

Job Methods – An Approach to Increase Human Resource Productivity in Pandemic COVID-19 (A Case Study of Parason Group, India)

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Abstract

Apart from multidimensional challenges and fierce competition, COVID-19 has created immense stress on manufacturing industries to work with limited human resources due to social distancing and other safety measures. During this tough time (COVID-19) companies are in great pressure to manage their costs, one of the significant cost is labour cost. Labour productivity is a division of worth of goods or services produced and labour hours used to produce that, thus productivity improvement can be done by producing more with same labour hours or producing same with less labour hours. There is a process of producing goods or services, each process may have one or more activity and each activity will have some methods to accomplish. Each process is also having its completion time which ultimately depends on number of activities and methods. If somehow the number of activities can be reduced or methods to accomplish the activity can be simplified in terms of easiness and less time without impacting quality of products or services, the completion time of that process will be reduced and eventually a gain in productivity will be achieved to help companies to be more productive and profitable without addition of manpower. The facilities and technology enhancement what the manufacturing world is enjoying today, is the result of improvement in production methods, e.g. automobile, mobile phones, laptops, home appliances etc. The TWI - Job Methods program is a structured program to identify and eliminate non value adding activities and to improve the existing methods of doing a job with available resources. Job Methods programme is focused on making the methods of work smarter and better. TWI – Job Methods is the best tool for involving all supervisor and workers in an organization for improvement activities. It also helps to involve the supervisors with the workforce and bring out collaborative solutions for different obstacles that occurs while working. Job Methods programme also provides a systematic improvement proposal to management to communicate so that decision making about new methods or process can be effective and quick. The case study had completed during Jan and Feb 2020 and focused on the practical application of Job Methods (JM) to improve productivity by using same number of human resources in producing refiner plates in a leading paper and pulp machine manufacturing company in India. TWI-JM technique is very relevant during tough time (COVID-19) when manpower availability is a concern and raise in productivity is required.

Keywords- Training within industry (TWI), Job Methods (JM), Job Breakdown Sheet (JBS), Inner Diameter (ID), Outer Diameter (OD)

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Introduction

The concept of TWI (Training within Industry) emerged during World War II in US, where the able bodied manpower from the companies drafted in to the military which resulted in shortage of skilled workforce in the companies. Companies were forced to recruit unskilled workers many of them were uneducated, ladies, farmers and other people with normal skill set. The recruitment was huge and there was a need to produce quality products specially weapons and ammunition in most imperativeness to maintain the supply to win the war. This new and unskilled workforce was exposed to complicated processes with an expectation of producing products as per standard which they couldn't. To solve this problem United States Department of War created TWI during 1940 to 1945. TWI primarily started to serve the purpose of consulting to war allied companies later on become the most effective technique of skill transfer, process simplification and relationship building across the globe. Post war, famously known as four Horsemen, Mike Kane, Channing Dooley, Walter Dietz and Bill Conover established the TWI foundation to spread the practice across Europe and Asia. TWI equally received in other parts of world including Japan and India, in Japan due to war agreement of not to own army and any ammunition company the people who used to work there were forced to work in other companies, Japan used TWI to train these people on new processes with new products. US discontinued this practice after world war but Japan continued to practice, after many years when Donald A. Dinero published the book on TWI, it came known to the world, still in India we have very limited practitioners of this technique but slowly-slowly picking up. TWI is three pronged

approached, first one is called Job Instruction (JI) which focuses on rapid skill transfer, second is Job Methods (JM) which focuses on to improve existing processes by using available resources and third one is Job Relations (JR) which focuses on solving personal problems in analytical way to avoid distraction of employees from targeted goals. Under the TWI framework, the Job Methods (JM) is an approach which helps in improving existing methods of doing a job and changing the paradigm of individuals that the existing methods can be improved without resource limitations to improve overall process effectiveness. The JM provides an easier, effective and productive method of doing the same job in a smarter way.

