

SMED

(One Step Setup)

Set-up and changeover reductions for
equipment, tooling and machines.

A STRATEGY FOR PERFORMANCE
EXCELLENCE

Performance Excellence Series

Training Module Elements

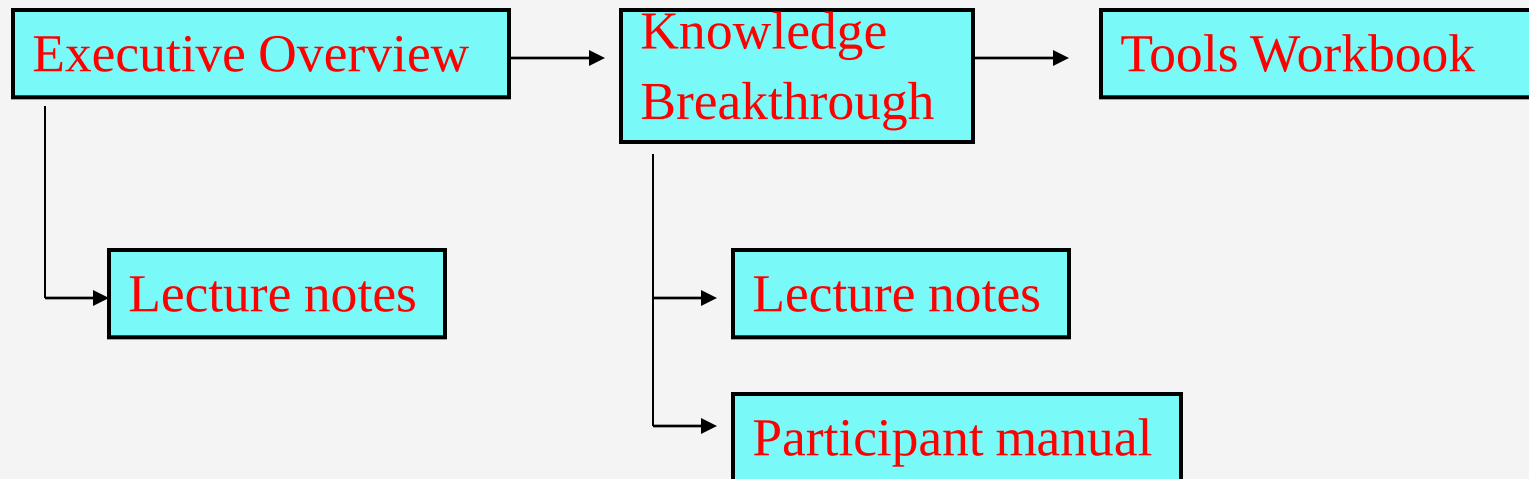


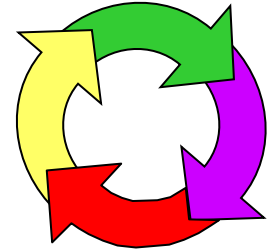
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SMED is Continuous Improvement



It is a customer driven requirement. Customers are demanding:

- ➡ **Product and service diversity**
- ➡ **Lower costs**
- ➡ **Higher reliability and quality.**

In essence organizations need to become leaner !

So organizations must:

- ➡ **Produce smaller lots, more frequently.**
- ➡ **Expand the scope and diversity of products and services.**
- ➡ **Reduce quality defects.**

Ultimately, SMED focuses on reducing changeover and set-up times, thus enabling organizations to:



Produce smaller lots of products and services more frequently !

Develop a broader scope of products and services !

Reduce quality defects towards zero !



Meet Customer's Expectations !



What Does Set-up/changeover reduction mean for my business?

