

SMED Guide

A practical 5-step roadmap to reduce changeover times and increase operational flexibility.

WHAT IS SMED?

SMED (Single-Minute Exchange of Die) is a methodology developed by industrial engineer **Shigeo Shingo** in the **1950s** and further refined over more than **two decades within Toyota** as part of the Toyota Production System.

It is an analysis and improvement methodology focused on **reducing changeover time** — defined as the period between the **last good part of one production run and the first good part of the next** — in order to enable **greater flexibility, flow, and efficiency** in manufacturing operations.

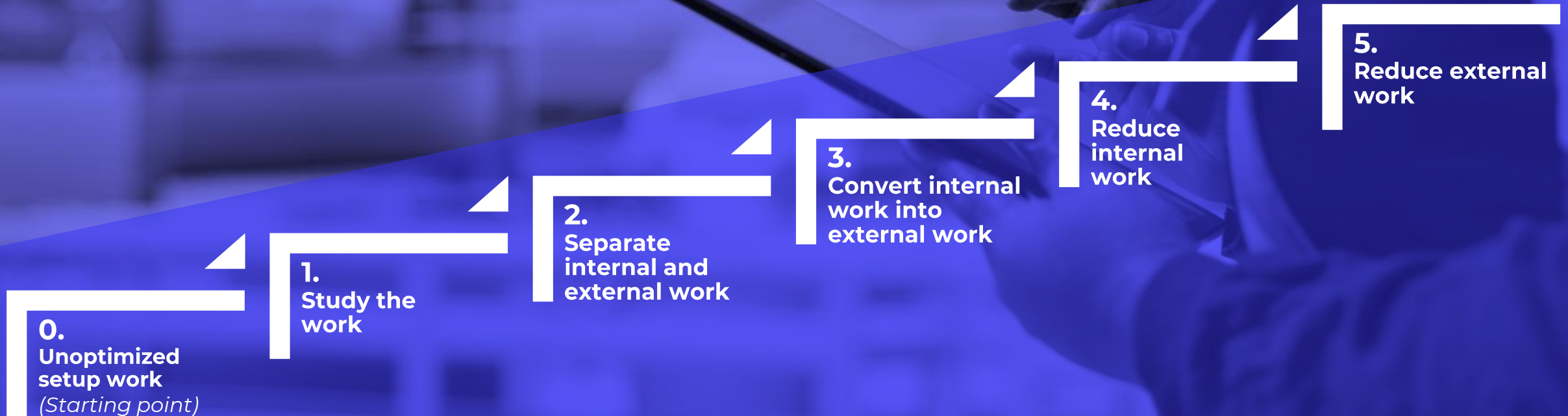
SMED goes beyond simple equipment changeovers, addressing all setup-related activities such as adjustments, cleaning, preparation, and verification.

SINGLE
MINUTE
EXCHANGE OF
DIE

REFERENCE CHANGE
(Machine)
IN LESS THAN 10 MIN.
(Original Definition)

5 SMED STEPS

SMED can be applied
to any industry
or activity

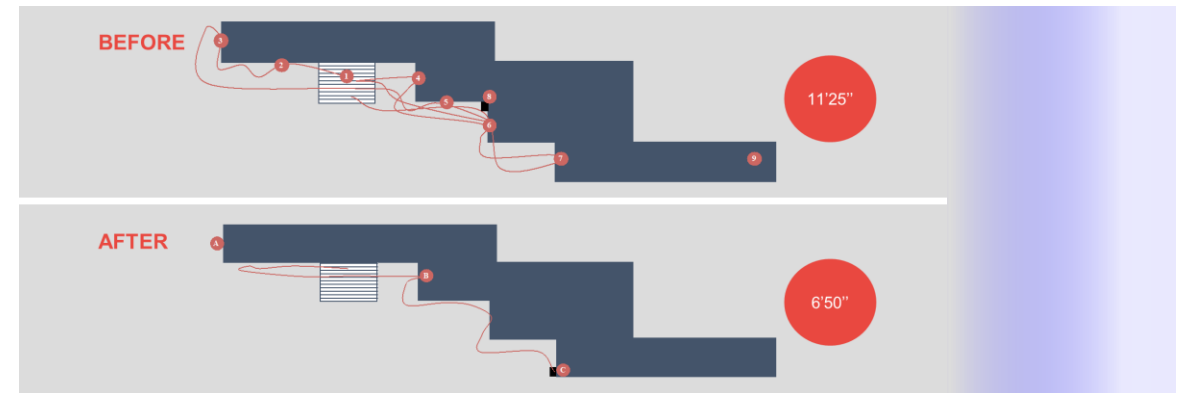


STEP 1. STUDY THE CURRENT SITUATION

The first step is to fully understand the existing changeover process through direct observation at the Gemba, with the involvement of the operators who perform the setup.

