

Training

SET-UP TIME REDUCTION

or

Pit Stop-style Changeovers

WHY ?????

In the heyday of large-scale mass production, production engineers used to agree that *the fewer the changeovers, the better.*

However, in today's market, where large product variety, small output volumes, and short delivery are all daily realities, *factories are having to make frequent product-model changeovers* to match production to current market needs.

WHY ??

IN TODAY'S WORLD WITH GREATER PRODUCT VARIETY and MORE DEMANDING CUSTOMER SERVICE ...

- We cannot necessarily dedicate equipment,**
- We must maximize the use of expensive equipment, and**
- we wish to have less investment in inventory**

How a Quick Changeover Helps

- ◆ **Smaller lot sizes**
- ◆ **Lower inventory**
- ◆ **Better quality**
- ◆ **Shorter lead times**

- ◆ **More frequent changeovers, better flexibility**
- ◆ **Better reaction time to Customer orders & requests**
- ◆ **On-time deliveries**
- ◆ **Improved profitability**

WHY ???

Reduced Set-Up Time



More Frequent Set-Ups



Smaller Lot Sizes



Reduced Inventories



Better Quality



Reduction in Waste



Greater Flexibility



Improved On-time Deliveries



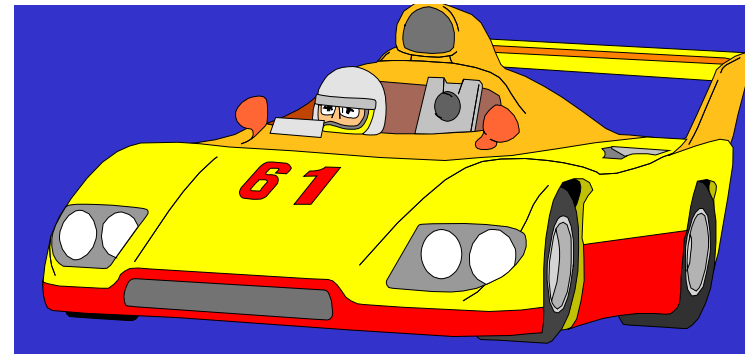
COMPETITIVE ADVANTAGE !!!

SIMPLY PUT

So that we can deliver...

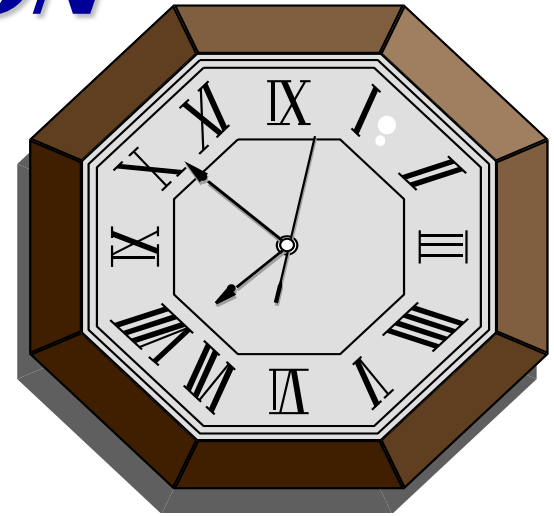
- what the Customer wants**
- when the Customer wants it**
- with good quality from the first piece**
- at the lowest cost**

like a *Pit Stop*...



SET-UP TIME DEFINITION

The amount of time taken to change a machine from the ***last good part*** of a production run to the ***first good part*** of the next production run



