

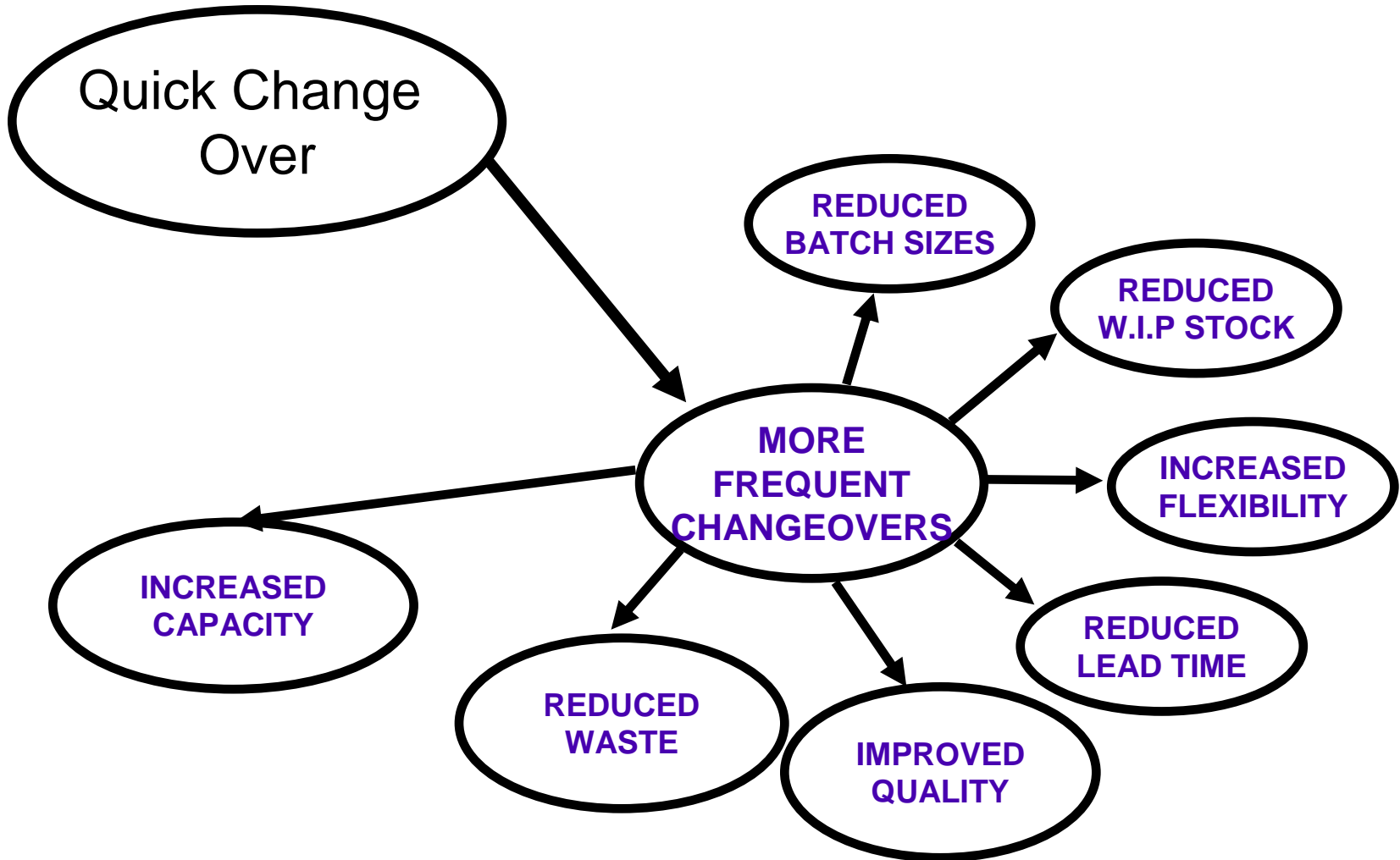
Module: TPM

Element: Quick Changeover (SMED)
Training pack

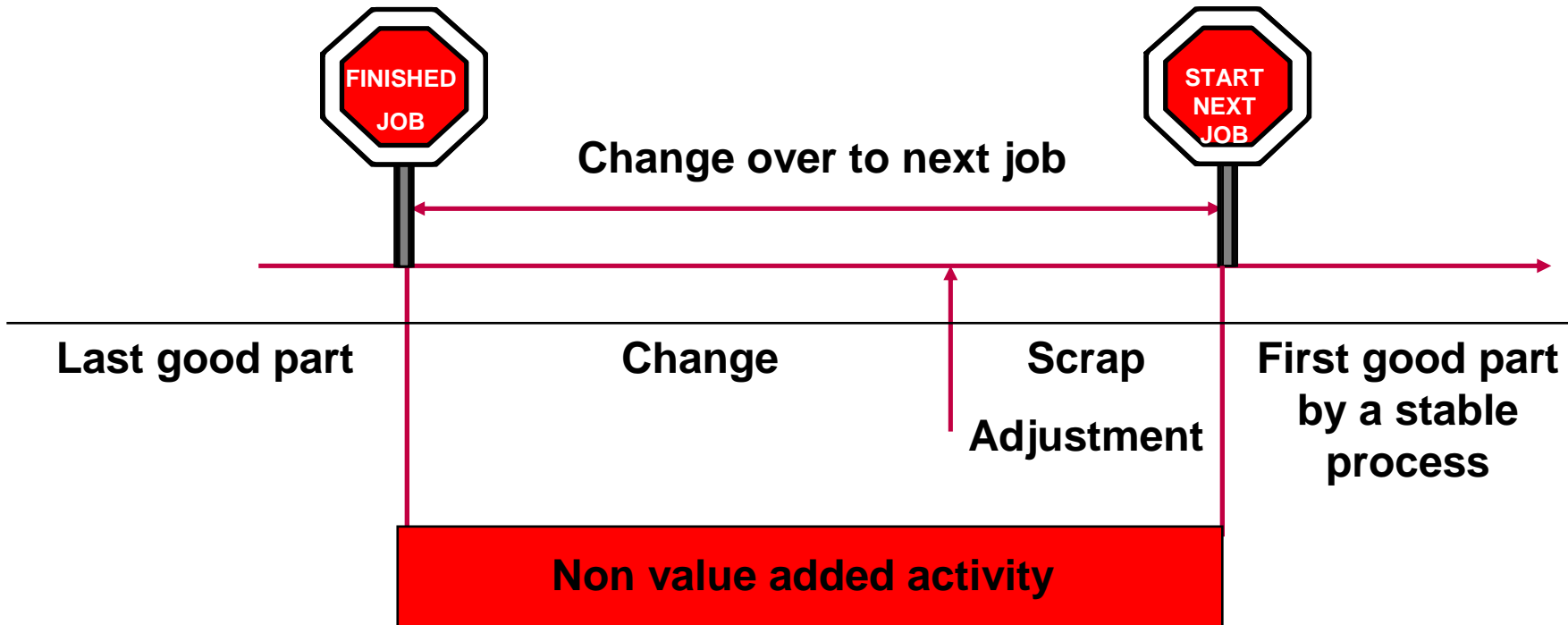
Aims & Objectives

- Target Audience :
 - Aerotooling, operations, programme planning, engineering
- Purpose of Module :
 - To provide participants with the knowledge of ‘quick changeover’ techniques to enable them to fully participate in ‘quick changeover’ workshops
- Aims & Objectives :
 - Communicate where the techniques are applicable (i.e. not just machines)
 - Communicate the 5 steps of ‘quick changeover’
 - Why we need to reduce changeover times
 - To provide an opportunity to experience changeover improvement scenarios

Why Quick Change Over?



What is a Change Over ?



“Quick Change Over” is a method of analysing and reducing the time needed to change a process from producing one good part to producing the next good part by using a team approach