Donald A. Dinero, explained in his famous book – “Training within industry: The foundation of lean” (year 2005) that using JM, companies can taught their employees how can they improve their processes using available resources Patrick Graupp & Robert J. Wrona defined JM in their book “The TWI Workbook: Essential Skills for Supervisors” (year 2006), as the simplest way to simplify the processes by studying, analyzing and elimination of non-value adding activities in working methods. Again Donald A. Dinero in his book “The TWI Facilitator's Guide: How to Use the TWI Programs Successfully” (year 2016) emphasized on customization of JM program to suit various cultures but without compromising on original principles, also he explained what TWI and JM must give us the answer of why should we not do it (all non-value adding activities)? Once it's clear then removal of that step is easy and a series of these steps eventually will lead to a shorter process without compromising intended purpose. Charles R. Allen, in his book “The Instructor: The Man and the Job” (2018) focused relationship between man his job and beautifully emphasized about standardization of job through JM to make work enjoyable and significant. Kaizen Institute India (a consulting company) has designed special module on JM, through which they have successfully simplified many processes in a very short period of time, resulting a more productive workplace. JM aims to reduce or eliminate the non-value adding activities to speed up the process, not on increasing the working speed as it can cause mistakes, supervisors are solely responsible for their departmental improvement which can be done using JM. The objective of JM can be defined as “A practical plan to help you to produce greater quantity of quality products in less time by making the best use of the Manpower, Machine & Materials now available”, further in detail can be explained as:

- A practical plan : method that anyone can use easily on daily basis
- To help you : not telling answer, but enabling to discover best solution
- Produce : the method is designed to facilitate production of product, not decide which product to produce
- Greater quantity : increasing production of products that you already make
- Quality products : at a minimum, not increase at the expense of reducing the level of quality & at best
- In less time : the quantity made per unit of time should increase
- By making the best use : optimizing the process by eliminating wasteful activities
- Manpower, Machine & Materials : consider all resources
- Now available : existing resources

About The Company

The Parason Group has been leading the market of manufacturing and supplying paper and pulp machinery and its spare parts. Parason started its first research unit for pulp and paper machinery in the Year 1977. Parason Group has total 8 units in Aurangabad, Maharashtra. Parason also have specialization in Refiner Discs and these are one of the best disc available for Paper mills across the globe. Parason Group is involved in manufacturing of a wide range of products used by Kraft, Tissue, Writing, Printing and Hard Board Paper Mills. Due to high quality standards and timely supply, Parason products are blindly used in various Indian paper mills. Parason have worldwide client base and having majority market in Germany, USA, France, Thailand, Italy, Brazil, Spain, Portugal, Philippines, Indonesia, and Bangladesh, Parason serving more than 60 countries across the globe.

Background of the Study

In the machining unit of Parason group, various machining operations like drilling, grinding, boring are performed to produce the refiner plates. The refiner plates are used in various paper and pulp manufacturing companies in their pulp refining machines. The production requirement of these plates is very large as it is used in bulk. In the process of making the refiner plates material removal operations are carried out at a large scale on various conventional machines like lathe machines and drilling machines. The company was in a great hurry to increase the production capacity of the same by adding machines and manpower to meet existing and future demand, then they came to know about “TWI-JM” approach and decided to give it a try. The study was done during Jan – Feb 2020.

Implementation Approach -Job Methods (JM) Technique

The method of doing work plays a crucial role always but significantly in large scale production. Job Methods (JM) is one of the modules of the TWI focusing on improving the shop floor method of doing work. It focuses

methods simplification. The Job Methods program was developed in order to provide the management with a tool, by which supervisors & workers could acquire skill in improving methods thus resulting in productivity improvement. Job Methods methodology aims in achieving maximum number products with better quality within the shortest possible time duration. As per the Job Methods methodology, the supervisor can develop a new simplified method of doing existing jobs with the team. A team including supervisor and lathe operators was formed, they were trained on the Job Methods techniques and the project was completed by following 4 Steps of JM:

1. Breakdown the job
2. Question every detail
3. Develop new method
4. Apply new method

1. Breakdown the Job

As the name itself suggests, this step includes the breakdown of each and every step which is performed currently while doing a job. It includes each and every single activity performed while doing a job and breaking these activities in steps. It should also include quality checks, delay or any waiting during job accomplishment. The three elements to be taken care of, while breaking the job are as follows

- Material handling
- Machine work
- Hand work.

