International Journal of Advanced Technology in Engineering and Science
Vol. No.5, Issue No. 03, March 2017
www.ijates.com
ijates
ISSN 2348 - 7550

IMPLEMENTATION OF STANDARDIZED WORK IN A LCV PRODUCTION LINE TO IMPROVE ITS PRODUCTIVITY

Syed Irfan S[1], Varun Bhatt[2], Shreenivas[3]

[1] *Mechanical Engineering Department, Sphoorthy Engineering College, Hyderabad, (India)*

[2] *Mechanical Engineering Department, Sphoorthy Engineering College, Hyderabad, (India)*

[3] *Mechanical Engineering Department, Sphoorthy Engineering College, Hyderabad, (India)*

ABSTRACT

Today in this highly competitive and globalized market, the primary objective of any manufacturing firm would be to deliver its products to its customers with zero defects and within the target date. To compete successfully in the market, adoption of Lean Manufacturing techniques would help the manufacturing firms to stay at zenith. This work is mainly focused on work Standardization, it is one of the most powerful but least used lean tools. By introducing and developing the work instruction sheet for current practices in the industry, standardized work forms the baseline, which sets for kaizen or continuous improvement. As this standard is improved, these new standard becomes the baseline for further improvements.

Keywords: Globalized, Kaizen, Lean Manufacturing, Standardization, WIS and Zenith.

I INTRODUCTION

The manufacturing industry is under pressure to achieve production in order to meet its target. An alternative that can change this scenario is Lean Thinking, as its implementation results in lead time and cost reduction and quality product improvement. Standardized work is an apparatus for looking after efficiency, quality, and security, at abnormal states. Standardized work is characterized as work in which the grouping of employment components has been proficiently composed, and is over looked after by a colleague. Standardized work is a procedure whose objective is kaizen.

According to Henry Ford standardize a method is to choose the best method out of many methods the best one, and use it. What is the best way to do a thing? It is the sum of all the good ways we have discovered up to the present. It, therefore, becomes the standard. Today's standardization is the essential foundation on which tomorrow's improvement will be based. If you think of "standardization" as the best you know today, but which is to be

enhanced tomorrow - you get somewhere. But if you think of this standards as confining, then progress stops. Hence these approaches are used to study the effect of value-added activities, non-value-added activities and waste times on cycle time of line.

1.1 Standardization

The Purpose of Standardized Work (SW) is to settle, in order to accomplish a base from which to develop and progress. "Standardized work (SW) is characterized as work in which the grouping of employment components has been proficiently composed, and is over and over took after by a colleague".

Standardization is a dynamic process by which one can set norms of wording, principles, methods & Processes inside of any organization. This standardization process should be audited, confirmed and overhauled every now and then based upon the recognized gaps, lessons learnt, feedbacks which is in accordance with nonstop change process. Standardized work is not to define only boundaries/constraints. It is to have organized work which is Observable, Measurable, Improvable(Kaizen) and Organize effectively to avoid waste of production.

The details of the standardization principle is as follows:

Workplace Organization

Management by TAKT time

Standardized Work

Visual Management

II LITERATURE REVIEW

All the manufacturing industries have put in continuous efforts for their survival in the current impulsive and competitive economy. In order to handle the critical situation, manufacturers are trying to implement new and innovative techniques in their manufacturing process by making it more effective and efficient. M. Shabeena Begam et al., [1] carried out a detailed literature survey and has conducted studies to identify the lean practices in various manufacturing industries to assist the organizations in the improvement of its process, align it to the requirements of its customers and relentless contribution to manufacturing sector to enhance productivity, quality and competitiveness is immense. Lean manufacturing tools are one of the most influential & most effective methodologies for eliminating wastes (MUDA), controlling quality, and improving overall performance of any machine, system or process in any industry with the complete assurance of large annual profit margins. Prathamesh P. Kulkarni et al., [2] proposes genuine solutions & concepts for implementing Work Study Methods and deploying associated lean manufacturing tools in any enterprise or industry, covering the technical, engineering, and manufacturing aspects as well as the business etiquette affairs. The benefits of lean manufacturing are evident in factories across the world. With a view to achieve performance improvement both the developed and developing countries are practicing lean. Farhana Ferdousi and Amir Ahmed [3] study to investigate the improvement of manufacturing performance through lean practice in the Bangladeshi garment industry. The findings indicate that the selected companies have adopted a wide variety of lean tools and techniques and gained many performance