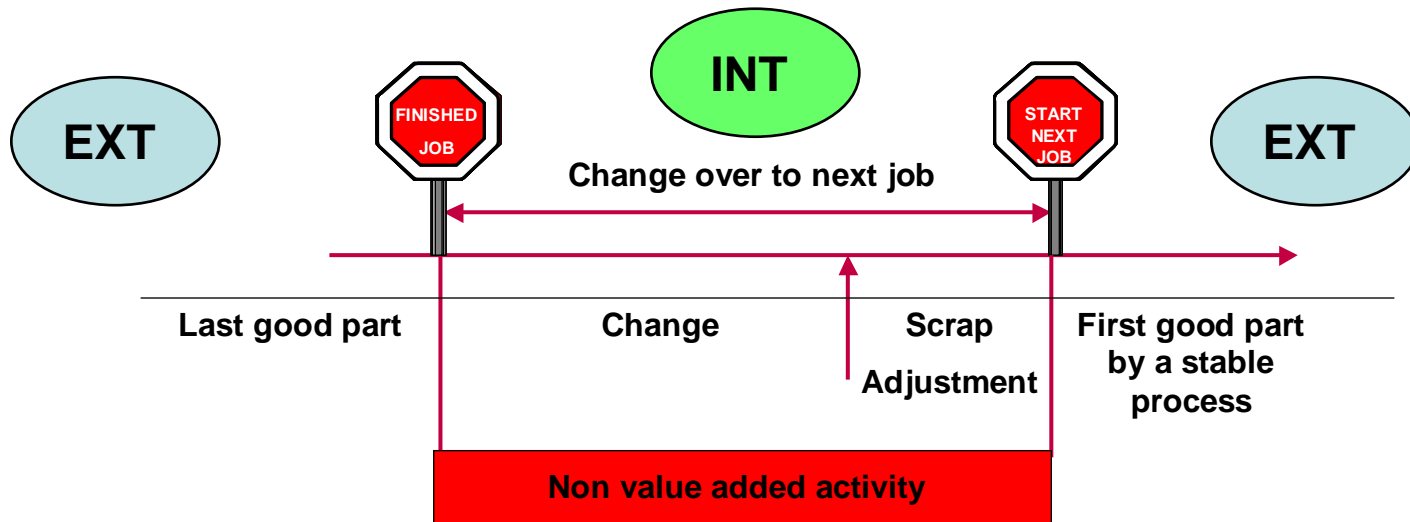
2 Key Elements in Any Change Over

- **Internal Activities**

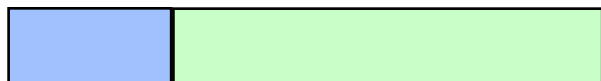
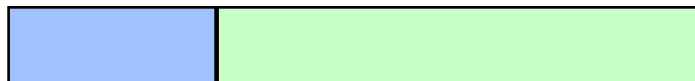
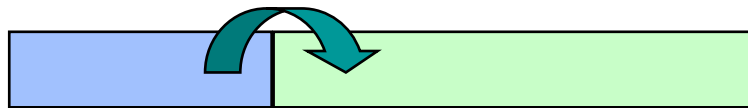
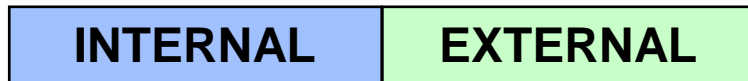
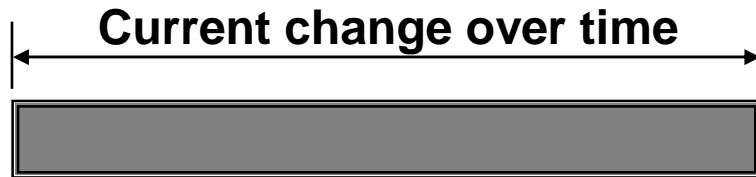
- must be performed while the machine / process is stopped i.e. not making parts

- **External Activities**

- can be performed whilst the machine / process is running . i.e. making parts