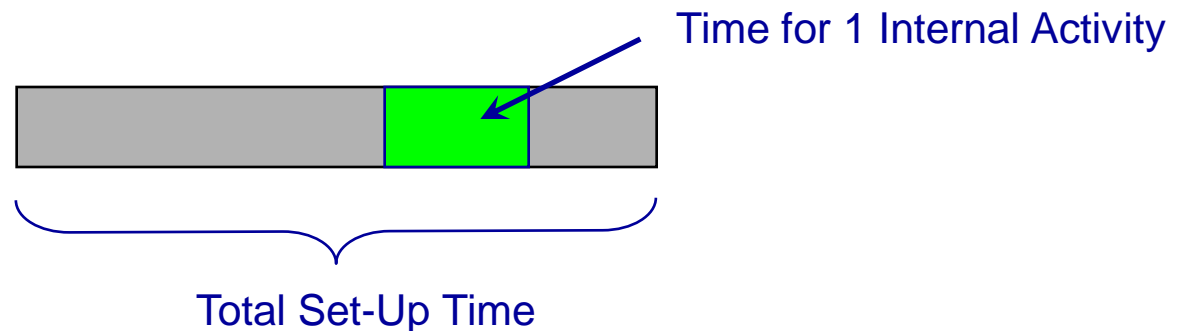
CLOCK TIME, not LABOR TIME !

What are Internal Activities ?

What's External ?

Internal Activities are those that must be performed while the machine is turned off and not making parts.

- 📄 Opening/Closing of the press, taking out or inserting a mold into a press, etc.
- 📄 Exchange of and adjustment of dies



What are Internal Activities ?

What's External ?

External Activities are those that can be performed while the machine is on and making good parts.

- 📄 Getting materials and tools
- 📄 Clean-up of the workplace
- 📄 Paperwork
- 📄 Sharpening die

Red = times for
External Activities



Total Set-Up Time

THE 4 STEPS TO IMPROVEMENT

1. Identify activities and document the process



2. Separate internal & external activity



3. Convert internal to external activity



4. Reduce all remaining activity



THE 4 STEPS TO IMPROVEMENT

1. Identify Activities and Document the Process

- 1. Observe the process (everybody)**
- 2. Identify and time the steps in the process**
- 3. List tools, materials, equipment, information needed during the process**
- 4. Determine the frequency and history of changeovers**
- 5. Document the problems in the process**

THE 4 STEPS TO IMPROVEMENT

2. Separate Internals from Externals

- 1. Develop checklists for all items necessary for the Set-Up... tools, gauges, materials, documentation, etc.**
- 2. Perform prior checks on all items to insure proper function and fit**
- 3. Stage all items close to the workplace such as die carts, tool boards, instructions, etc.**

...in much the same manner as an operating room procedure

THE 4 STEPS TO IMPROVEMENT

3. Convert Internals to Externals

- 1. Prepare operating conditions prior to the setup or changeover**
 - preheat molds, pre-adjust parts**
- 2. Standardize necessary functions**
 - change the fewest parts**
 - minimize or eliminate adjustments**
- 3. Use intermediary fixtures/jigs**
 - preset tools, position dies**