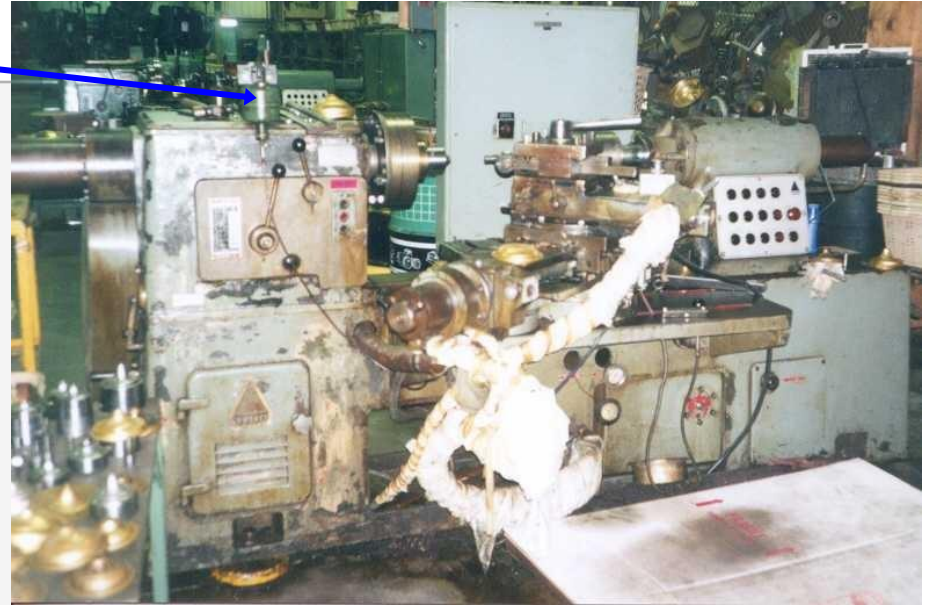
Increased customer service levels and profits !

Via Waste Elimination resulting in:

- ✦ Reduced Lead Times-Faster Delivery
- ✦ Zero Inventories-Reduced Working Capital
 - ✦ Improved Quality
 - ✦ Improved Safety
- ✦ Smaller lots of products-flexibility
- ✦ Diversified Product & Service Options

Why SMED ?

Look Familiar?



- To eliminate the wastes that result from “uncontrolled” processes increasing inventories and lead times..
- To gain control on equipment, material & inventory.
- Apply Control Techniques to Eliminate Erosion of Improvements.
- Standardize Improvements for Maintenance of Critical Set-up Parameters.

Tool Kit Comparison



Major Tools	CPI (6σ)	Kaizen	Lean	Description
Cp/Cpk	☞			Process capability assessment
DOE	☞			Design of experiments
SPC	☞			Process control based on statistics and data analysis
FMEA	☞			Risk assessment tool
Regression	☞			Correlate effect one variable has on another
Process Map	☞	☞	☞	Map process steps to communicate and identify opportunities
5 whys / 2 hows	☞		☞	Determination
methods for root cause discovery				
Pareto	☞	☞	☞	Column chart ranking items highest to lowest
Fishbone	☞		☞	☞ Cause / Effect Diagram
5S		☞☞	☞☞	Elimination waste
Visual Mgmt	☞		☞	☞ Emphasis on visual techniques to manage process
Poka-Yoke			☞	☞ Error proofing techniques
Spaghetti Chart		☞	☞	
Kanban			☞	☞ Material storage technique used to control process
Takt Time		☞	☞	Determine pace or beat of a process
Std Work		☞	☞	Evaluate tasks done during a process
SMED		☞	☞	Single minute exchange of dies - Quick machine set up
TPM			☞	Integrate maintenance strategy with process
Cellular Flow			☞	Reduce inventory & cycle time through process layout and pull

Expand Process Improvement Program to Utilize Kaizen Tool Kit

Identify what types of internal and external setup times are involved in the following pictures.

Picture A: Wire Cutting Machine

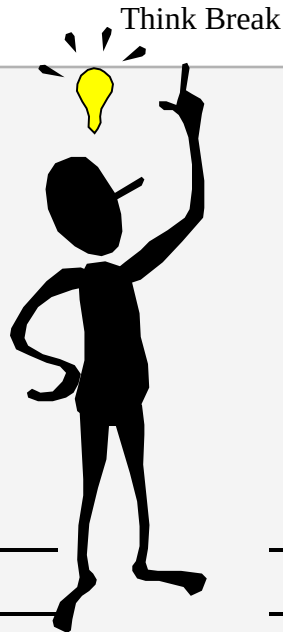


Picture B: Metal Stamping Machine



Identify what types of internal and external setup & times are involved in the following pictures.

Picture A: Wire Cutting Machine



Setup Type	Time (Min)

Picture B: Metal Stamping Machine



Setup Type	Time (Min)

Think Break



Internal External Setup

Classify Three items under each item category.

Internal

External

Which items would you convert from internal to external Setup ?

Why?

Traditional Setup Practices

Material movement occurs after the machine is turned off.

- Completed products are transferred to next operation.
- Raw material is moved after the machine is stopped.

Detection of defects or missing equipment is noticed which the machine is running.

- Setup tooling delivered after the changeover has begun.
- Defective product identified after internal setup has begun.

Defective tooling, fixtures, setup instruments are noticed after the machine is turned on.

- The operator notices that equipment is missing after internal setup has begun.

