

# Reduction In Setup Time By Single Minute Exchange Of Dies (SMED) Methodology

Pallavi A. Gade, Roshan G. Chavan, Dhananjay N. Bhavsar

**Abstract:** Life is a race if you don't chase it someone is definitely chase you and will go ahead. Hence to survive in today's business world every manufacturer has to have some idea and plans for their betterment. Market scenario has nearly change after 1990's that every manufacturer must go through the global competition, demand for short lead time, demand for variety, small lot sizes and also proliferation of OEM's. If we have to increase the frequency of delivery without compromising the quality Single Minute Exchange of Dies is the answer. Single Minute Exchange of Dies is not only apply to bottleneck machines it is to be implemented company wide and aim must be to bring all setup time to less than ten minutes in this paper some techniques, basic procedure, problems faced by companies are discussed and solution for them are suggested.

**Keyword:** SMED, Productivity, Non Value Adding (NVA),

## 1 INTRODUCTION

To increase the productivity it is necessary to reduced production time, but the total time for production contains setup time and production time. So the setup time is nothing but elapsed time in between last piece of the old series to the first good piece of new series. Setup time is non-value activity. NVA are those activities which does not convert input into the output for example transportation, setup time, defects etc. and for these type of activities customer does not will to pay. So it is very straight that if we minimize this non-value adding activities it will beneficial. For increase in production time in Single Minute Exchange of Dies we use the different quality tools. Also we can use the modern technologies. Though we invest money in the Single Minute Exchange of Dies the payback period will be very short and bottom line for the company will go up.

### 1.1 Historical background

Single Minute Exchange of Dies was developed in 1950's in Japan by Sheigo Shingo (chief engineer of TOYOTA). Method was first applied to press operations and method can be applied to any type of changeover. Actually problem identified for the need of Single Minute Exchange of Dies by the engineers was the land cost in Japan were very high. Therefore it was not feasible to store large inventories of vehicles. So to reduce inventories production of small lot sizes were necessary and hence Shingo applied some techniques of Single Minute Exchange of Dies and reduced the setup time from days to 3 minutes.

### 1.2 Why SMED?

1. To survive in today's competitive world
2. To reduced inventory
3. Flexibility for scheduling of job
4. To increase safety on workplace

### 1.3 Literature Review

1. Application of SMED Methodology-A Case Study in Small Scale Industry published by Mr. Rahul R. Joshi and prof. G.R. Naik on [www.ijstrp.org](http://www.ijstrp.org) in 2012, he focused on one of the noteworthy accomplishment in keeping the price of products low is the gradual shorting of the production cycle. Also he has explained the basic procedure, important terms and also focused on better teamwork, good order, planning and simple modifications.
2. A Review on Lean Manufacturing Implementation Techniques by Mr. R. Sundar and A .N. Balaji on [www.sciencedirect.com](http://www.sciencedirect.com) in 2014, he unfold that due to rapidly changing business environment the organization are forced to face challenges and complexities. To survive they need to enhance product quality therefore the value adding processes should be cut down to achieve the perfection in quality.
3. He explained that short changeover time have been always critical in manufacturing business setup duration, initiatives have been associated with shingo's SMED method. Although maximum number of companies initiated SMED some failed on implementation. In present days a tailored methodology is developed specifically for automotive suppliers. The companies achieved 33% reduction on changeover time.

## 2. BASIC CONCEPT RELATED TO SMED

Setup time: It is define as the elapsed time from when the last part of the current run is completed until the work center starts running the first good piece of the next run<sup>[1]</sup>. Setup activities are divided in two types of activities

- i) Internal – Internal activities are those which are performed when the machine is OFF for example adjustment of height, cleaning of piece etc.
- ii) External – External activities are those which are performed when the machine is ON for example moment of dies or tools, raw material etc.

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• Roshan G. Chavan, Pallavi A. Gade, and Dhananjay N. Bhavsar is currently pursuing  
 • Bachelor degree program in Mechanical Engineering in Pune University, India PH-+91 8983799850, 8237331393, 9405890013  
 • E-mail: [gadepallavi1995@gmail.com](mailto:gadepallavi1995@gmail.com), [roshanchavan444@gmail.com](mailto:roshanchavan444@gmail.com), [dhananjay.n.bhavsar@gmail.com](mailto:dhananjay.n.bhavsar@gmail.com)

As there are so many other quality tools why to implement SMED? And the answer is SMED includes all the other quality tools like 5S, Kaizen, Poka-yoke, Value Stream mapping (VSM), scheduling, employee perception<sup>[2]</sup>.

1. 5S – 5S includes Sort, Set in order, Shine, Standardize, Sustain. Now from all these 5S last two 'S' are difficult to implement so if we try to reach up to 3S it will help in reduction in setup time.
2. Kaizen – Kaizen is the continuous improvement and SMED is not one night study and implementation task. It will take so many days and may be years. So Kaizen will be very useful.
3. Poka-Yoke – Safety come first, So there are so many techniques by which we can ensure safety as well as reduce time.

Other quality tools will also help in SMED but above three are the basic and easy to implement.