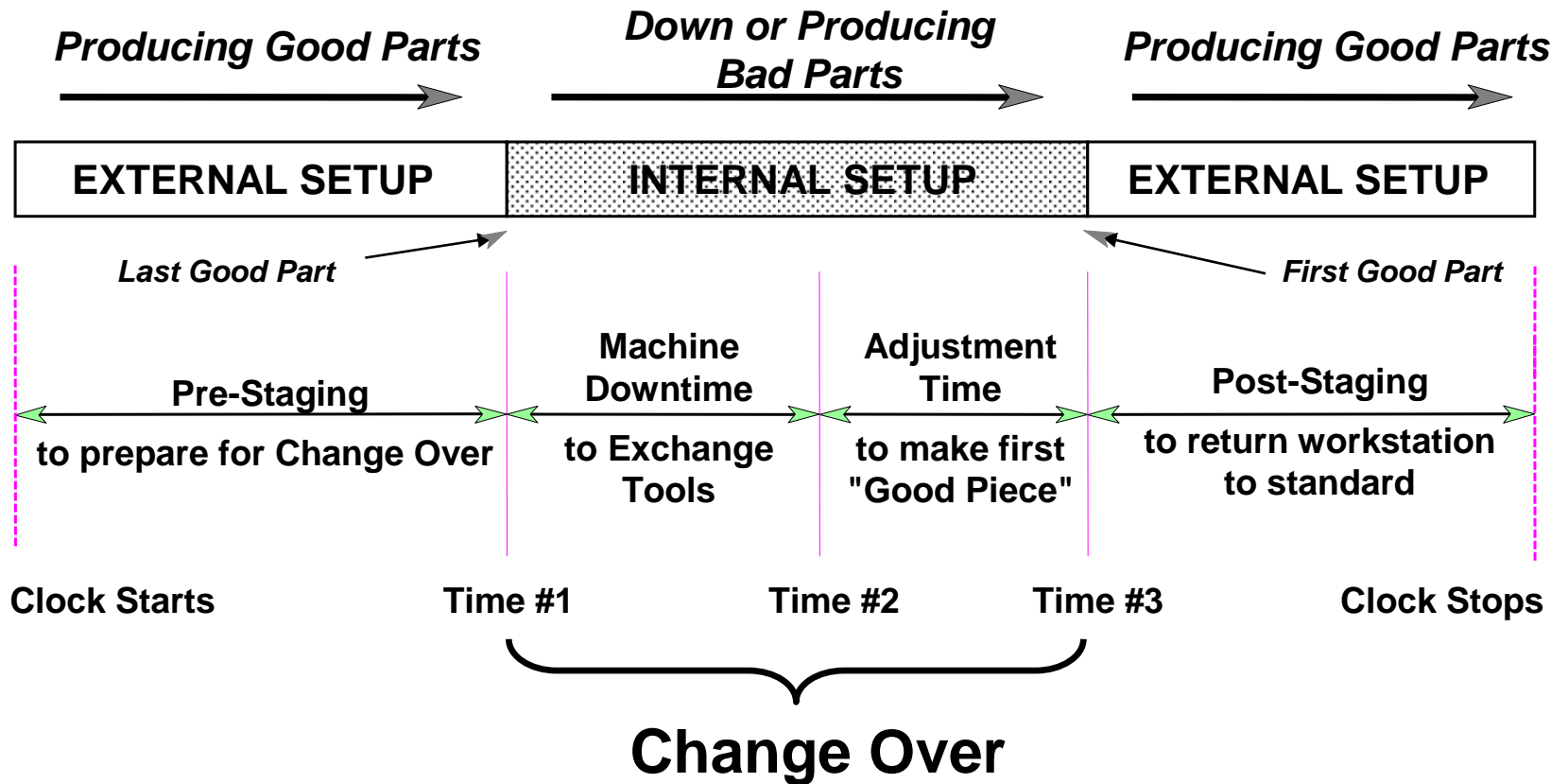


6 Steps in a Change Over Improvement



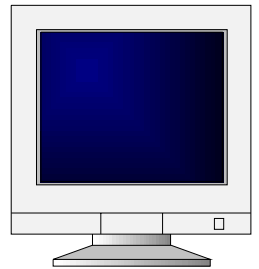
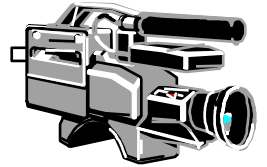
- 1. Select appropriate set up to reduce
- 2. Observe / measure the current process
- 3. Separate / internal and external activities
- 4. Convert internal activities into external activities
- 5. Reduce internal activities
- 6. Reduce external activities