It is required to make notes regarding each activity which includes all the distances travelled, tolerances taken or to be taken, safety needs, scrap material, time used, weights, etc. Along with this, also list all the long reaches, holdings, stoppages, bending, or extra difficult moves.

These details help to collect all the facts regarding the job in a systematic manner. These details are completely reliable and accurate as these are based on the current method and collected during real time. A standard job breakdown sheet format should be used to avoid any misunderstanding. In making refiner plates the operations including inner diameter (ID) machining and outer diameter (OD) machining is performed for material removal from refiner discs. These operations are carried out on conventional lathe machine. The detailed job breakdown of all these machining processes was made in which individual activities were noted down with consideration of all 3 elements (material handling, machine work, and hand work). The notes were also made with respect to time, distance and weight maintained in the job breakdown sheet (figure- 1)

As per job breakdown sheet (Figure 1) the breakdown of the present method of doing job listed and found that there were total 91 activities involved with a total time of 55 minutes to accomplish the same. After this the next step of Question every detail conceded.

2. Question Every Detail

Any scope of improvement starts with a questionable attitude and with a paradigm that any existing state can be improved further. A successful improvement in any method depends upon the questioning capability of the improver for the current method. No method is optimum for a longer run and hence it can be questioned every now and then. Every on-going activity is questionable; this provides the scope for improvement, always remember this. Questions should be asked as mentioned in table 1.

During the questioning phase, certain points need to be taken under consideration for getting the exact scope of improvement which are: Machines, Equipment, Tools, Product Design, Workplace Layout, Movement, Safety and Housekeeping etc. Thus in the mentioned manner, all questioning was done on all activities (noted during job breakdown sheet- figure, 1) with taking utmost care for the parameters. After that, the exercise for developing new methods based on questioning input was done.

3. Develop New Methods

Productivity can be increased only when number of activities in a process are eliminated, combined, rearranged, or simplified. For every new method, there has to be a lot of thinking processes involved behind it. ECRS technique was used in "Develop the New Method", ECRS is elaborated below:

- E - Eliminate unnecessary activities
- C - Combine activities whenever possible and practical
- R - Rearrange activities for better sequence
- S - Simplify activities so that they are easier and safer to do

The ECRS technique looks simple and easy to understand however very crucial when it comes to implementation. As per the ECRS technique, the activities which are eliminated by asking questions focusing on 'Why' and 'What' are marked as red cross (figure, 1-job breakdown sheet). The other activities which are Combined, rearranged and simplified are written down in fig 1, job breakdown sheet. While progressing towards the application on a lathe machining activity, as per the job breakdown sheet, it was observed that the current method was very complex and required skilled manpower. The maximum time taken was for ID machining

(Figure-1, 938 seconds & 6 times) and number of inspections (Figure-1, 6 times). The ID Machining required more time because the operator was not completely aware of how much of the material was to be removed from the ID to meet the exact dimensions of the product. For the material removal, the operator used to take depth of cuts as per his guess, which eventually increased the number of cuts. Due to the more no. of cuts, the operator has to do more inspections between two intermediate cuts with the help of ID measuring GO gauge. So for reducing this ID machining time, the exact material which was actually required to remove from the job was to be calculated using the reference of the outer diameter (OD) of the plate with the help of a vernier calliper. Due to this the number of cuts which were required for machining is reduced and thus reducing the ID machining time. Also, it was observed that the weight of this gauge was 9KG. The numbers of inspections were more too, thus the operator had to use the 9KG gauge again and again, due to this, there was more fatigue to the operator and eventually it affected the speed of the work. So gauge weight reduction (from 9kg to 5kg) was done by boring in handle and making grip using rubber.

