Reduce Die Changeover Time in HCCP Using SMED Technique

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Abstract - In today’s world, time as a resource is a major issue for any industry to avoid being wasted for an improved production facility. In this paper we present an application of Single Minute Exchange of Die (SMED) in a Refinery division of a company named Rashtriya Metal Industrial Ltd (RMIL) where they cast copper alloys using Horizontal Continues Casting Process (HCCP). In this casters, they often need to change dies due to many reasons like excessive zinc composition causing defects in metal casting, change in dimensions of casting requirement, etc. Current time taken in changing of a single die is 6 to 7 hours. By observing the changeovers as well as referring Standard Operation Procedure (SOP) we are positive that we can reduce time up to a considerable extent.

There are many techniques to reduce the changeover or setup time but we have selected SMED techniques to reduce the same. It bifurcates activities into two categories which are internal activities and external activities. Internal activities are carried out only when the machine or process has stopped and external activities can be done when the machine or process is still in operating. In SMED these internal activities are converted into external activities to reduce the changeover time.

Keywords - SMED, Changeover time, Cycle Time, Internal and External Activities, Die, HCCP, Copper alloy, Casting

I. INTRODUCTION

In now a day’s customer needs a good quality product with minimum price and less time. This is not possible with using conventional methods for manufacturing. This is possible with only using modern techniques, tools and machines as per the requirement of the process. So to the fulfillment of the requirements, we have used the SMED technique to reduce the setup time of operation for the existing machines.\textsuperscript{[1]}

A SMED goal is a quick changeover of setup. It is a suitable method not only for improving manufacturing process but also for the equipment design development. Customers are expected to get the reliable product in a short time.

To accomplish this, it is needed to eliminate and improve productivity and quality. It is a customer-driven requirement who demands a product and service diversity, high reliability, quality and meeting customer satisfaction.\textsuperscript{[6]}

A comparison of results and achievements before and after SMED implementation were done to measure the effectiveness of SMED to reduce cycle time. The SMED process complete in four steps i.e. combine, elimination, simplification and reduction that are shown in figure 1.\textsuperscript{[1]}

![SMED Process](image-url)

II. LITERATURE REVIEW

1. The Implementation of Single Minute Exchange of Die with 5’s in Machining Process for Reduction of Setup Time by Vipan Kumar, Amit Bajaj in 2015 is explaining on Reduction of Setup time with eliminating no value-adding activities to either remove or eliminate completely in changeover time of die.\textsuperscript{[1]}
2. Performance Improvement Using the Single Minute Exchange of Die (SMED) Methodology in an Aluminium Profiles Extrusion Production System by Ramiz Assaf, Tamer Haddad in 2014 has worked on using Automation Technology and advanced industrial robots with Single Minute Exchange of Dies to go even further one step ahead to One Touch Exchange of Die (OTED).[2]

3. Single Minute Exchange of Dies: Literature Review by Yash Dave, Nagendra Sohani in 2012 is explaining the SMED technique with its history, stages, types, topics and methodology for the improvement in operating performance and flexibility.[3]

4. Setup Time Reduction of Machine using SMED Technique and Lean Manufacturing by N.S. Jagpat, V.D. Ugale, M.M. Kadam, A.V. Salve. Published in 2015, they explained in this paper about using the SMED technique along with the additional tools like Eliminate, Combine, Reduce and Simplify (ECRS) for the effective implementation.[4]

5. An application of SMED Methodology by Berna Ulutas stated that SMED is mostly concerned with the differentiating the Internal activities and External activities and converting most of the Internal activities into External activities and the validity of the process is verified by an application in Styrofoam manufacturing process whose set up time is critical.[5]

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Research topic</th>
<th>Author</th>
<th>Gap related to our company</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>The Implementation of Single Minute Exchange of Die with 5’s in Machining Process For Reduction of Setup Time</td>
<td>Vipan Kumar, Amit Bajaj (2015)[1]</td>
<td>Reduce Setup time with eliminating NO value adding Activities at Time of Changeover.</td>
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<tr>
<td>03</td>
<td>Single Minute Exchange of Dies: Literature Review</td>
<td>Yash Dave, Nagendra Sohani (2012)[3]</td>
<td>SMED implementation help in reducing waste of sources in a systematic way and also continue study and practice will avail true potential of the technique.</td>
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III. DISCUSSION

• By studying the different research papers related to the SMED application, we realize the merits that can be driven by its application in the company we are referring. Different areas of implementing the method with its conclusion led us to think that it’s a gap for us that company we are referring is not using SMED and the resources being wasted. So, we locked on to carry out the implementation of SMED technique in a company.

• We study and understand the processes and activities which are carried out in continuous production and found out that the time taken in changing of dies on HCCP is taking much more due to the traditional approach of doing than it should have to. This extra time being wasted in changing of die is a waste of resources. So, by discussing the particular topic we decided to implement the SMED technique on reducing the changeover time of exchange of die.

IV. TERMS RELATED TO SMED

1) Internal Activity:- Activity that can be carried out when the machine is shut down or off at a time of working is defined as Internal Activity. An example would be the removal or exchange of a die.[3]

2) External Activity:- Activity that can be carried out while the machine is in operation or running is defined as the External Activity. For example, preparation of a die which is used for the changeover. [3]

3) Changeover Time:- Changeover time is defined as the time from completion of the last good part of one lot to completion of the first good part in the next lot. Traditionally, when somebody referred to changeover, they used to refer to mere tooling attachment and detachment operations. Actual changeover, on the other hand, is longer and comprises all activities required to have the machine ready to produce the new lot.[3]

4) Value Added Activities:- The time spent on activities which add value to the product from the customers perspective is defined as the Value Added Activity. These are the main activities that effectively change the form and function of a raw material into a good that the customer is willing to pay for.[3]

5) Non-Value Added Activities:- The time spent on activities which add costs but no value to the product from the customers perspective is defined as the Non-Value Added Activity. The Customer is not willing to pay for these activities.[3]

6) Waste: Any activity that consumes resources but creates no value for the customer.[3]

V. STEPS OF SMED[7]

1) Observe the current operation and existing setup changeover.
2) Identify internal and external activities.
3) Separate internal and external activities.
4) Internal activities converted into external activities.
5) Some activities are made parallel wherever possible.

VI. OBJECTIVES

1) To bifurcate whole activities into internal activity and External activity for the changeover of die
2) Reduce the downtime of the machine and changeover of die by converting internal activities into External activities.
3) To reduces the time being wasted in transportation of the tools and equipments.
4) To reduces or completely eliminates the Non Value Added activities by differentiating whole procedure into Value Added and Non Value Added ones.
5) Design Improvement of die cage and surface stone.

REFERENCES