- Observe and **film the complete changeover** from start to finish
- **Map operator movements** (e.g. Spaghetti Diagram)
- **Time and sequence each task**, by operator
- Classify tasks as:
 - **Internal** (machine stopped)
 - **External** (machine running)
- **Identify waste** (waiting, motion, searching, rework)
- **Calculate total changeover time** and task breakdown
- **List required tools and materials**

Spaghetti diagram example



This detailed diagnosis serves as the basis for the subsequent steps

STEP 2 . SEPARATE INTERNAL AND EXTERNAL WORK

After analyzing the current setup with operator input, all tasks are reorganized based on whether they require the machine/process to be stopped. This separation is the foundation for reducing downtime.

- Define the optimal setup sequence
- Separate tasks into:
 - **External work before stop**
 - **Internal work during stop**
 - **External work after restart**
- Eliminate unnecessary stoppages through better task organization

Example – Separating Internal and External Work

Context	Internal (Process Stopped)	External (Process Running)
Healthcare	• Cleaning and disinfecting the operating room • Positioning the patient	• Preparing surgical instruments • Bringing the next surgery kit
Industry	• Removing the old mold or tool • Installing and locking the new mold	• Collecting tools and bolts • Preheating the mold
Banking	• Activating a new service or campaign in the system • Final validation before opening	• Preparing forms and documents • Training staff and updating instructions

The optimized primary sequence separates internal and external work

STEP 3 . CONVERT INTERNAL TASKS TO EXTERNAL TASKS

After separating internal and external activities, convert as many internal tasks as possible into external ones. Tasks that do not require a stop should be done before or after the transition to reduce downtime.

- **Preheat tools, materials, or equipment** to ensure immediate readiness
- **Standardize interfaces or settings** to eliminate on-the-spot adjustments
- **Pre-assemble parts or kits** before the setup or transition
- **Prepare tools, documents, or parameters in advance**
- **Use pre-calibrated or duplicate items** to avoid adjustments during the stop

Example – Reducing film changeover time through external preparation

Target waste

- Preparation of the roll of film for replacement

Type of machine/ line

- Pasta production line

Industry

- Food industry

Description

- A support and a second pathway were prepared
- The operator has all the consumables ready to reduce the replacement time once the first coil is finished



Converting internal tasks to external ones is key to reducing downtime and improving availability

STEP 4 . STREAMLINE ALL REMAINING INTERNAL ACTIVITIES

After converting tasks, the next step is to optimize the remaining internal activities. The goal is to perform internal work as quickly, safely, and consistently as possible, minimizing effort, variability, and waste.

- **Use quick and assisted fastening systems** (levers, clamps, pneumatic or hydraulic clamping) to reduce manual effort
- **Enable parallel work** by assigning tasks to two operators when possible to shorten total downtime
- **Eliminate adjustments** through pre-calibrated, standardized, or duplicate tools
- **Apply guided positioning and visual standards** (alignment aids, color coding) to ensure fast and correct execution
- **Simplify connections and preparation** using single connectors and dedicated setup or cleaning kits

Example – Visual standards for fast and accurate setup



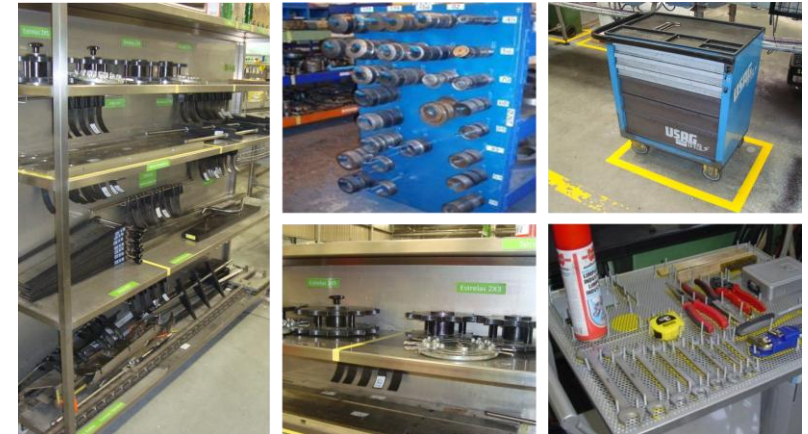
Make unavoidable internal work fast, simple, and repeatable