Change Over Activity "Detail"



Tools for the Team (Check List)

- Agree team roles
 - Timer (not critical)
 - Scribe
- Agree and get all support materials
 - Video Camera (must be an operator)
 - Tools / Fixtures /Gauges / Information / set up sheet / route cards
- Special note for Camcorder, for the team to video the process
 - Team to view, any operator & Trade union
 - Team can brainstorm ideas from tape
 - Repeatability preserved
- All to Determine set-up activities
 - Set-up activities should be less than 3 minutes (get the detail waste)
- All to observe for improvements

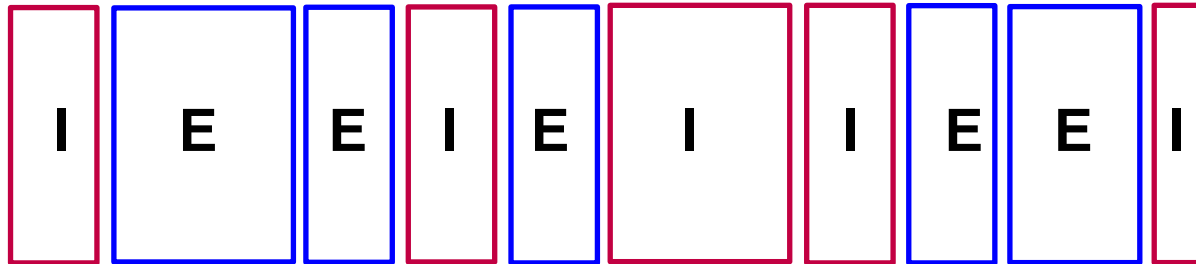


Step 1. Select appropriate set up to reduce

- Why ?** What is the need ? i.e. Increased capacity, flexibility and multi-manning, etc.
- When ?** After the appropriate personnel have been trained and objectives have been set (e.g.. Minimum 50% reduction in first year).
- What ?** Establish a policy of low / no cost solutions in the early stages : 40-60% of all reductions can be achieved with little or no cost.
- Where ?** Identify the bottlenecks in the process. These are the limiting factors in the manufacturing cycle and therefore the places to tackle first.
- Who ?** Establish a taskforce team, operator involvement is key, action based approach.
- How ?** Identify potential obstacles and conflicts and overcome them, communicate programme through-out the organisation.

Step 2. Observe the current Process

Analyse all change-over activities



PROCESS STOPPAGE TIME

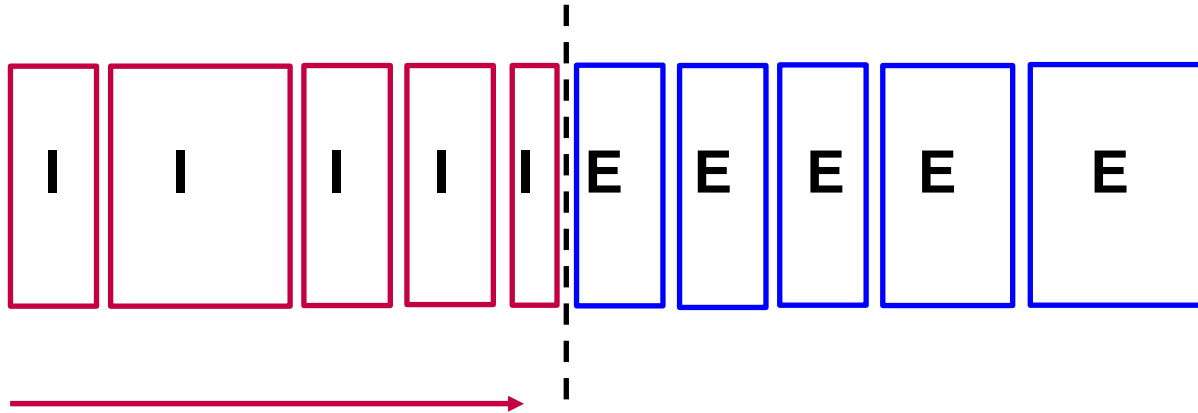
- Observe, describe and map the current Change Over process
- Determine all activities in the Change Over process
- Start to think which are internal and external elements

Step 2. Workshop Activities

- Perform the FIRST setup (BASELINE)
- The key is to map full process and in detail
- Map the change over process, video operations, timing them, look at the walk pattern, scrap, excessive effort and 7Wastes
- Think about what are internal and what are external activities in the change over process

