

# Basics of Set-up / Changeover Reduction (Single Minute Exchange of Dies - SMED)

Single Minute Exchange of Dies (SMED) is a powerful technique, used to reduce the amount of time required for equipment setup, including the exchange of tools and dies, and / or changeover. The technique was first developed by Shigeo Shingo of Toyota in the 1950's, with the aim of reducing downtime from more than 24 hours to less than 10 minutes, i.e. Single (Digit) Minutes. In offices the goal is to retrieve documents or files from shelves / cabinets / network servers in less than one minute.

## 1. Step back and observe the process

Before you begin the SMED exercise prepare a sketch of the area where the changeover will take place. During the changeover mark on the sketch each movement of the operative(s) with a line showing their travel path(s). This sketch is often called a "spaghetti diagram".

The best way to observe the process is to video a process changeover. Where possible use two video cameras - one fixed to a tripod and videoing the changeover, the second mobile and following the operative(s) doing the changeover. The idea is to capture each process task in detail. Try to capture at least ten minutes of the process running pre- and post- setup in order to observe any activities that take place before or after the changeover.

When the changeover is complete the entire team, including the operative(s), should watch the video, and create a SMED timesheet, (Figure 1), by listing all of the tasks required for the changeover. Take a note of the start and finish time of each task (using the video time stamp if available), and use these to work out the time it takes for each individual task.

|   | Task Element                     | Start Time<br>(hh:mm:ss) | Finish Time<br>(hh:mm:ss) | Element Time<br>(hh:mm:ss) | Element Time<br>(secs.) |
|---|----------------------------------|--------------------------|---------------------------|----------------------------|-------------------------|
|   | <b>Changeover on Moulder</b>     |                          |                           |                            |                         |
| 1 | Remove tooling from previous job | 11:58:07                 | 12:10:43                  | 0:12:36                    | 756                     |
| 2 | Head 2 – fit and align block     | 12:10:43                 | 12:12:43                  | 0:02:00                    | 120                     |
| 3 | Head 2 – replace cover           | 12:12:43                 | 12:13:13                  | 0:00:30                    | 30                      |

Fig 1: Example of a SMED Timesheet

## **2. Separate Internal from External setup operations**

**Internal** activities are those that can only be performed when the process is stopped, while **External** activities can be done while the process is on-going. Mark on your SMED Timesheet which tasks which are Internal and which are External

## **3. Ensure that external are actually done before or after the changeover.**

External tasks include all those tasks that could be done before or after the set-up / changeover. In practice many external tasks are actually performed during the set-up / changeover, resulting in unnecessary downtime. It's often possible for example to get the required tools for the job before the process stops. Workplace Organisation (5S) is often helpful here!

## **4. Convert Internal activities to External activities**

Brainstorm ideas for converting, where possible, Internal activities into External activities, for example pre-heating tools. In other words change the activities so that they can be done while the machine or process is on-going.

## **5. Streamline the remaining Internal activities**

Brainstorm how the remaining Internal activities can be streamlined. Look at the spaghetti diagram of the operatives' movements during the changeover. How can movement be reduced? For example try to get rid of nuts and bolts and use clamps, use intermediate jigs, and eliminate adjustments. Consider manning levels e.g. could two people do it in less than half the time that one person would take?

## **6. Streamline the External activities**

Look at the External activities, and once again using the spaghetti diagram brainstorm how any wastes could be removed. Planning, preparation and good Workplace Organisation (5S) can all make a big difference.

## **7. Document the new procedure, and train relevant personnel**

## **8. Do it all again!!!!**

Remember the Continuous Improvement Cycle: Plan-Do-Check-Act.