improvements. According to Davood Gharakhani [4] Identify and ranking the different obstacles for implementing of world class manufacturing system in Iranian manufacturing companies using fuzzy Analytical Hierarchy Process (FAHP). In this study, first the obstacles to implementation of WCM system were recognized by library studies and some questionnaires and interviewing experts. Goriwondo, W.M et al.,[5] focus is on how companies can assess their progress in terms of achieving a world class manufacturing status. The research starts with an assessment of the world class status of the company that has adopted best manufacturing practices. K. Pałucha [6] complexity of issues related to modern management of production systems. Furthermore, it presents in a coherent form principles and the nature of the so-called World Class Manufacturing model. Literature on maintenance management practices evolution from total productive maintenance to world class maintenance has so far been very limited. Goyal Ravi Kumar and Maheshwari Kapil [7] reviews a large number of papers in this field and suggests the retrospective growth in this field. Subsequently, the need of maintenance, TPM attributes with it's different pillars, shortcoming of TPM are discussed in details then the world class maintenance system with its components, modules, factors for success and how to implement the world class maintenance system in any industry are discussed.

III APPROACH TO THE PROBLEM

The movement of Product or Material in the right quantity, at the right time, to the right location, with the right equipment, using the shortest lead time and the lowest possible cost for both the Supplier and the Customer. So, as per the customers' demand the manufacturing industry has to improve its productivity by reducing the cycle time.

3.1 Problem Definition

Optimization of cycle time using standardized work and development of work instruction sheet for under body line in XYZ shop and from station 1 to 7 in XYZ shop.

3.2 Project Objectives

- Understanding the fundamentals of standardization and its importance in the foundation of a lean system.
- To Prepare standardized work forms.
- To introduce standardization techniques to improve:
  - Training
  - Waste elimination
  - Sustainability of improvements
  - Reduction of cycle time

IV METHODOLOGY

This work is carried out in LCV manufacturing unit .To allow deeper examination and ensure the reliability of the data from the existing process, the cases were analyzed more thoroughly through, existing information, direct observations, and formal conversations, attending persons at meetings and events, and review of archival sources.
The following sequence of operations are carried out in a LCV manufacturing unit.

1. Studying the current process done in LCV shop
2. Collect and summarize the data about each process
3. Identifying the waste
4. Determine what changes are to be made in LCV shop
5. Develop Lean options
6. Training the operators
7. Results
8. Document the changes

The flow chart of methodology is as shown in the figure below:

