

## Reduction in Setup Time By SMED A Literature Review

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### ABSTRACT

Manufacturing Organizations faces an a Problem in reduction of cost and efficiency Challenges in their manufacturing Operations. To Stand up in todays Globalization world, Manufacturers need to find ways to reduce Production time and cost in order to improve operating performance and Product quality. This Paper deals with the basic Overview of an a reduction in setup time by SMED. It is normally possible to greatly reduce the setup times and extraordinary results can be Possible through better teamwork, good order, Planning and Simple modifications. The reduction in setup times can be done with help of a SMED Methodology. Each type of Industries can apply the SMED System to reduce their setup times. Single Minute Exchange of Die (SMED) is the approach to reduce Output and Quality losses due to Changeovers.

**Keywords:-** Changeover, External Setup, Internal Setup, Setup time, SMED

### 1 INTRODUCTION

In the past a lot of effort has been put to reducing the cycle time and speeding up the output rate whilst totally ignoring the change overtime from one product to another. This has lead to the Economic batch quantity Concept and has resulted in small batches appearing to be Uneconomical to run. [1]

Reducing Setup times (Which we rarely Concentrate on) can give the Equivalent of huge increase in process speed (Which we almost and always concentrate on). This is all achieved without detriment to the quality of the Product. The idea of a setup time reduction Plan is move towards SMED (Single Minute Exchange Die) or OTED (one touch Exchange of dies). [1]

### 2 DEFINITION OF SETUP TIME/SETUP REDUCTION

Setup time is defined as a the elapsed time from when the last part of the current run is Completed until the workcentre starts running the first good piece of the next run [2] or Setup time can be defined as from the stop of Production of Product A until the start of Production of non defective units of Product B.

There are two types of Setup times:- 1) Sequence independent 2) Sequence dependent. [3]

If setup time depends solely on the task to be processed, regardless of its preceding task, it is called a sequence independent. On the other hand, in the sequence dependant type, setup time depends on the both the task and its preceding task. Setup reduction is a Process through which the total time required to changeover or setup equipment or a work centre is dramatically reduced. Through a systematic, Problem solving, Waste eliminating approach to support the movement towards small lot size runs. The main goal of setup reducing is to reduce the downtime of equipment during Changeover.

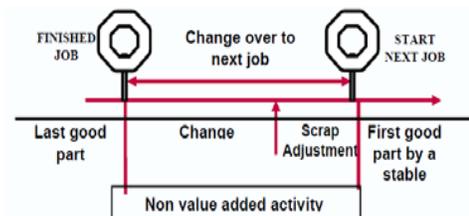


Fig 1: Set Up Reduction representation [4]

As shown in the [5] the Three main reasons for setup reduction are:-

- Flexibility:-** To be able to respond very quickly to changing market demands, you need to be able to produce small lot sizes in an economical way.
- Bottleneck Capacities:-** Reducing setup times increases the available capacity, which can be interesting as an alternative to buying new equipment or installing an extra shift in situations where the market demand increases.
- Cost Reduction :-** Since, especially on bottlenecks, the direct production cost is related to machine performance, an OEE (Overall Equipment Effectiveness) can easily show the impact of setup reduction.

### 3 SMED

Working in any kind of manufacturing environment one of the unfortunate characteristics is waste. Waste can extend from unused raw material to damaged products, and it can carry quite of a financial loss for the company if not treated in an efficient manner. In order to reduce waste, there are several number of methods and strategies that companies can use depending on the desired results. One of the most popular methods is Single Minute Exchange of Die or SMED.

SMED was developed by Shigeo Shingo in 1950s Japan in response to the emerging needs of increasingly smaller production lot sizes required to meet the required flexibility for customer demand. The SMED technique is used as an element of Total Productivity Maintenance (TPM) and "continuous improvement process"[4]. It is one of the method of a reducing wastage in a manufacturing Process. The phrase "single minute" does not mean that all changeovers and startups should take only *one* minute, but that they should take less than 10 minutes (in other words, "single-digit minute")

### 4 BASIC PROCEDURES FOR SETUP TIME REDUCTION

**Practical Step 1:** Analyze the Setup Operation.

**Practical Step 2:** Identify the Targets for Improvement.

*Sub step 2.1 Eliminate Losses in Setup Operations.*

*Sub step 2.2 Separate Internal and External Setup.*

At this step an important question must be asked for each setup activity. "Do I have to shut the machine down to perform this activity?" The answer helps us in distinguishing between internal and external setup. This step can reduce the setup time by as much as 30 to 50 percent. The three techniques that SMED uses at this step are: Check lists, function checks, and improved transport of dies and other parts.

