Equipment optimization of machine by increasing the uptime of CNC machine

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***Abstract*—In order to cope with today's leading Manufacturers, it is necessary to provide products to customer in a very shortest time possible. For this one of the way is to reduce the setup time or changeover time between the product A to product B. This paper contains implementation of SMED technique with team work to manufacturing company workshop for the reduction of setup time in CNC machine.**

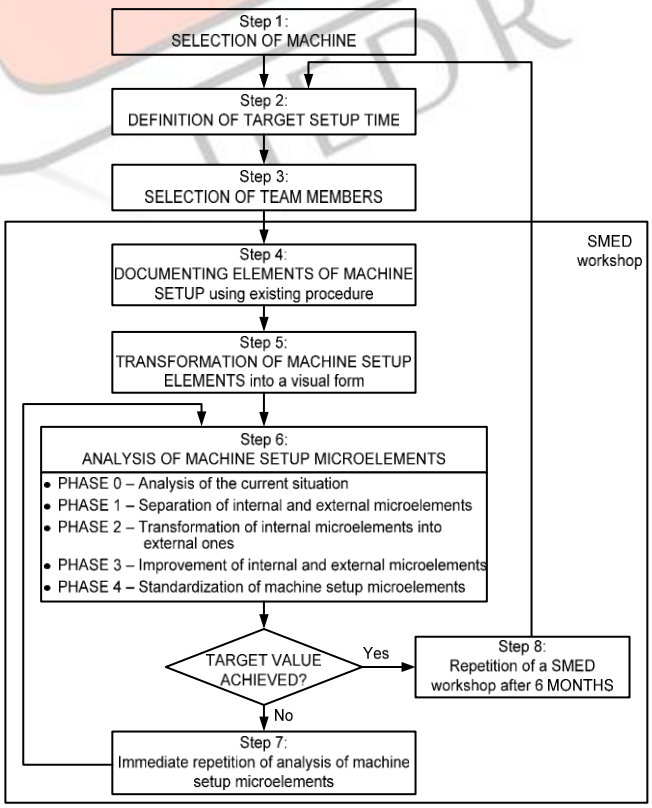
***Keywords*— SMED, setup time, changeover time, team work**

I. INTRODUCTION

In the early year's lots of attempts have been made for reducing the setup time or changeover time. The changeover time is defined as the time when the last product "A" is finished and the finished product "B" comes out of the CNC machine. For reduction of setup time there are various techniques and one of the best techniques is SMED (Single Minute Exchange of Die). SMED helps to minimize the time of non-productive activities by organizing and standardizing the operations. SMED helps to convert the internal elements (machine operates) into external elements (machine does not operate) and vice versa. SMED increases the flexibility and increases the productivity of the company.

II. SMED

In any manufacturing company, waste is an important characteristic to look upon. Waste can be formed from damaged or unused resources which can be quite financial loss for the company. There are various techniques to reduce these wastes and one of the best technique is SMED. Shiego Shingo introduced SMED in 1950s, Japan. Single minute Exchange of Die does not mean to reduce time to one minute but more precisely less than 10 minutes. It is basically related to setup time reduction or changeover time reduction. This will help the company to minimize the level of inventory and helps to increase the efficiency of the equipment. Due to increasing demand of varieties of products it is necessary to apply SMED in various organization to increase productivity and reduce non-productive activities.



III. CASE STUDY

A. *PROBLEM DEFINITION:*

Since there is a high changeover time as the project changes, the company is failing to compete the increasing demand from the customers. Therefore, WIP (Work In Progress) is also being piled up. WIP then leads to financial losses of the company. On observing, it was found that they also lack standard procedure for the operations. The main aim is to reduce the setup time of the CNC machine by implementing SMED technique.

B. *OBJECTIVES:*

- To study the existing CNC machining process.
- To separate internal and external elements and optimize them.
- Identifying similarities in operation between all operations and standardize these operations.
- Apply SMED and standard the process.