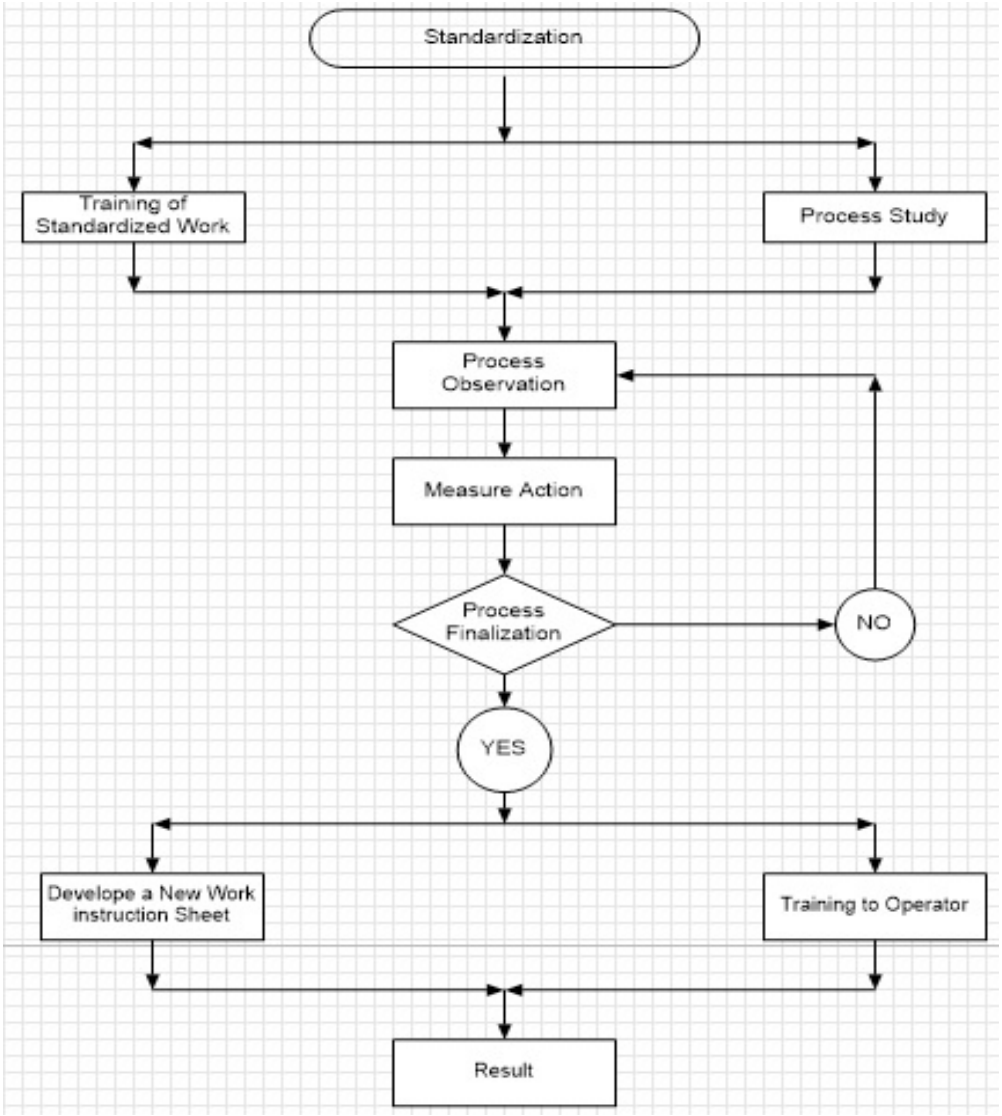

Fig 1: Working Methodology.

4.1 Process Study of existing System

The list of activities are mentioned here in the activity chart indicates the sequences of operations carried out by operator.

Activities carried out by Operator 1 for assembly of Light Commercial Vehicle before implementing Kaizen Activities. Fitments made by operator 1 for assembly of Light Commercial Vehicle in stations X-01 are Horn and Fuel Filter. The activities carried out by operator 1 for assembly of Light Commercial Vehicle are as shown in this table.

Table 1.1 Activity Chart of operator 1 for assembly of existing LCV

ACTIVITY CHART				
STATION NO : X-01	SUMMARY			
	EVENT	COUNT	TIME	DISTANCE
OPERATOR NO : 1	OPERATION	8	87	0
MODEL : MMM401	TRANSPORT	5	39	28
	DELAY	0	0	0
NO OF OPERATORS AT STATION : 2	INSPECTION	0	0	0
	STORAGE	0	0	0
ACTIVITY DESCRIPTION	TOTAL		126	28
Take the fuel filter from line side storage	⇨		11	9
Take the two hex bolt from line side storage	⇨		5	3
Align the fuel filter with frame bracket weld nut	O		10	0
Hand align both the bolts	O		10	0
Tighten all the bolts	O		10	0
Take assembly horn from line side storage	⇨		5	5
Take hex screw m8x20, bright washer 8.4, spring washer b8 from line side storage	⇨		8	3
Assemble screw & washers for fitment	O		10	0
Move to the horn fitment area	⇨		10	6
Align horn with the horn bracket	O		10	0
Tighten the horn using assembled screw	O		15	0
Tighten mounting bolt with use of nut runner	O		15	0
Connect the horn connection	O		7	2
TIME-Sec, DISTANCE- Meters				