5 “Traditional” Setup Steps Defined

- Preparation - Ensures that all the tools are working properly and are in the right location.
- Mounting & Extraction - Involves the removal of the tooling after the production lot is completed and the placement of the new tooling before the next production lot.
- Establishing Control Settings - Setting all the process control settings prior to the production run. Inclusive of calibrations and measurements needed to make the machine, tooling operate effectively.
- First Run Capability - This includes the necessary adjustments(re-calibrations, additional measurements) required after the first trial pieces are produced.
- Setup Improvement- The time after processing during which the tooling, machinery is cleaned, identified, and tested for functionality prior to storage.

“Traditional” Setup Resource Consumption Analysis

Setup Steps	Setup Type Traditional Internal	Setup Type Traditional External	Resource Consumption (%)	Setup Type One-Step Internal	Setup Type One-Step External
Preparation	X		20 %		X
Mounting & Extraction	X		5 %	X	
Establish Control Settings	X		15 %		X
First Run Capability	X		50 %	N/A	N/A
Process Improvement	X		10 %		X

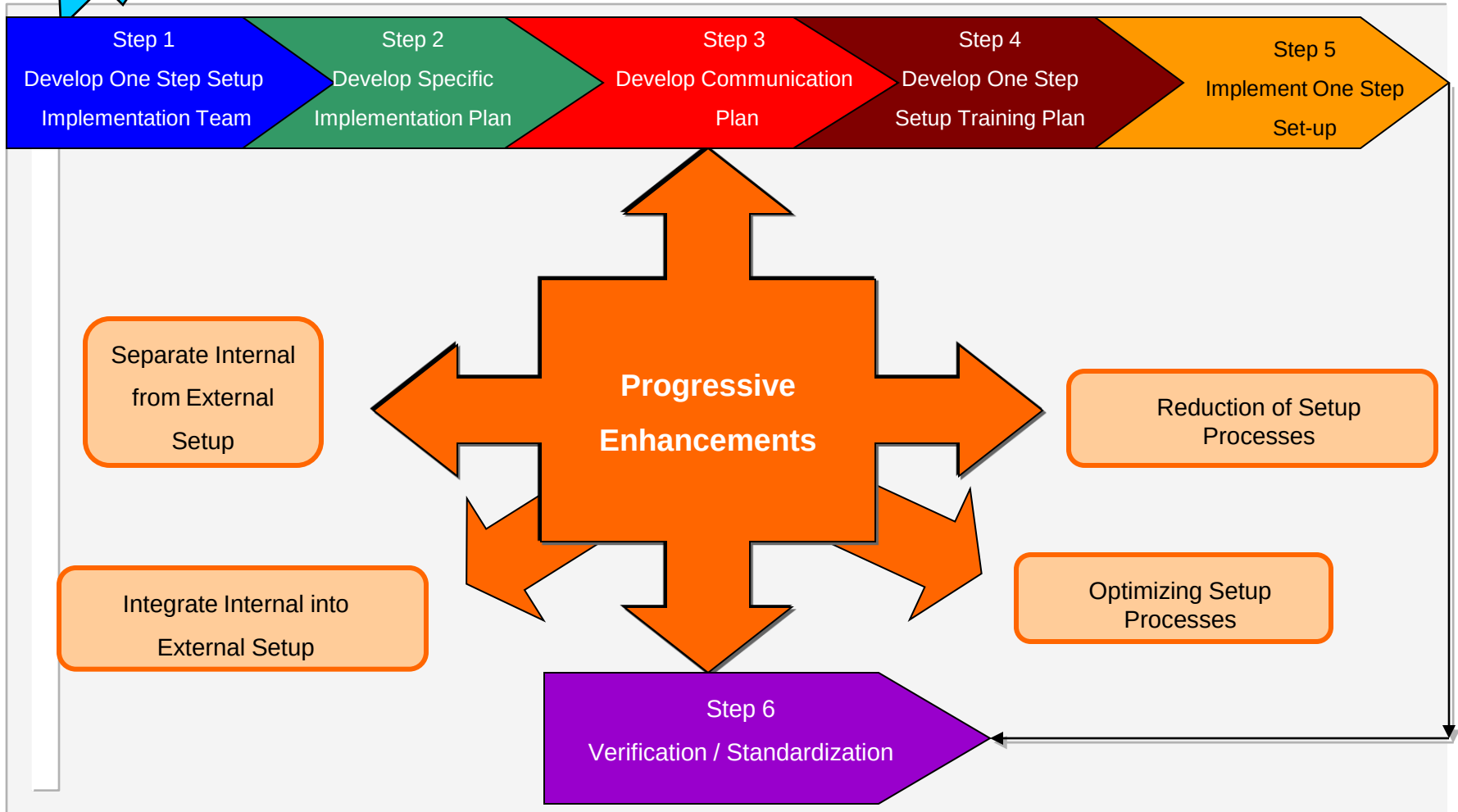
Think Break



Examples of wastes in a traditional setup !