Step 3. Separate Internal & External Activities

Separate internal activities from external activities

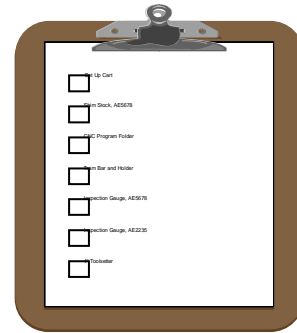


PROCESS STOPPAGE TIME

- Differentiate the activities in a change over into internal and external activities

Step 3. Separate Internal & External Activities

- From current process Map / Change Over sheet
- Define Internal & External
 - Safety can define I from E
 - Quality can define I from E
 - Is it physically possible for it to be external
- Define activities that can be moved now
- Define activities that can be moved with minor changes
- Define activities that can be moved with major changes
- Remember safety can not be compromised



Step 3. Workshop Activities

- Map out the new setup process (what, where, when)

Before

During

After

Set-up

Set-up

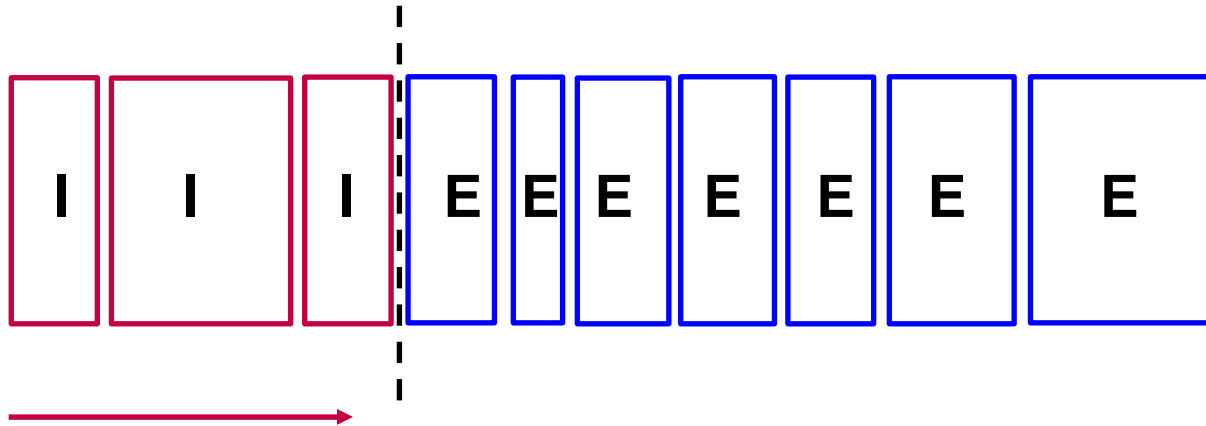
Set-up

- Look for additional improvements

- What went well, what did go so well (we are all learning)

Step 4. Convert I to E

Convert internal elements to external elements



PROCESS DOWNTIME

- The key is to prepare in advance for the change over
- Simplify & standardise the changer over process / tools
- Remove activities fundamentally (is it critical to the process)

Step 4. Convert Internal to External Activities

- Prepare operating conditions prior to the changeover
 - Develop checklist needed changeover (what, where, when, how many etc)
 - Use visual management: “on deck circle,” scheduling board
 - Have everything at hand, at point of use, place tools / parts / material in order of usage to position for quick insertion into machine
 - Preheat, pre-set, pre-cut, or pre-adjust I.e. dress grinding wheels offline
 - Store high-use items at the machine i.e. Consumables
 - Very accurate presetting tools with minimum adjustments
 - Standard (one fits all) bolts, clamps, Dowels, location / datum points.
 - Replace fewest parts possible.
- Check all items to ensure proper fit and function
- Cleanup & Return Removed Tools After First Good Part
- Use intermediary fixtures/jigs

Step 4. Workshop Activities

- Map out the new setup process (what, where, when)

Before
Set-up

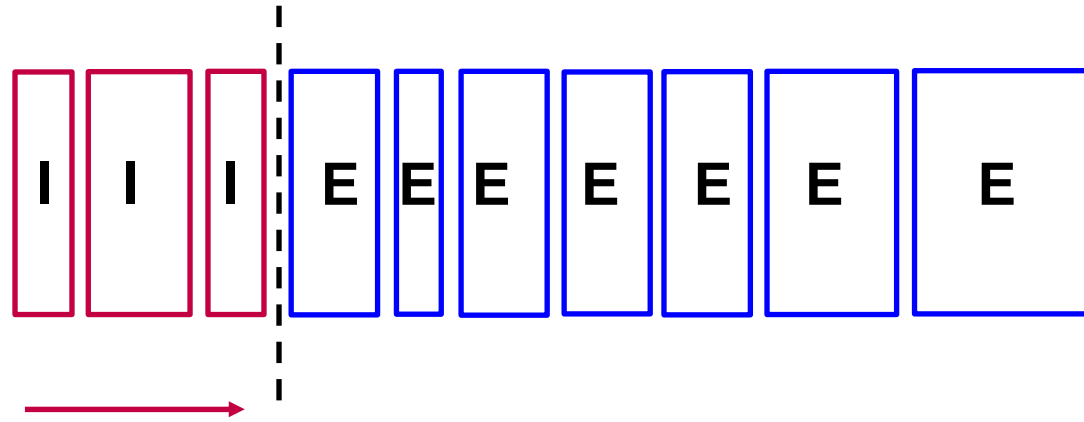
During
Set-up

After
Set-up

- Design improvements which can be Implemented during and after this Workshop
 - WHO, WHAT, WHERE, WHEN & WHY
 - Can we Do them Now ??
- Try Revised Set-up??
- Look for Additional Improvements
 - What went well, what did go so well (we are all learning)
 - Can other steps can be done externally?