4.2 PDCA Cycle

In order to come up with a framework for continuous analysis and improvement of the value addition process, the PDCA cycle has been introduced and all identified functions are categorized into the four distinct phases of the cycle – Plan-Do-Check-Act. Aesthetical values are also added through these function.

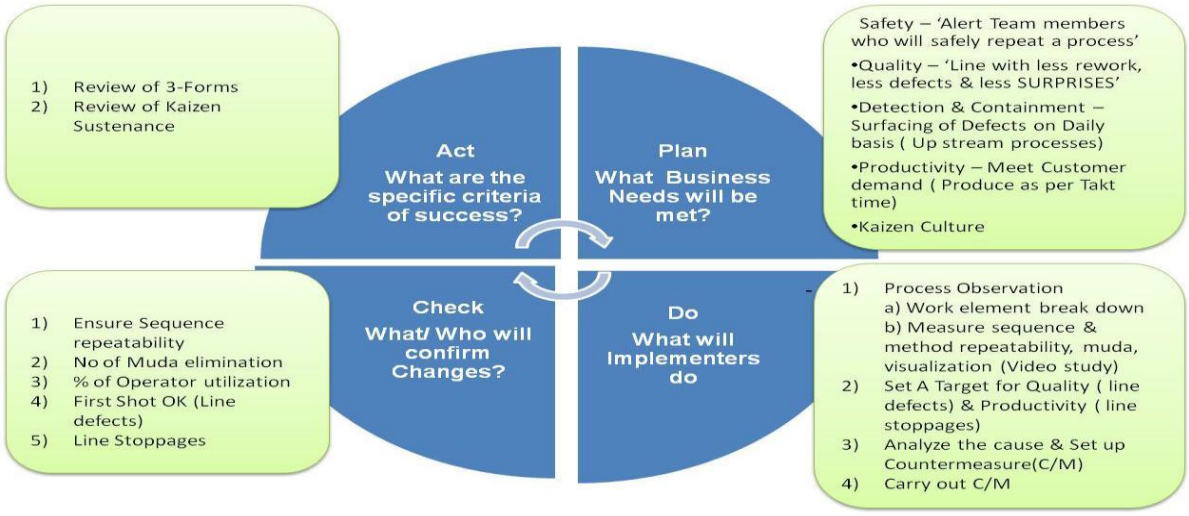

Fig 2: PDCA Cycle.

Work Instruction Sheet

The Work Instruction Sheet is used to train the operator. It lists the steps of job detecting special idea which may be required to perform the job safety with utmost quality and efficiency. It can be useful for experienced operations to reconfirm the right operations.

After giving training to the operators regarding the WIS. Operations are being observed and videos were taken of each operations, analyzed the process through each videos, identified the No. of motion of the operations, transportation, what are difficulties they are facing a particular idea was given and WIS sheet is introduced.