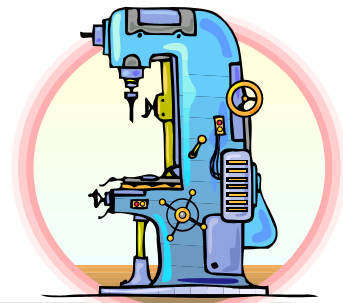
What kind of “setup wastes” can you identify in this pictures ?





Phase 2

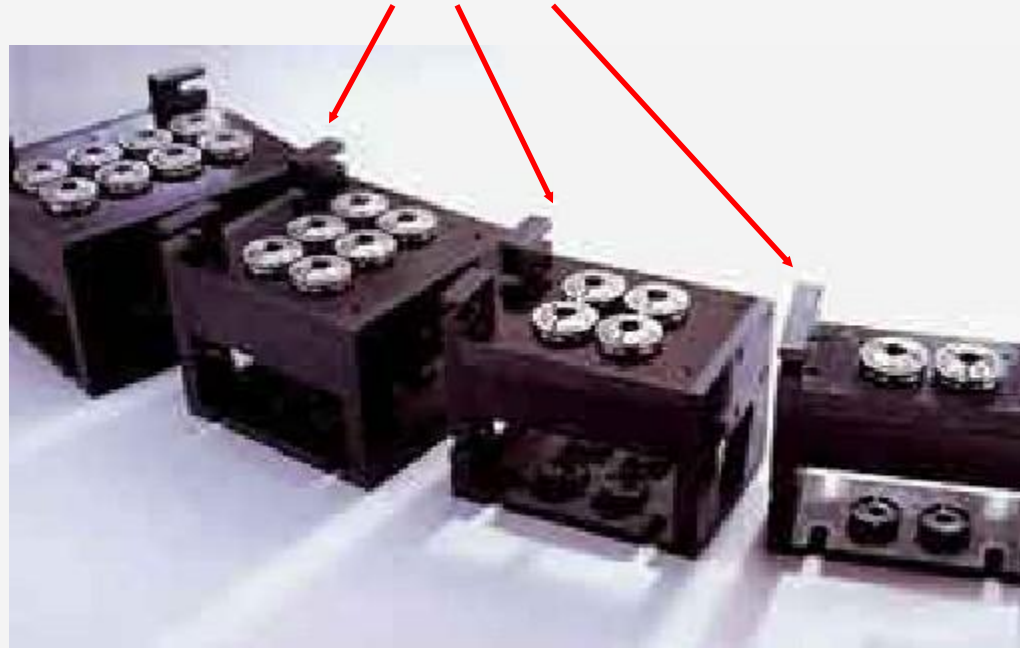
Combining equipment functionality



Involves standardizing the equipment (parts, tooling, processes) based on commonality between setups to reduce the number of setup steps and cycle times.

The common setup parts were identified and replaced with this jig/holder combination.

By using these fixtures, the parts are automatically centered and adjusted for height and flatness as a part of External setup- not Internal setup.



Notice how different quantities of the same part can be setup with the same fixture. Also, these setups can occur while the machine is running.

Waste associated with finding, replacing, motion will be eliminated by this example of visual placement.

Tooling supplies are clearly labeled

Tooling supplies are neatly assigned a unique location.

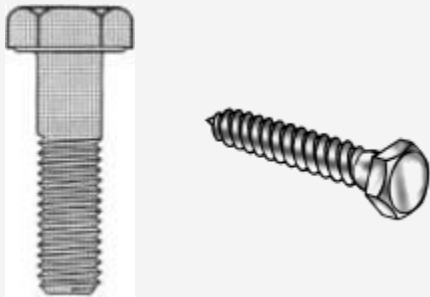


Phase 3: Reducing setup processing time.

Elimination of Bolts & Adjustments.

Example of One Step Fastening

Bolt attachments requires 32 complete turns for each bolt or screw (1 for each thread) to fasten this bolt and die to a machine.



This clamp attachment requires one step to attach the die to a machine.