Step 5. Reduce Internals Activities

Streamline internal elements



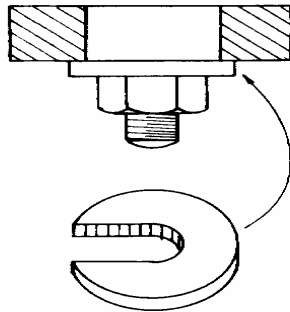
MACHINE STOPPAGE TIME

- Reduce effort, motions or distances
- Simultaneous operations
- Teamwork to quickly hit the set-up activity
- Develop one touch operations

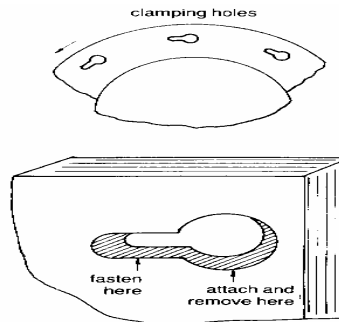
Step 5. Reduce Internal Activities

- Eliminate time lost removing and installing bolts

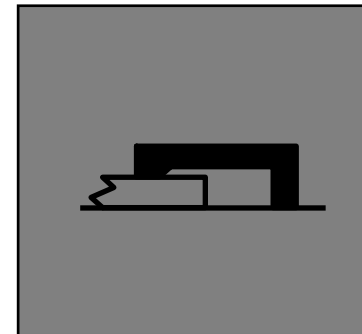
'C' shaped washer



Key shaped mounting holes

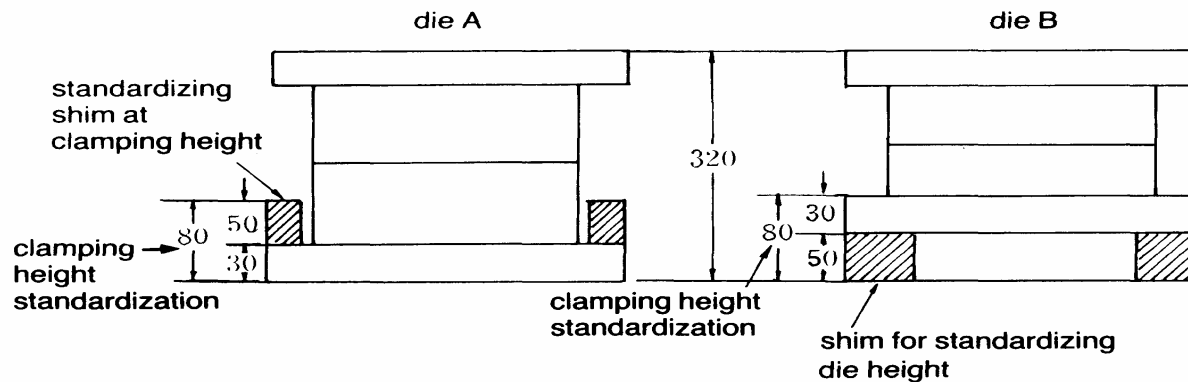


Functional clamp



Step 5. Reduce Internal Activities

- Standardize Operations to Minimize Internal Adjustments
 - Pressures, size, shapes, Dies, tools, jigs
 - Bolts, hoses, & handles, Height and Stroke
 - Die height, Machine stroke height
 - Machine level, Handling & storage level



Step 5. Reduce Internal Activities

- Perform parallel operations
- Improve clamping mechanism
- Eliminate all adjustments
 - Graduated scales Standardized settings
 - Calibrated values Setting gauges/blocks
 - Measurement devices Dead stop locations
 - Standard datum's VMS
- Automate activities where appropriate ?

Step 5. Workshop Activities

- Map out the new setup process (what, where, when)

Before
Set-up

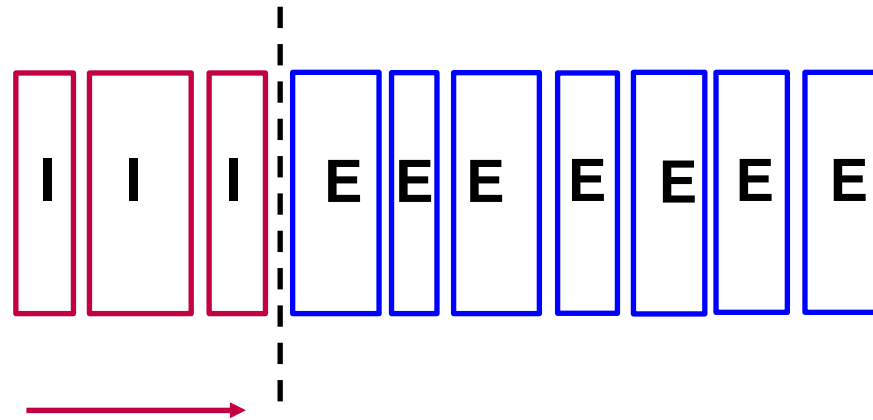
During
Set-up

After
Set-up

- Design improvements which can be Implemented during and after this Workshop
 - WHO, WHAT, WHERE, WHEN & WHY
 - Can we Do them Now ??
- Try Revised Set-up??
- Look for Additional Improvements
 - What went well, what did go so well (we are all learning)
 - What other steps can be done externally?