*Sub step 2.3 Convert Internal Setup Steps to External*

In order to achieve the single digit setup time objective SMED introduces this step. At this step internal setup activities tried to be converted to external activities. So the total time that the machine is shut down will be reduced. Advance preparation of operating conditions, function standardization, and use of intermediary jigs are the techniques to support the second step.

*Sub step 2.4 Shorten Internal Setup and Shorten External Setup Steps.*

At this step "specific principles" are applied to shorten the setup times. Implementing parallel operations, using functional clamps, eliminating adjustment and mechanization techniques are used to further setup time reduction

After one round of Sub Steps—from (2.1) to (2.4), return to Practical Steps. Practical Step 3 is next in the procedure sequence

**Practical Step 3:** Finalize the Improvement Plan.

**Practical Step 4:** Estimate Postimprovement Setup

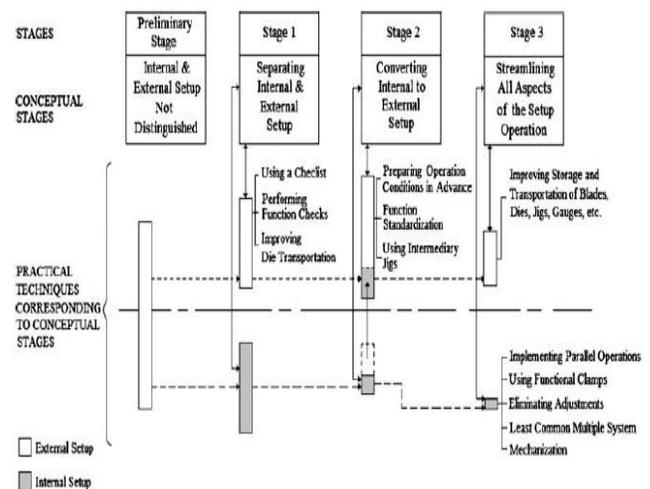
**Practical Step 5:** Study and Evaluate the Improvement Plans.

**Practical Step 6** Arrange the Actual Implementation.

**Practical Step 7** Create a Temporary Procedures Manual for the Improved Setup Method.

**Practical Step 8** Officially Launch the Improved Setup Method.

**Practical Step 9** Implement a "Sideways Expansion" of Single Setup.



**Fig.2 SMED Conceptual Stage and practical Techniques[6]**

To make the SMED implementation smoother a group of leveraging tools was also used. They are mentioned in table.[7]

**Table I Phases of the SMED concept and their Leveraging tools**

Phases of the SMED concept	Leveraging tools
Phase A: SMED project kick off	1) Analyze the Shop Floor activities in order to differentiate internal from external operations
Phase B: Separate internal from external operations	(2) The use of <i>checklists</i> (3) The definition of functions for each worker (4) The improvement of tool transportation
Phase C: Convert internal to external operations	(5) The previous preparation of setup operations (6) The automation of operations (7) The utilization of different tools
Phase D: Improve all aspects of the setup operation	(8) The improvement of tool transportation and warehousing (9) Elimination of settings, calibrations and adjustments (10) The automation of operations

## 5 BENEFITS [7]

According to Shingo (1985), the main benefits of the SMED application are presented below

### Direct Benefits

- Setup time reduction
- Reduction of time spent with fine tuning
- Fewer errors during change-overs
- Product quality improvement
- Increased safety

### Indirect Benefits

- Inventory reduction
- Increase of production flexibility
- Rationalization of tools

## 6 CONCLUSION

"One of the most noteworthy accomplishments in keeping the price of products low is the gradual shortening of the production cycle. The longer an article is in the process of manufacture and the more it is moved about, the greater is its ultimate cost." (Henry Ford 1926). The changing world economy has caused an increase in the use of just-in-time manufacturing, which results in a trend toward short-run, multiple-product manufacturing. In this Paper the basic ideas of SMED Such as Definition, Basic Procedures for Setup Time Reduction using SMED, SMED implementation smoother a group of leveraging tools and Benefits were Discussed. The importance of setup time reduction was

presented using SMED methodologies. After implementing the SMED methodology, it is possible to defend that simple process-based innovations, as the Separation of internal from external operations and the conversion of internal to external operations, are among the key drivers to productivity improvement.

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