SMED for the Workplace

**Training and
Sourcebook
for
SMED
Worksheets**

How to Use This Manual

The continuous improvement tools that are presented in Sections 1-10 of this manual are shown in order of use. These forms **MUST** be completed in the order presented in this manual. Each section contains a brief description of the tool, its purpose, when to use it, who should use it, how to use it, and the expected results.

Remember to focus on the elimination of waste. Strive to maximize yields and obtain cost reductions from existing machinery and equipment before “buying solutions”. Improve current systems and techniques before automation. Automating a system or practices without first having an understanding of the process will not solve underlying process problems.

Perhaps the most important point to remember is that we must understand a process before we make any attempt in changing it. “No Tampering” is the first rule of continuous improvement. We can not tamper with a process without understanding it.

By using these tools, we will all share a common and systematic approach for questioning, analyzing, proposing solutions, experimenting, and finally, implementing proven changes.

“The problems that exist in the world today cannot be solved by the same level of thinking that created them.”

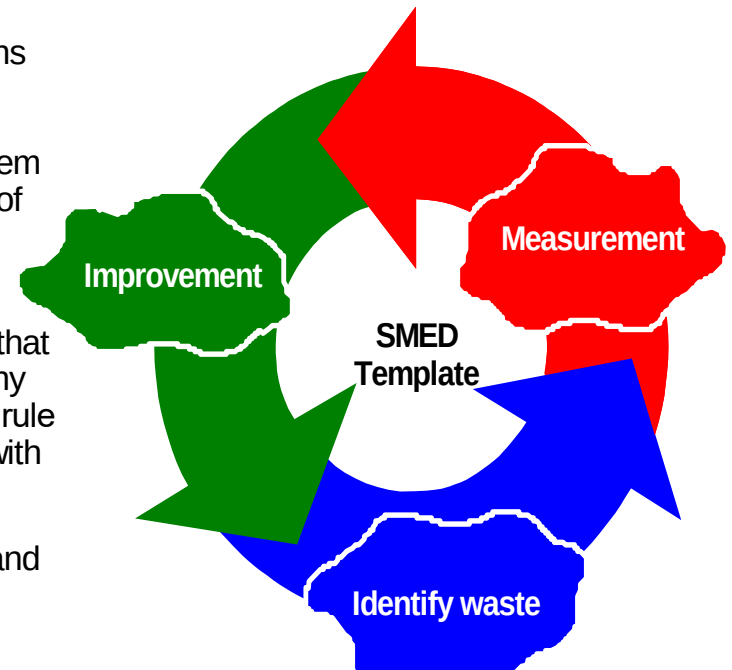


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Section 7

Setup Conversion Matrix

SET-UP CONVERSION MATRIX

Sheet

Date:

Page of

Area/Department	Machine/Equipment Name	Set-up Tools Required	Operator Number		Standard Set-up Time
			Date Prepared		

CURRENT PROCESS		CURRENT TIME		IMPROVEMENT	PROPOSED TIME	
NO.	Task/Operation	Internal	External		Internal	External
Current Total:				Improve Total		

Conversation Methology


Preparation of Set-up Process


Combining Equipment Functionality


Standardized Jigs

Setup Conversion Matrix

Purpose	Used to identify specific actions taken to convert internal setup operations into external setup operations as part of Phase 1 in the SMED program.
When To Use	The Setup conversion Matrix should be used after the Setup work Combination sheet has been completed.
Who Should Use It	The Setup conversion Matrix can be used by anyone involved in area or process improvement.
Expected Benefits	The resultant deliverables will be specific actions aligned with each of the three conversion methodologies(Preparation of Setup Processes, Combining Equipment Functionality, Standardized Jigs) to convert internal setup operations into external setup operations.

How To Use It

1. **Complete the sections titled “ Area/Department, Machine/Equipment Name, Setup Tools required, Operator Number, Date, and Standard Setup time.**
2. **List all the specific setup tasks/steps in sequential order**(can obtain this information from the process map)under the column titled “tasks/operations” and indication the step number under the column titled “No.”.
3. **Next list the total amount of Internal and External Setup time in the appropriate column** for each task **Before** any changes have been made.
4. **Complete the column titled” improvement”** by listing the specific continual improvement actions that will be taken to convert the Internal setup time into External setup time.
5. **Next complete the column titled “proposed time”** by listing the **expected** Internal and External setup times.
6. Finally add up the total internal and External setup times for both the current and proposed columns and **list these at the bottom of the form in the sections titled “ Current Total & Improved Total “ respectively.**

Next Step

You are now ready to move to the next step, the SMED Conversion To Do List.