ijates
ISSN 2348 - 7550

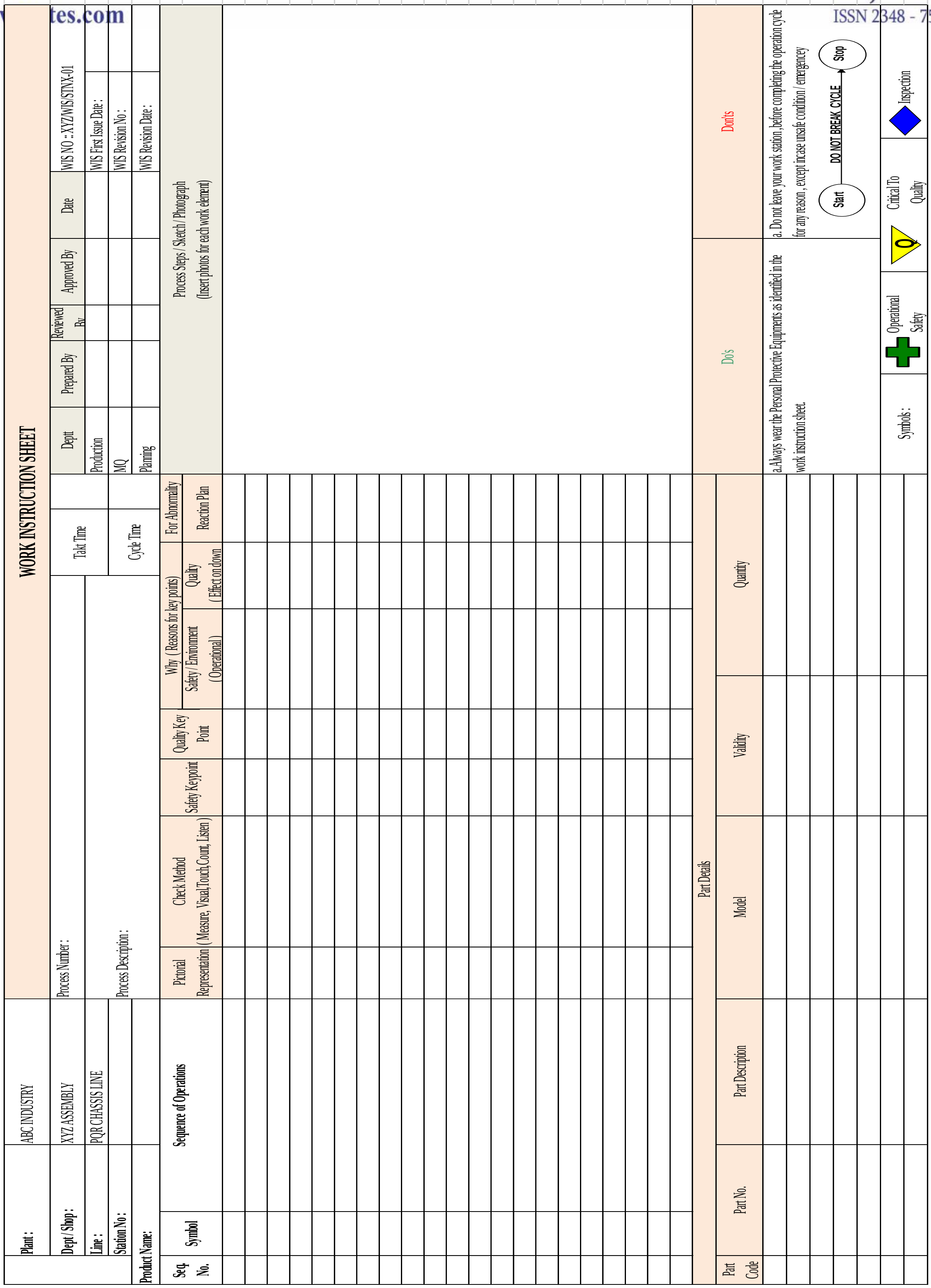

Fig 4: Work Instruction Sheet.

After the standardized work was implemented, the following improvements were achieved:

1. The operator loading was distributed according to the takt time limit, which meant operators could comply with customers demand without overtime.
2. Some of the operator work elements were transferred to a previous work station that had available time, thus occupying the operator work time in a better way.
3. After the tasks of the two operators had been separated, walking was not necessary anymore, so this waste was fully eliminated.
4. After reducing the operator work load and working according to takt time, the waste of waiting caused by running short of parts in the previous operation was eliminated.