### 3. METHODOLOGY

- i) Select SMED Team: SMED Team should contain cross functional team (Purchase manager, design head, production head etc.) and also some workers. By communicating with the top management start the project. Give responsibilities to all the members
- ii) Select the model machine: Actually there is no any specific criterion to select the model machine. But generally try to plot the parato chart (setup time vs machine) and according to that machines which requires maximum time for its setup select that machine.
- iii) Analyze the current setup: In this step try to analyze the setup before implementation of SMED. Take the video shooting from last piece of the previous series to the first 'OK' piece of next series. Chalked down the all the activities.
- iv) Separate internal and external activities: After we chalked down all the activities separate activities into two categories internal and external activities which we performed when the machine is stop are internal activities and activities which are performed when the machine is running are external activities. Again try to plot the parato chart.
- v) Convert internal setup into External setup: Convert as much as possible the internal activities into external. For example bring the dies or raw material as the previous setup is running. So the total time that the machine is shut down will be reduced.
- vi) Apply 5S methodology: If the working area is neat and clean people will definitely love to work in that environment. As discussed earlier last two steps of 5S are difficult to implement. So just try to implement first three steps
  1. Sort- All the parts which we don't need removed that one from the working area.
  2. Set In Order- Set everything sequentially and take care that the time of workers should not get waste for searching of any tool. By using this step most of the time for SMED will get reduced.
  3. Shine- Clean the machine tools and working area near the machine.
- vii) Implement various actions to achieve SMED: Use the different methods, Techniques to shorten the time. It may happen that SMED is not achieved in one stage

so repeat the above stage until the SINGLE DIGIT MINUTE time has been achieved.

- viii) Appreciate all members for achieving SMED: Don't forget to appreciate the members who has successfully implemented the SMED.
- ix) Try to implement SMED for other machines: Techniques which we implemented for one model machine try to implement for the other machines also and sustain it.

### 4. SOME TECHNIQUES FOR SMED

1. Use compound dies: If we have to implement the SMED on press machine this method will be very useful. For example suppose there is a job which requires a two operations say blanking and piercing respectively. Company have two choices go for simple separate die or compound die but try to design a compound die for both the operation so that the setup time between both the operations so that the total setup time between both the operations to half. If this will get successful try to design for whole production process.
2. As we are using the methodology like 5S, in that one we are sorting the unneeded things. Floor space get empty so bring the dies near to the machine or make that process external so that time will get save.
3. Formulate the procedure of setup in language that the workers can easily understand and attach or stick near to the machine or on the machine. Write Do's and Don'ts activities and show that to the workers and explain them in detail.

## 5. FIRST STEP TOWARDS IMPLEMENTATION OF SMED

### 5.1 Problem Statement

During oil servicing of a car we found one problem which is, for filling the oil tank of four wheel car near about 12 to 14 minutes are consumed there seems to be scope for reducing the time and here we can implement the SMED technique for reducing the time factor during servicing and also reduce the human effort.

### 5.2 Procedure

This paper is the summary result of the research project which was conducted at the automobile workshop, so research was started by knowing the whole process of oil servicing of a car. The SMED technique is implemented for reducing the time and human efforts. So important tool we have used is stop watch, camera recorder.

1. Jacking up the vehicle – Firstly park the car and apply the parking brake, by using jacking points lift the vehicle to get some more space below the car. Assure that, the vehicle lifted is safe by applying force on jacking points and also by shaking the vehicle.
2. Drain the oil – Place the oil drain pan below car. Firstly locate the oil cap and then remove it and also engine drain plug and remove it by rotating the oil plug in counter clockwise direction. The above action will start draining of oil from the engine, adjust the oil pan in such a way that all the oil will drain in the pan.
3. Replace the oil filter – For different car models the filter position is different, so locate the oil filter and try

to take off the oil filter with the help of hand and if that is not possible then use oil filter removal tool. Put the oil pan below the oil filter assembly and catch the spilling oil. Prepare new filter and screw it.

4. Filling of new engine oil – The amount of oil that you need to fill is given in owner's manual and on that basis fill the sufficient quantity of oil and before starting the vehicle check the oil indicator for this oil filling procedure we are using funnel and pipes.

For above all steps time required is about 12 to 14 minutes. So, basically there were two disadvantages of using conventional method that are it is time consuming and in case the vacuum is created inside the pipe that causes back flow of oil. So, to avoid those two problems we have a simple solution:

1. So, the procedure of jacking up the vehicle, draining the oil and replacing the oil filter is same.
2. Instead of using the funnel and pipes we are going to use the gear pump.
3. In that one the gear pumps could be human powered with the help of handle or may be electrical powered, but we are using the human powered gear pump.
4. Connect the gear pump to the oil tank of a car and rotating motion of a handle will pump the oil inside the tank and by using this method we can fill the tank within 2-3 minutes instead of 12-14 minutes.

By using this method of filling oil we can save the time and overcomes the above two listed disadvantages.

## 6. CONCLUSION

In this paper step by step procedure is explained for changing the oil from oil tank of a car. By using our solution the oil filling process gets easier and as well as the time is also gets reduced for filling the oil, near about time saved by our solution is 8-9 minutes. Also talking about SMED waste associated with manufacturing process can get eliminate with application of SMED. SMED need to be treated as a constant improvement program. As a result it is proposed that SMED can be sustained in a competitive business environment.

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## BIOGRAPHIES



Gade Pallavi Anil, Pursuing Final Year in Bachelor of Mechanical Engineering degree from GES's R.H.S.C.O.E, Nasik, under the Affiliation of University of Pune, Maharashtra, India.



Chavan Roshan Gangadhar, Pursuing Final Year in Bachelor of Mechanical Engineering degree from GES's R.H.S.C.O.E, Nasik, under the Affiliation of University of Pune, Maharashtra, India.



Bhavasar Dhananjay Narendra, Pursuing Final Year in Bachelor of Mechanical Engineering degree from GES's R.H.S.C.O.E, Nasik, under the Affiliation of University of Pune, Maharashtra, India.