In step 1, a job breakdown sheet was made (figure, 1) and as per step 2 questioning was done, based on questioning using ECRS technique some new methods were developed which were proposed in “Proposed JBS - JM Sheet” (Table, 2)

As per the proposed method sheet the total number of activities listed were 61 and time taken to complete these activities came 37.13 minutes. As per the job breakdown sheet of existing process (Figure, 1) the number of activities were 91 and time taken was 55 minutes, so Proposed JBS-JM sheet had improvement in terms of total activities and time taken.

4. Apply New Method

Improvements are of no use when they are still on paper and not put on to work. In the application phase, the main agenda is to convince the management to put this whole improvement plan into action. All the improvement plans on paper cannot be executed unless the management agrees to do so. For convincing the management, it is very essential for them to know the process of the new method and how it can be helpful in uplifting the productivity. There are 4 steps involved in “Apply the New Method” step, which are as follows:

- I. Sell your improvement ideas
- II. Get Approval from required areas
- III. Implement the change as quickly as possible
- IV. Give credits

The improvement proposal sheet (Table, 3) was made with all benefits related to the new methods and was presented to management

Team presented improvement proposal sheet to management, they approved and given a green signal to implement the new process of performing material removal task on lathe machine. Team arranged the material and did a trial run successfully, the team followed the new proposed method for a month and collected results to check the impact of JM technique in long term.

RESULTS

After the implementation of new methods for a month, it was seen that the improved method is more productive and easy, compared to the previous one. Tool touch time reduced, setup time reduced and number of cuts and number of inspections were also reduced. Due to reduction of inspection frequency and gauge weight the operators were happy. The material handling of job was reduced due to all jobs being placed at once near the machine. The JM implementation helped to standardize the current method of work. The results were summarized to check which the effectiveness (Table 4- Results of JM)

The results achieved by the usage of Job Methods technique were self-explanatory, the team achieved a significant productivity improvement of 27% per shift in machining section by reducing number of activities from 91 to 61 to complete one job on one lathe machine. Some of the before and after photos are also shared for better understanding (table 5)

CONCLUSION

On the basis of the study, it was concluded that the Job Method is the best tool for developing improved methods involving operators and supervisors. Company achieved a significant productivity improvement of 27% per shift without adding any machine or manpower, this productivity improvement was achieved only by simplifying existing processes (activities and methods). Company understood that JM technique is a simple, systematic, calculated and effective approach to figure out the best possibly suitable methods over the existing methods without compromising on Quality. Customer delivery rate also increased significantly, Company deferred its plan to extend the facility as they discovered hidden capacity. After successful implementation of JM technique in lathe machine Department Company appreciated and awarded the team, also company selected the members from this team and given them a full time responsibility to deploy JM horizontally in other departments. The case study succeeded to prove the point that during COVID-19, when companies are facing a lot of issues regarding human

resources, the productivity can be improved by simplification of process without adding any new manpower or machine.

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Figure 1 – Job Breakdown Sheet