4.3 Process Study after implementation of WIS

Activities carried out by Operator 1 for assembly of Light Commercial Vehicle after implementing Kaizen Activities. The activities carried out by operator 1 for assembly of Light Commercial Vehicle are as shown in this table, Fitments made by operator 1 for assembly of Light Commercial Vehicle in stations X-01 are Horn and Fuel Filter.

Table 1.2 Activity Chart of operator 1 for assembly of LCV after WIS Implementation.

ACTIVITY CHART				
STATION NO : X-01	SUMMARY			
	EVENT	COUNT	TIME	DISTANCE
OPERATOR NO : 1	OPERATION	8	87	0
MODEL : MMM401	TRANSPORT	5	29	19
	DELAY	0	0	0
NO OF OPERATORS AT STATION : 2	INSPECTION	0	0	0
	STORAGE	0	0	0
ACTIVITY DESCRIPTION	TOTAL		116	19
Take the fuel filter from line side storage	⇨		5	3
Take the two hex bolt from line side storage	⇨		5	3
Align the fuel filter with frame bracket weld nut	O		10	0
Hand align both the bolts	O		10	0
Tighten all the bolts	O		10	0
Take assembly horn from line side storage	⇨		5	5
Take hex screw m8x20, bright washer 8.4, spring washer b8 from line side storage	⇨		8	3
Assemble screw & washers for fitment	O		10	0

Move to the horn fitment area	⇨		4	3
Align horn with the horn bracket	O		10	0
Tighten the horn using assembled screw	O		15	0
Tighten mounting bolt with use of nut runner	O		15	0
Connect the horn connection	O		7	2
TIME-Sec, DISTANCE- Meters				

V FOLLOW UP THROUGH STANDARDIZATION

As this standard is enhanced, the new standard becomes the guideline for the further enhancements. Enhancing standardized work is continuous process. Improving organization performance is an ongoing challenge and organizations benefit best from a holistic approach. The following road map defines the mechanism for SW implementation.

Table 1.3 Implementation Guideline for Road map preparation

PHASE	MAJOR ACTIVITY	ACTIVITY	KPI	LEVEL
1-MAKE	HUMAN DEVELOPMENT	-Trainer/shop champion development. -Supervisor training on SW & role training. -Team member fundamental skill training. -Team member SW awareness & role training.	- No of trainer's. -supervisor training status. - Team member training status.	Reactive production is unstable
2-MAINTAIN	PREPARATION & VISUALIZATION OF SW	-Preparation or modification (Element sequence, Key points). -Supervisor ability evaluation. -SW work shop culture establishment. -TM's training on process (utilize WIS)	-No of process -No of supervisor -% of completion	Reactive production is unstable

3-IMPROVE	UTILIZATION OF SW	-Daily process observation by supervisor through layered audit. -TM's follow SW. -Review of SW-Continuous improvement (Add safety & quality key points). -Review of SW document.	-No of process observation -% of operator SW -No of improvements (SW)	Proactive production is stable

1. Role training for Team Members, Supervisors and Managers.
2. Are Documents like WIS, Control plans, JH check sheet etc. signed off by all concerned and are in standardized approved format and displayed at the work station?
3. Process Observation: Study through video using POC form and control Daily through Layered Audit.
4. Based on identify MUDA, record in Kaizen newspaper and implement counter measures. Establish right sequence, best methods, ensure repeatability and visualize SW.
5. Reduce variation in skill, safety quality and productivity by continuous monitor and control abnormalities through 5S, Layered Audit (SW observation) and Daily Work Management.
6. Add safety & Quality key points in WIS after reflection any safety or quality incident and ensure sustenance of kaizen implemented.

VI RESULTS

The distance between conveyor and horn trolleys is 6 mtrs and distance between conveyor and fuel filter trolley is 9 mtrs. By reducing the distance between conveyor and horn trolley to 3mt and distance between conveyor and fuel filter trolley to 3mt.After reducing that the route time got reduced to 10 seconds and the overall process cycle time was reduced to 10 seconds. During the activities the operator has excess of 70 items waiting in the line side storage, which was reduced to 58.