C.METHODOLOGY:

By referring journals, books, manuals and web survey a review was made to analyse the SMED technique and understand the benefits of SMED technique. The first step in the implementation of SMED is to separate the internal and external elements. Once the internal and external elements are defined and separated, checklist can be made of all the operations and process and steps should be carried out externally during the current process. There are various non-productive activities based on the setup observed that should be eliminated which are causing unnecessary delay during the setup time. After all these activities, by optimizing the activities, confirming the results and standardization of the operation is done.

D.DATA COLLECTION AND IMPLEMENTING SMED:

By using Time and Motion study,the setup time reduction process was carried out on existing CNC machine to understand how much time was taken by operator and process followed by the operator. During change of tool, it was observed that more time was consumed by the operator which was delaying the setup time.Time was measured by using stopwatch and simultaneously statistical chart can be drawn to analyse the problem as show in fig 2 &3.

TABLE I: PRE-SETUP DATA

SR.NO	ACTIVITIES	BEFORE SMED(mins)	AFTER SMED(mins)
1	Previous fixture unloading	20	14
2	Next fixture unloading	27	8
3	Making fixture true	45	26
4	Work offset	13	9
	TOTAL TIME	105	57

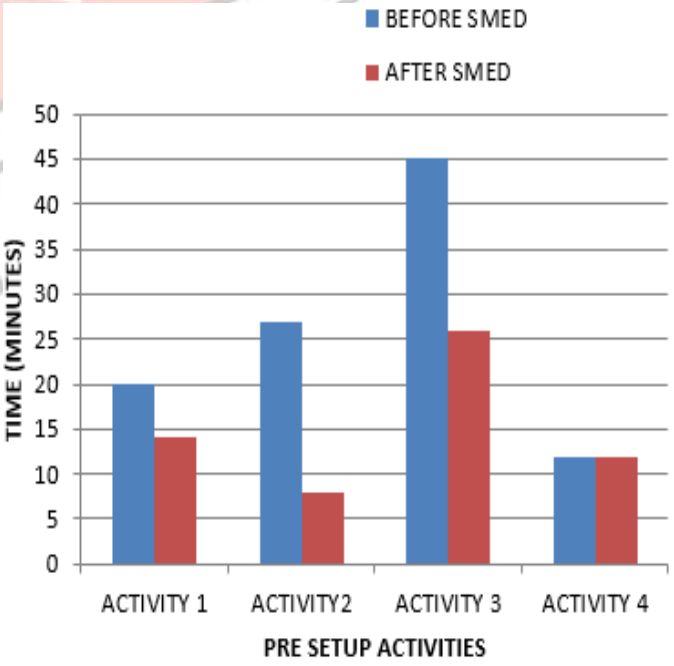


TABLE II:OPERATION DATA

TOOL NO	TOOL DESCRIPTION	BEFORE SMED(mins)	AFTER SMED(mins)
1	Milling cutter D100	20	9.32
2	Rough boring bar D157.5	10	7.23
3	Finish boring bar D158.4	22.05	20.10
4	Burnishing	29.17	24.39
5	Centre drill (BS-05)	9	8.04
6	Drill D9.2	15.02	14.45
7	Chamfer tool 45	10.05	8.36
8	Thread roll tap M10*1.5	9.05	7.32
9	Long drill D5	8.40	8.11
10	Combine drill	49	35.30
11	End mill D12	13	11.59
12	Drill D8.5	16.10	13.30
13	Drill D10.2	14	10.50
14	Chamfer tool 45	4	4.50
15	M12*1.75 Tap	7.10	6.15
16	M10*1.5 Tap	9.10	7.42
17	D4.2 Drill*80mm	25.15	19.15
18	M5*0.8 Tap	19.26	15.23
19	Combine finish boring bar	12.56	10.08
20	Finish eccentric spot face	18.49	13.14
	TOTAL TIME	325.45	247.28