Job Breakdown Sheet						
Present Method Breakdown (PA-2527) Step 1 – Breakdown the Job			Questioning and Development of New Method Step 2 – Question every detail- List your ideas – Don't trust memory		Step 3 Develop	
List all details A detail is every single thing that is done including every inspection and every delay or waiting period. Be sure details include all material handling, machine work, and hand work.		Notes: List all distances, tolerances, safety, scrap, time used, weights, etc. Also list long reaches, tugging, holding, stopping, bending, or awkward moves.	Challenge Yourself WHY is this detail necessary? WHAT useful purpose does this detail serve? Does this detail add quality? Cut cost? Improve safety? Increase production?	Be Specific WHERE should this detail be done? Which machine bench, equipment? WHEN should this detail be done? Before some other detail? Another time? WHO is qualified to do this detail? From standpoint of experience? Skill? Physical strength? Who is available?	There May Be A Better Way HOW is the best way to do this detail? Can you improve on the materials, machines, equipment, tools, product design, workplace, safety, or housekeeping? Can you make the work easier or safer by using jigs or fixtures, both hands etc.	Re number your details
What operation or handling precedes your job?			If not- can I do my job without this detail?			
1	Calling casual for unloading the job	15 Sec	X			
2	waiting for job to come	90 Sec	X			
3	Waiting for crane	21 Sec	X			
4	Take chuck key from Rack	12 Sec		From Rack		
5	Loosing the jaw	150 Sec		By operator		
6	Lifting the job using the crane	18 Sec	X			
7	moving crane away from the job	11 Sec	X			
8	placing job on trolley	10 Sec		On trolley, By Helper		
9	Crane handling	15 Sec	X			
10	Crane operating for loading the job	16 Sec	X			
11	chuck cleaning	8 Sec	X			
12	Inspect the RH and LH Side of job	35 Sec		By operator		
13	Loading the job	28 Sec		By operator		
14	Tightening the jaw	62 Sec		By operator		

15	Waiting for jaw tightening	24 Sec	X		
16	Tightening the jaw and rotating	36 Sec		By operator, Un chuck	
17	Take dial gauge	2 Sec		By operator	
18	Dial gauge setting	38 Sec		By operator	
19	OD true	120 Sec		By operator	
20	Job rotate and true	142 Sec		By operator	
21	Face true	195 Sec		By operator	
22	Hammering on job for face true	85 Sec		By operator	
23	Again Check and hammering on job	55 Sec		By operator	
24	Hammering on back side of job	36 Sec		From Rack	
25	Take other hammer	10 Sec			
26	Using both hammer adjust the face	15 Sec		By operator	
27	Hammering the face side of the plate	18 Sec		By operator	
28	Make adjustment in plate	5 Sec		By operator	
29	Check the belt tension	10 Sec		On pully	
30	Tightening belt	13 Sec		By operator	
31	Make adjustment for speed change	12 Sec		By operator	
32	Take screw driver from other operator	20 Sec	X	From other operator	
33	Check ID using gauge	12 Sec			
34	Moving the hand wheel	6 Sec		By operator	
35	Start machining	3 Sec		By operator	
36	Give feed	4 Sec	A gear at high speed		
37	1st Depth of cut	3 Sec, 0.3mm		By operator	
38	ID machining	186 Sec		By operator	
39	Stop the machine	5 Sec		By operator	
40	Moving away tool post	8 Sec		By operator	
41	Take gauge	4 Sec, 9 KG		By operator	Removal of excess material inorder to reduce the weight of gauge
42	checking the ID	16 Sec, 9 KG		By operator	
43	take out the gauge	7 Sec, 9 KG		By operator	