Step 6. Reduce External Activities

Streamline external elements

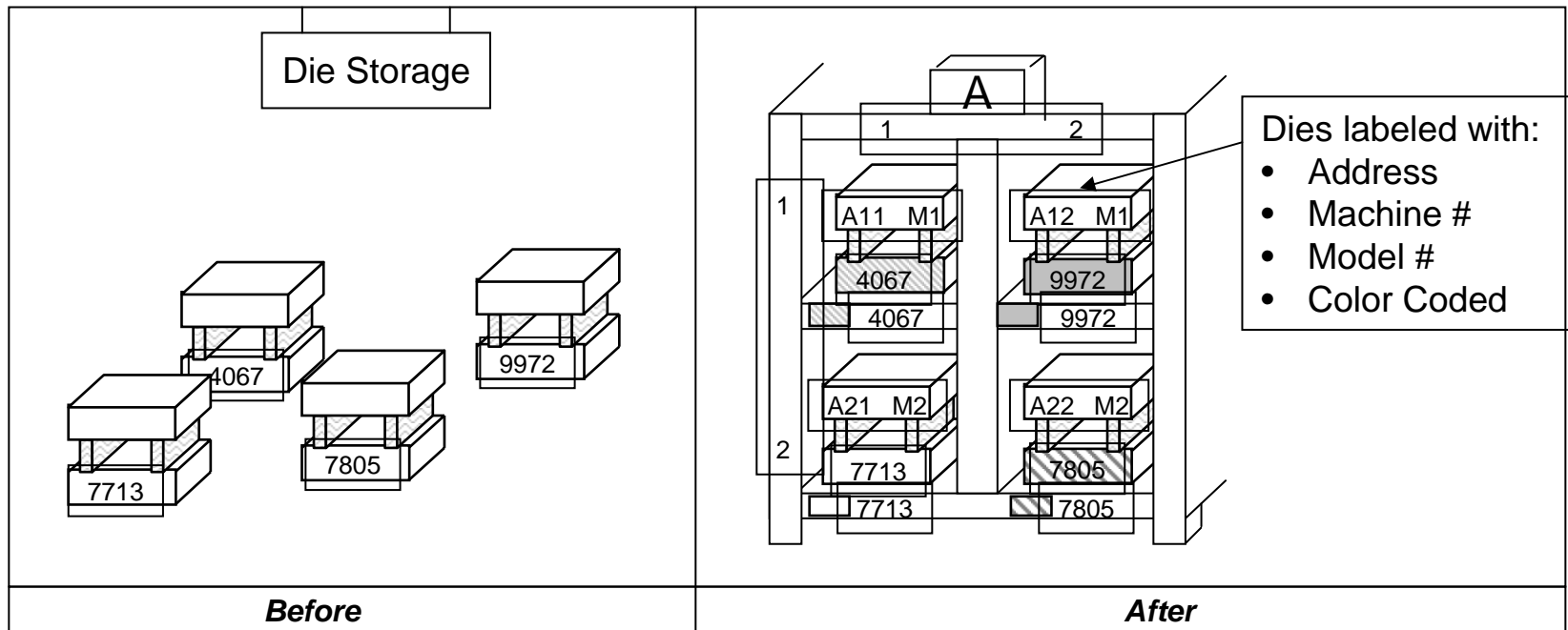


MACHINE STOPPAGE TIME

- Reduce effort, motions or distances
- Determine optimum storage locations
- Establish user friendly systems e.g. sign-off procedures

Step 6. Reduce External Activities

- Avoid Time Lost Looking for or Verifying Correct Items:
 - **Color Coding**
 - **Number Coding**



Step 6. Reduce External Activities

- Proper Arrangement and Orderliness
 - (5c)
- Carts Reserved for Changeovers
 - (VMS)
- Material Flow Racks
- Simplify Adjustments
 - Go-No Go Gauges
 - Part specific inspection package/ equipment
- Continuously Collect Ideas to Improve Setup!
 - Kaizen

Change over Check Sheet

- Set-up road map (STANDARD OPERATIONS)
 - (what, where, when + care points)
 - **Materials**
 - **Machine tools (cutters)**
 - **Setting tools (Allen keys, etc)**
 - **Setting consumables**
 - **Gauges**
 - **Fixtures**
 - **Route card**
 - **tool setting sheet**
 - **drawing**
 - **set-up sheet , m/c program, offsets, etc.....**
 - **Machine settings: pressure, temperature**

Step 6. Workshop Activities

- Map out the new setup process (what, where, when)

Before
Set-up

During
Set-up

After
Set-up

- Design improvements which can be Implemented during and after this Workshop
 - WHO, WHAT, WHERE, WHEN & WHY
 - Can we Do them Now ??
- Try Revised Set-up??
- Look for Additional Improvements
 - What went well, what did go so well (we are all learning)
 - What other steps can be done externally?

