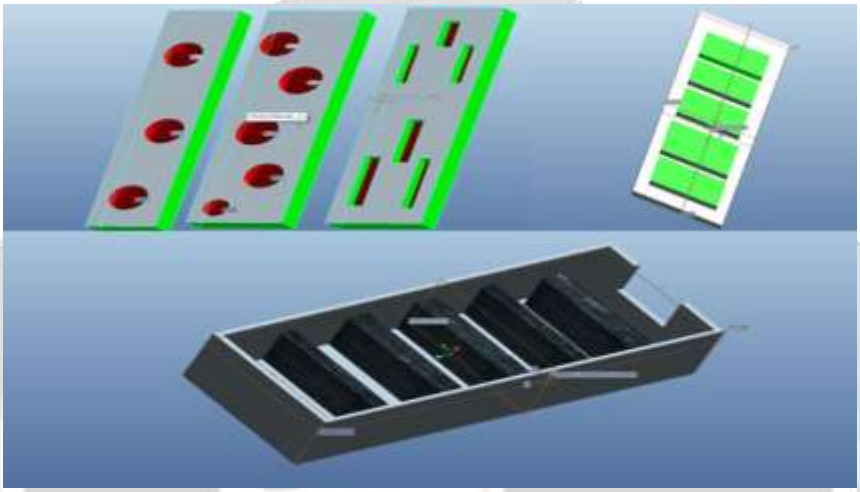
4.5.2 DEFECT MATERIAL CONTROL BIN

Problem Observed:-

DMC (Defect Material Control) it's parts of production department. While during parts assembly to find parts damaged in the area. To make that particular damaged parts hand over to DMC team. They will put all those defective parts in the same DMC Bin after that they cannot able to find requesting parts due to proper arrangements not available in the Bin.

Alternate solution:-

We have designed "DMC" (Defective Material Control) Bin to arranged size of material in the separate bin location so we will get time saving as well as easy to identified parts location and quantity.



5. RESULT AND CONCULUSION

CURRENT STATE	FUTURE STATE
• The current process makes more time taken by finishing one unit at time duration is 2.60 hrs.	• The future process to make less time taken by finishing one unit at time duration is 2.54 hrs.
• Stage position take more area occupied sub assembly's and storage	• New plan indicate effective utilization of area
• Process flow is complicated	• Process flow is simplified
• Fixture is used but the way of efficient working is less	• The fixture re-designed and making it into work efficiently
• Material space optimization of assembly line material space are high so production was slow	• The material storage space is low

Time study use in fixture in stage benefits:

Fixture name	Line& stage	Current state average time	Future state average time	Remarks
Timing sensor fixture	S2 Assembly line 7 &stage3	149	140	Timing sensor fixing and prepare handling time taken is more because it is an one of sensitive part. The fixture use to fair free work duration achieved save time is 9sec
Lower shaft bearing fixture	S2 Assembly line 8 & stage6	100	87	Shaft and bearing fix process take more time. Fixture used to saving time is 3sec
Applicator	S2 Assembly line 8 & stage4	98	95	Roller fixing process is create for slip age to produce rework that applicator reduce this problem saving time is 3 sec
Tray fork fixture	SDM2 Assembly line 1 & stage1	681	651	Fork the dumping process is create more pressure so handling time taken increased fixture is used to reduce this problem. The time savings is 30 sec

INTANGIABLE BENEFITS:

- The ergonomics factor the worker has been greatly increased.
- The work load is reasonably divided for certain stages.
- The use of trolley makes the shop floor as optimized.
- The properly aligned working environment increases the efficiency of the worker.

TANGIABLE BENEFITS:

- Nose area is 1300m^2 and it usage is only300m^2, dumb pick area is 1000m^2 that area is long distance from assembly line. The S-2 stages change in area 1000m^2can be saved and process flow is easy to handle.
- S-2 ASSEMBLY LINE 7 (stage 3) time savings is 9 sec.
- S-2 ASSEMBLY LINE 8 (stage4& stage6) time savings is 6 sec.
- SDM2 Assembly modules reduce unwanted racks and refill all the parts in the required stages.
- SDM2 ASSEMBLY LINE 2 time saving 30sec.

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