STEP 5 . REDUCE EXTERNAL WORK

Although external activities do not directly affect downtime, they still consume time and resources. The objective is to simplify, reduce, and standardize external work to improve efficiency and eliminate waste.

- **Reduce transport and movement** by placing tools and materials closer to the point of use
- **Improve organization and accessibility** using dedicated cabinets, shadow boards, and visual management
- **Apply 5S practices** in workstations and support areas to sustain order and standardization

Example
– **Reducing preparation waste with 5S and shadow boards**



External work should be improved as it consumes the resources of the support areas

SMED STANDARDIZATION & TRAINING

The goal of SMED is to define and standardize an improved setup method that delivers repeatable, sustainable results independent of shifts or operators, preventing regression over time.

I. Standardize the setup process

- Define a **clear operational sequence** for the setup
- Specify **what is done, when, by whom, and with which tools**
- Standardize both **internal and external activities**
- Use **simple and visual standards** to support execution

II. Create visual SMED checklists

- Develop **visual checklists** for internal and external setup tasks
- Display checklists at the **workstation**
- Use visuals to support:
 - Correct sequence
 - Tool readiness
 - Task completion

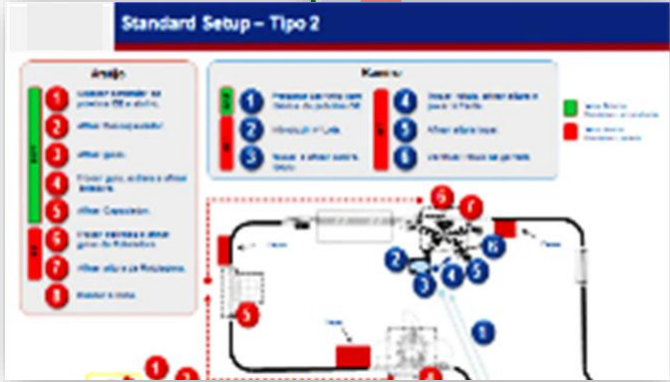
Standardization and training are essential to sustain SMED results over time

SETUP STANDARDS EXAMPLES



Pattern change on press 5 External Tasks			
 EXTERNAL TASKS TASKS TO BE CARRIED OUT BEFORE A PATTERN CHANGE STOPPAGE			
1	Collect recipe from the pattern entering the supervisor's office.		
2	Check that the wedges to be inserted are on the bench (see bench procedure).		
3	Check availability of the reservoir car.		
4	Place empty unloading container on site if necessary.		

Tema: MUDANÇA DE REFERÊNCIA				Pág. de 1/2	Data emissão: 11.02.2011
1.- Modo operador (1/2)					
Nº		Técnico		Tempo	Ferramenta
1	E	Buscar saco das cápsulas		00:11,0	Saco das cápsulas
2	E	Trocar O'ring		01:00,0	
3	E	Buscar comando manual		00:52,0	
4	E	Buscar chave roquete		00:10,0	Chave roquete 27
5	E	Buscar chave 24		03:05,0	Chave bocas 24
6	E	Buscar peças formato		02:00,0	
7	E	Buscar bitola		00:07,0	Bitola capsulador
8	E	Carregar programa dos transportadores		00:25,0	
9	F	Fechar a cuba / enviar a covete		00:29,0	
10	F	Inspeccionar		00:10,0	
11	F	Retirar cápsulas e retirar valores		06:35,0	Calculadora, Folha registro
12	F	Parar a enchedora		00:30,0	
13	F	Ligar comando manual		00:55,0	Comando manual
14	F	Tirar bicos		07:20,0	Caixa bicos; Chave bicos (90°)
15	F	Colocar bicos		11:25,0	Caixa bicos; Chave bicos (90°)
				07:30,0	
				01:10,0	
				01:15,0	Martelo





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