44	slide the tool post towards job	6 Sec		By operator	
45	2nd depth of cut	3 Sec, 0.3mm	X		
46	ID machining	183 Sec	X		
47	Stop the machine	5 Sec	X		
48	Moving away tool post	6 Sec	X		
49	Take gauge	4 Sec, 9 KG	X		
50	checking the ID	19 Sec, 9 KG	X		
51	take out the gauge	7 Sec, 9 KG	X		
52	slide the tool post towards job	6 Sec	X		
53	3rd depth of cut	3 Sec, 0.3mm	X		
54	ID machining	187 Sec	X		
55	Stop the machining	5 Sec	X		
56	Moving away tool post	7 Sec	X		
57	Take gauge	4 Sec, 9 KG	X		
58	checking the ID	17 Sec, 9 KG	X		
59	take out the gauge	7 Sec, 9 KG	X		
60	slide the tool post towards job	6 Sec	X		
61	4th depth of cut	2 Sec, 0.2mm	X		
62	ID machining	190 Sec	X		
63	Stop the machining	5 Sec	X		
64	Moving away tool post	9 Sec	X		
65	Take gauge	4 Sec, 9 KG	X		
66	checking the ID	16 Sec, 9 KG	X		
67	take out the gauge	7 Sec, 9 KG	X		
68	slide the tool post towards job	6 Sec	X		
69	5th depth of cut	4 Sec, 0.2mm	X		Calculating the extra material to be removed
70	ID machining	192 Sec	X		
71	Stop the machine	5 Sec	X		
72	Moving away tool post	8 Sec	X		
73	Take gauge	4 Sec, 9 KG	X		
74	checking the ID	18 Sec, 9 KG	X		Inspection between a constitutive cut
75	take out the gauge	7 Sec, 9 KG	X		
76	Gauge passed in ID	6 Sec, 9 kG	X		
77	Place gauge	8 Sec, 9 KG	X		
78	Change tool post setting for facing operation	48 Sec		By operator	
79	Slide tool post towards job	8 Sec		By operator	
80	Face operation depth of cut	2 Sec, 0.8mm		By operator	
81	start the machine	3 Sec		By operator	
82	Face machining	613 Sec		By operator	
83	Stop the machine	3 Sec		By operator	
84	Moving away tool post	5 Sec		By operator	
85	visual inspection	8 Sec		By operator	
86	Calling casual for unloading the job	32 Sec		By operator	
87	Waiting for crane	25 Sec		By operator	
88	Take chuck key from Rack	6 Sec		By operator	Arrangement for placing chuck key
89	Loose the jaw	84 Sec		By operator	
90	Lift job using crane	18 Sec		By operator	
91	Put job on trolly	15 Sec	X		
	Total Time For Lathe Machining in min	55			
	Machining time of 6 cuts (before) in min	33			

Table 1 –Questions Asking Sequence

Sr.	Question	Detail
1	Why is it necessary?	Helps to distinguish between necessary and unnecessary.
2	What is the purpose?	It adds quality or value to a product or service
3	Where should it be done?	Helps determining the best place to do each detail
4	When it should be done?	Helps determine the best time to do a job.
5	Who is the best qualified to do it?	Determines the best person to do it
6	How is the ‘best way’ to do it?	Determiners the best way of doing.

Table 2 - Proposed JBS -JM Sheet

PROPOSED JBS-JM SHEET		
Product : 21"RTR, Made By : YVM, PMA, AVC		Operations: ID, FACING
Sr. No.	All Details of proposed JBS Sheet	Time / Notes
1	Calling the helper	10 Sec
2	Bring the crane	8 Sec
3	Loose the jaw	23 Sec
4	Unloading the job using crane	20 Sec
5	Lifting the job using crane	6 Sec
6	Put job on trolley	8 Sec
7	Loose the jaw	48 Sec
8	chuck cleaning	8 Sec, Using brush
9	Take the job using crane	10 sec
10	Loading the job on chuck	9sec
11	Inspect the RH and LH Side of job	10 Sec
12	Loading the job	22 Sec
13	Tightening the jaw and rotating	16 Sec
14	Take dial gauge	9 Sec
15	Dial gauge setting	63 Sec
16	OD true	230 Sec
17	Job rotate and true	70 Sec
18	Face true	121 Sec
19	Hammering on job for face true	75 Sec
20	Hammering on back side of job	12 Sec
21	Take other hammer	6 Sec
22	Using both hammer adjust the face	25 Sec
23	Hammering the face side of the plate	5 Sec
24	Check the belt tension	12 Sec
25	Make adjustment for speed change	13 Sec
26	Tightening belt	12 Sec
27	Check OD using vernier	25 Sec
28	Check the distance between OD & ID	18 Sec
29	Calculation of ID Allowance	35 Sec
30	Moving the hand wheel	3 Sec
31	Start machine	4 Sec
32	Give feed	3 Sec
33	Give required First Depth of cut	8 Sec
34	ID machining	167 Sec
35	Stop the machine	5 Sec
36	Moving tool post away from chuck	7 Sec
37	Take gauge	6 Sec, 5Kg
38	Checking the ID using gauge	12 Sec
39	Take out the gauge	6 Sec
40	Slide the tool post towards job	7 Sec
41	Give final depth of cut	5 Sec
42	Start the machine	4 Sec
43	ID machining	176 Sec