THE 4 STEPS TO IMPROVEMENT

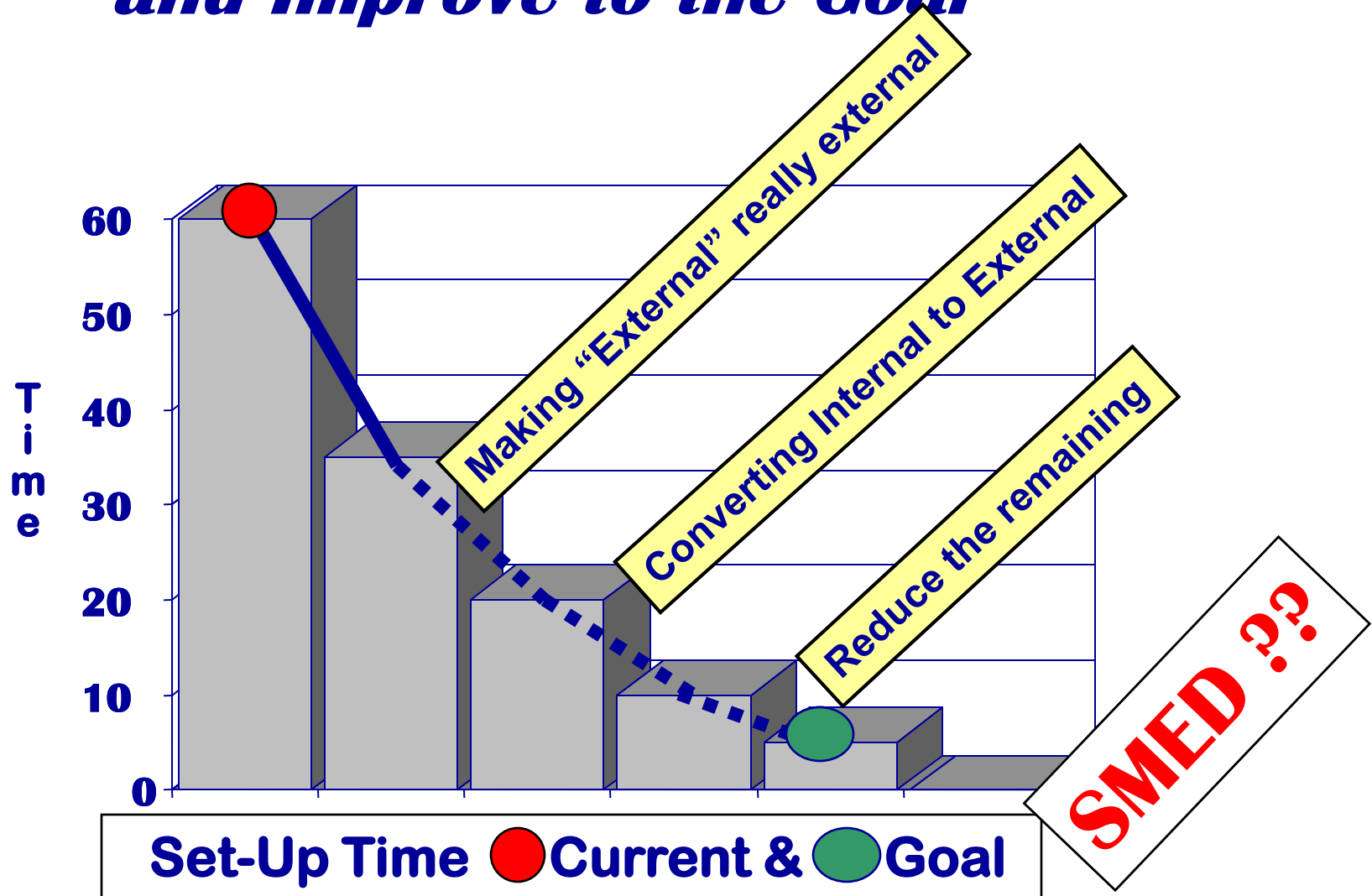
4. Reduce All Remaining Activity

- 1. Perform parallel operations**
- 2. Improve clamping mechanisms**
 - one turn, one motion methods**
- 3. Eliminate all adjustments**
 - numerical settings versus feel**
- 4. Automate activities where appropriate**

The Seven Rules

- 1. Set-Up begins and ends with the 5S's**
- 2. Change internal into external, *THEN* improve the rest of the internals**
- 3. Bolts are your enemies**
- 4. If you have to use your hands, make sure your feet stay put**
- 5. Don't rely on special, fine-tuning skills**
- 6. Standardize all Set-Up operations**
- 7. Standards are standards; they are not flexible**

Establish the Current Position and Improve to the Goal



The Lean Team Tools

5 Times Why ??????

<p>What is the purpose?</p>	<p>5 Why's Is this activity necessary? Can it be eliminated?</p>	<p>Eliminate any unnecessary activity</p>
<p>Where is this being done?</p>	<p>5 Why's Why does it have to be done in this place? Where should this be done?</p>	<p>Combine and / or move closer</p>
<p>When is this being done?</p>	<p>5 Why's Why are we doing this now in relation to other things? When should this done?</p>	<p>Combine activities Organize parallel activities Re-arrange sequence of activities</p>
<p>Who is doing this?</p>	<p>5 Why's Why is this person doing it? Who should do it?</p>	<p>Combine or change people to speed overall task completion</p>
<p>How is it being done?</p>	<p>5 Why's Why are we doing it this way? Is there a simpler or better way? How should this be done?</p>	<p>Simplify or improve method</p>