VII CONCLUSION

Standardized work is a method of defining efficient work process that are repeatedly followed by workers ¾ Standardized work often aims to maintain productivity, quality, and safety at high levels. Here the Work instruction sheets was developed for the underbody line in XYZ shop and in LCV shop for stations 1 to 7.Discussing with the Team members of respective stations, issues related to productivity, quality and safety were classified to make the

process to be carried out in least possible time, Earlier WIS was in Process centric format this led to many work instruction sheets for the station, implementing station centric WIS has helped in reducing number of sheets and for the team member to glance through the WIS only one time. Standard Work shows people how structure actually promotes flexibility and creativity and facilitates change. WIS created in such a way that, supervisor can be easily teach the processes to any new team member.

REFERENCES

Journal Papers:

[1] M. Shabeena Begam, R. Swamynathan and J.Sekkizhar (2013). Current Trends on Lean Management.

[2] Prathamesh P. Kulkarni, Sagar S. Kshire and Kailas V. Chandratre (2014). Productivity Improvement through Lean Deployment & Work Study Methods.

[3] Farhana Ferdousi and Amir Ahmed (2009). An Investigation of Manufacturing Performance Improvement through Lean Production.

[4] Davood Gharakhani (2010). Identify and ranking the different obstacles for implementing of world class manufacturing system in Iranian manufacturing companies using fuzzy Analytical Hierarchy Process (FAHP).

[5]Enamul Kabir, B (2008). Studied and evaluated processes in an organization, by determining the current sigma level and finally to improve existing sigma level through productivity improvement. The automotive industry has been experiencing a competitive environment and striving hard to find methods to reduce manufacturing cost, waste and improve quality. Volume 04, year 2008.

[6] Hemendra Nath Roy, Sudipta Saha, Prof. Dr. Tarapada Bhowmick & Sufal Chandra Goldar, (2013). "Productivity Improvement of a Fan Manufacturing C company by using DMAIC Approach: A Six-Sigma Practice", Global Journal of Researches in Engineering Industrial Engineering.

[7] Mazedul Islam (2010). Provided a framework to identify quantify and eliminate sources of variation in an operational process, to optimize the operation variables, improve and sustain process performance with well-executed control plans.

[8] Rahani AR and Muhammad al-Ashraf (2012). Production Flow Analysis through Value Stream Mapping: A Lean Manufacturing Process Case Study.

[9] Robert W. Hall (1998). Standard Work: Holding the Gains.

[10] Jim Huntzinger (2006) Why Standard Work is not standard: Training within Industry Provides an Answer

[11] K. Pałucha (2012). World Class Manufacturing model in production management.

[12] Zimwara, D., Goriwondo, W.M, Mhlanga, S., Chasara, T., Chuma, T., Gwatidzo, O. & Sarema, B. (2012). World Class Manufacturing status Assessment for a Margarine Producing Company in Zimbabwe.

[13] Ajit Kumar Senapati, P.C.Mishra, B.C.Routra, Amitabha Biswas (2012). An Extensive Literature Review on Lead Time Reduction in Inventory Control.

[14] Dave nil'bide (2012). Reducing lead-Time, the key to Make-To-Order success.

[15] Suzanne de Trevillea, Isik Bicer, Valérie Chavez-Demoulin, Verena Hagspiel, Norman Schürhoff, Christophe Tasserit & Stefan Wager (2014). Valuing lead time.

[16] Katarzyna Midor (2012). World Class Manufacturing – characteristics and implementation in an automotive enterprise.

[17] R.Sundar, A.N.Balaji & R.M.SatheeshKumar (2014). A review on lean manufacturing implementation techniques.

[18] Shu San Gan, I. Nyoman Pujawan, Suparno & Basuki Widod (2014). Pricing decision model for new and remanufactured short-life cycle products with time-dependent demand.