PROPOSED JBS-JM SHEET		
Product : 21"RTR, Made By : YVM, PMA, AVC		Operations: ID, FACING
Sr. No.	All Details of proposed JBS Sheet	Time / Notes
44	Stop the machine	4 Sec
45	Moving away tool post	4 Sec
46	Check ID by gauge	43 sec, 5Kg
47	Change tool post setting for facing operation	47 Sec
48	Slide tool post towards job	7 Sec
49	Give depth of cut	6 Sec
50	start the machine	5 Sec
51	Face machining	669 Sec
52	Stop the machine	3 Sec
53	Moving away tool post	7 Sec
54	Visual inspection	8 Sec
57	Loose the jaw	20 Sec
58	Bring the crane	9 Sec
59	Unloading the job using crane	32 Sec
60	Lifting the job using crane	12 Sec
61	Put job on trolley	10 Sec
Total Time For Lathe Machining in min		37.13






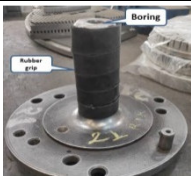
Table 3 – Improvement Proposal Sheet

Improvement Proposal Sheet				
Department :	PRODUCTION	Operations	ID & FACE	
1	Summary			
We had worked on 21" Rotor machining on lathe, it was observed that the material handling, machining time, Set up time is more. The waiting time of rotor at drilling section is more. As per proposed method the machining time and weight of gauge will reduced.				
2	Results (Proposed \ Achieved)			
Sr	Results	Before	After	Impact Status
1	Jobs Per shift	8	11	+
2	No of activities	91	61	+
3	Tool Touch time in min	33	22	+
4	Setup Time in min	22	15	+
5	Material Handling Movement in meter per shift	552	94	+
6	No of Depth of cuts for ID Machining	5	2	+
7	No of Gauge Inspections of ID	6	2	+
8	Gauge Weight in KG	9	5	+
3	Improvements			
SR	BEFORE	AFTER		
1	Time required for ID machining is more	Time required for ID machining will reduce		
2	Operator doing more number of inspection during machining	Operator doing less number of inspection during machining		
3	More fatigue to operator due to heavy gauge	Less fatigue as weight of gauge is reduced		
4	More fatigue in inspection activity	Gauge handling is easy		
4	Approval:			
	Production: Y. Mirge	Engineering :	G.Deshmukh	
	Quality : N. Upse	Safety :	P. Gaikwad	
5	Credits: B. Barate, P. Vetal	Month:	Jan-20	

Table 4- Results of JM in Machining section

Sr.	Results	Before	After
1	No of Jobs Per shift	8	11
2	No of activities to complete the job	91	61
3	Tool Touch time in min to complete the job	33	22
4	Setup Time in min to make one job	22	15
5	Material Handling Movement in meter per shift	552	94
6	No of Depth of cuts for ID Machining	5	2
7	No of Gauge Inspections of ID	6	2
8	Gauge Weight in KG	9	5

Table 5 – Before and After pictures

S. No.	Before	After
1		
	Material travelling from storage to Lathe machine one by one	Place all jobs near lathe
2		
	No measurement was done. To check the extra material GO Gauge is used for 6 times	Reduce the machining time by calculating the material to be removed resulting in less inspection & less depth of cuts
3		
	Gauge weight is more and no grip is present	Reduction of weight by boring in handle and making grip using rubber