WORKSHOP WORKSHEETS

KEY SET-UP TOOLS

- **Set-Up TIME OBSERVATION SHEET**

___ define and time the steps in the Set-Up process

- **Set-Up OBSERVATION GRAPH**

___ display the relative time involved in each of the Set-Up steps

- **OPERATIONS LAYOUT**

___ record flows, distances, and the layout of equipment & inventory

- **EXTERNAL CHECKLIST for Set-Ups**

record the equipment, materials or information needed to perform a Set-Up

Set-Up Observation Sheet - Video Tool # 1

Thomas&Betts		CHANGEOVER -- OBSERVATION SHEET						3	<~	3	<~								
Seq No	PERSON ~ ELEMENT	Crew	Int Ext	Start Tape Counter	Finish Tape Counter	Elapsed Time (hh:mm)		INDIVIDUAL ELEMENT TIME (minutes)											
						Element	Cumulative	3	6	9	12	15	18	21	24	27	30	33	36
1	call for and get fork lift driver	1	Ext	7:33 AM	7:55 AM	0:22	0:22	[Gantt chart bar: 0:00 to 0:22]											
2	Stop press remove strip from main press	1	Int	7:55 AM	8:13 AM	0:18	0:40	[Gantt chart bar: 0:22 to 0:40]											
3	Get tools, move to main press, look for crowbar	1	Ext	8:13 AM	8:26 AM	0:13	0:53	[Gantt chart bar: 0:40 to 0:53]											
4	Prepare new side die for install on bolster	2	Ext	8:26 AM	8:44 AM	0:18	1:11	[Gantt chart bar: 0:53 to 1:11]											
5	Stop side press after magazine runs out	1	Int	8:44 AM	8:49 AM	0:05	1:16	[Gantt chart bar: 1:11 to 1:16]											
6	Remove main die, unbolt, 12 bolts (no clamps)	2	Ext	8:49 AM	9:32 AM	0:43	1:59	[Gantt chart bar: 1:16 to 1:59]											
7	Unfasten pusher arm; unthread 2 allen machine r	3	Ext	9:32 AM	9:42 AM	0:10	2:09	[Gantt chart bar: 1:59 to 2:09]											
8				9:42 AM															
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Total Time (hours:minutes)						2:09	TITLE:					SHE							
Crew-Hrs Internal ~>						0:23	3:07 <~ Crew-Hrs External					----- clock hours -----							
Monday 18-February-2002 17:42						3-Page Total:		Internal: 0:23		External: 1:46		Int+Ext: 2:09							

Enter either an "I" or "E" in these cells for colors to signify Internal or External activity

To clear, select range "Gantt", then press Delete key

Set-Up Time Observation Sheet Tool # 2

Lean

Set-Up Observation Sheet

Step No.	Step Description	Elapsed Time		Step Time	"Should be" Int/Ext	Items needed		Comments
		Start	Stop			Tools	Information	
TOTAL								

Set-Up

Group Activities on the Shop Floor

- 1. OBSERVE and document the current process**
- 2. Characterize and analyze each of the activities**
 - ❖ Identify activities & document the process
- 3. Record problems and opportunities for improvement**
- 4. Brainstorm ideas & establish priorities for change**
 - ❖ Separate internals from externals
 - ❖ Procedure for external prep
 - ❖ Reduce all (remaining) internal activities
- 5. Develop new procedures & new equipment**
- 6. Establish the recording of performance each Set-Ups**
- 6. Perform the new Set-Up procedure**
 - ❖ Simulate the new activities as needed
 - ❖ Look for further improvements
- 7. Refine the new procedure**
- 8. Repeat, document and train on the new process**
- 9. Measure, review performance, make further improvements**

Set-Up

End