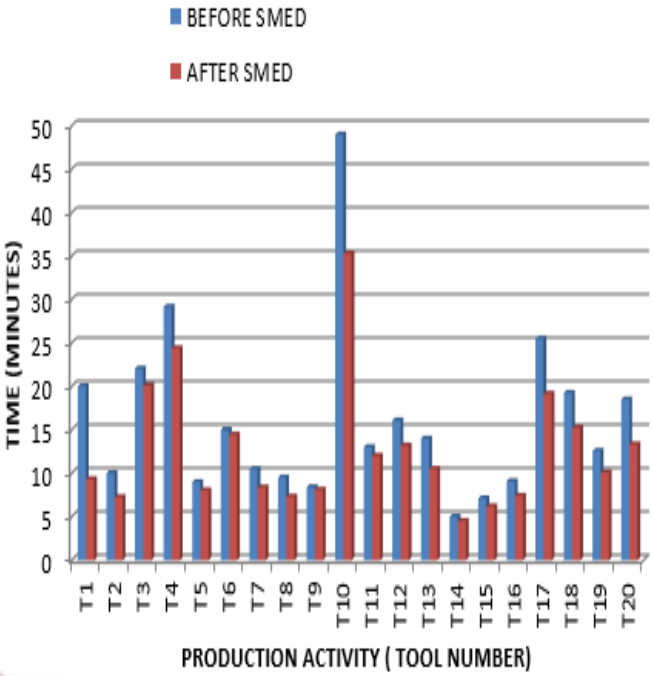


Fig3.Graph for operations

IV.CONCLUSION

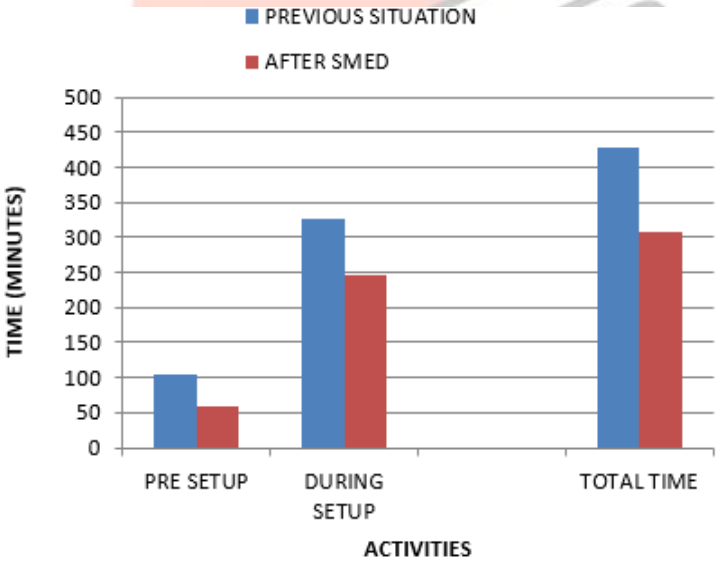


Fig4.Comparision between before and after SMED.

As seen from Fig 4 and entire study, the reduction in setup time is 28.63%. Thus, this reduction of setup time was achieved by converting internal elements into external elements and vice versa. It was also found that precautions were also not taken during operations and tools were not already placed in the rack due to which there were delays in the setup time. Also, bodies were rejected because of the above reasons. Thus, following precautions need to be taken care of:

- Fixture, machine and cleaning of tools should be done properly.
- Tool sharpness and blunt should be checked.
- Required tool materials should be placed in the rack.
- Use of previous finished product body should be used for referencing.
- Tight the fixture after every operation to avoid faults.
- Screws of compound drill needs to be check as they are insert tools.
  Thus, good results can be achieved by eliminating non-productive activities and such principles can be applied in various industries for good results and SMED can also be used to standardize the procedure.

Thus,by applying SMED setup time can be reduced and waste can be eliminated.

V.REFERENCES

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