Final Workshop Activities

- Do the New Set-up With a New Operator (verification)
- Wrap Up Workshop
 - **Document achievements (before / after photo)**
 - **Document changes to process standards**
 - **Develop action plans to implement longer-term improvements**
 - **Present achievements to management and work-team**

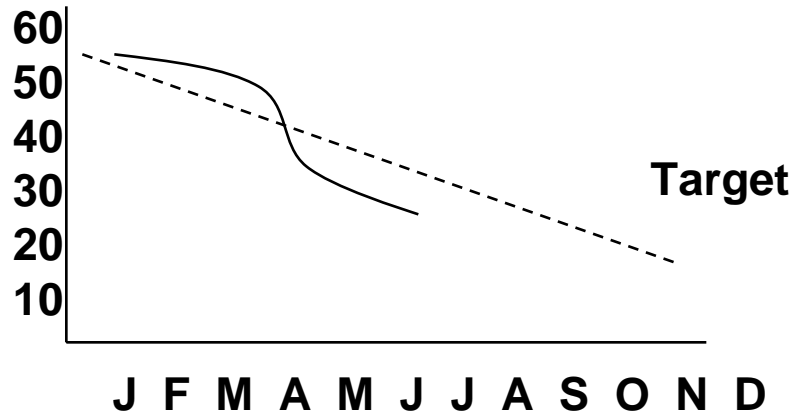
Changeover Improvements

Set-up Schedule

M/C	Priority	Job No	Est. Date	Time	Kit	Mat'l	Gauges
MCC	1	101	09/10	14:00	x	x	x	
	3	150	15/10					
	2	126	13/10	09:00		x		
....								

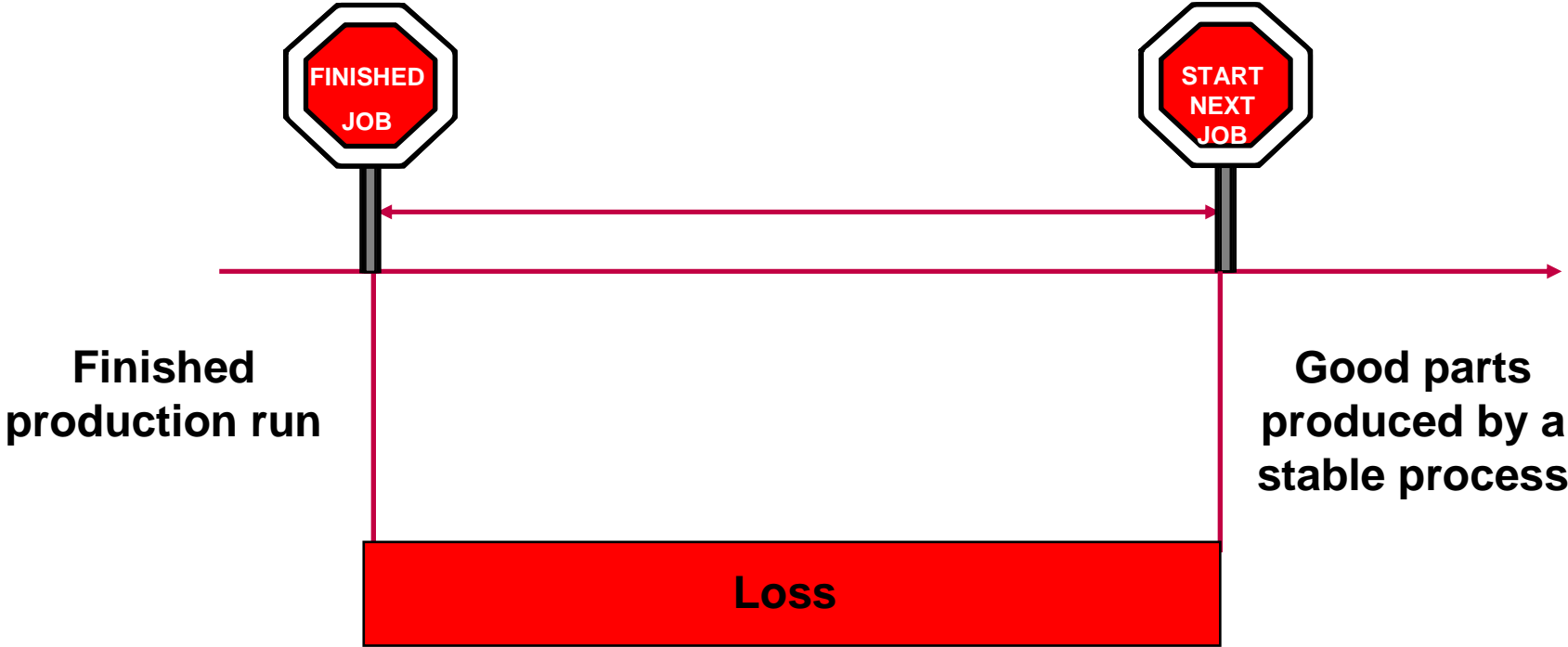
Initial Set-up	50 mins
Current Target	25 mins
Target period	Nov/Dec
Best to Date	36 mins
Rolling Average	38 mins

Action Plan

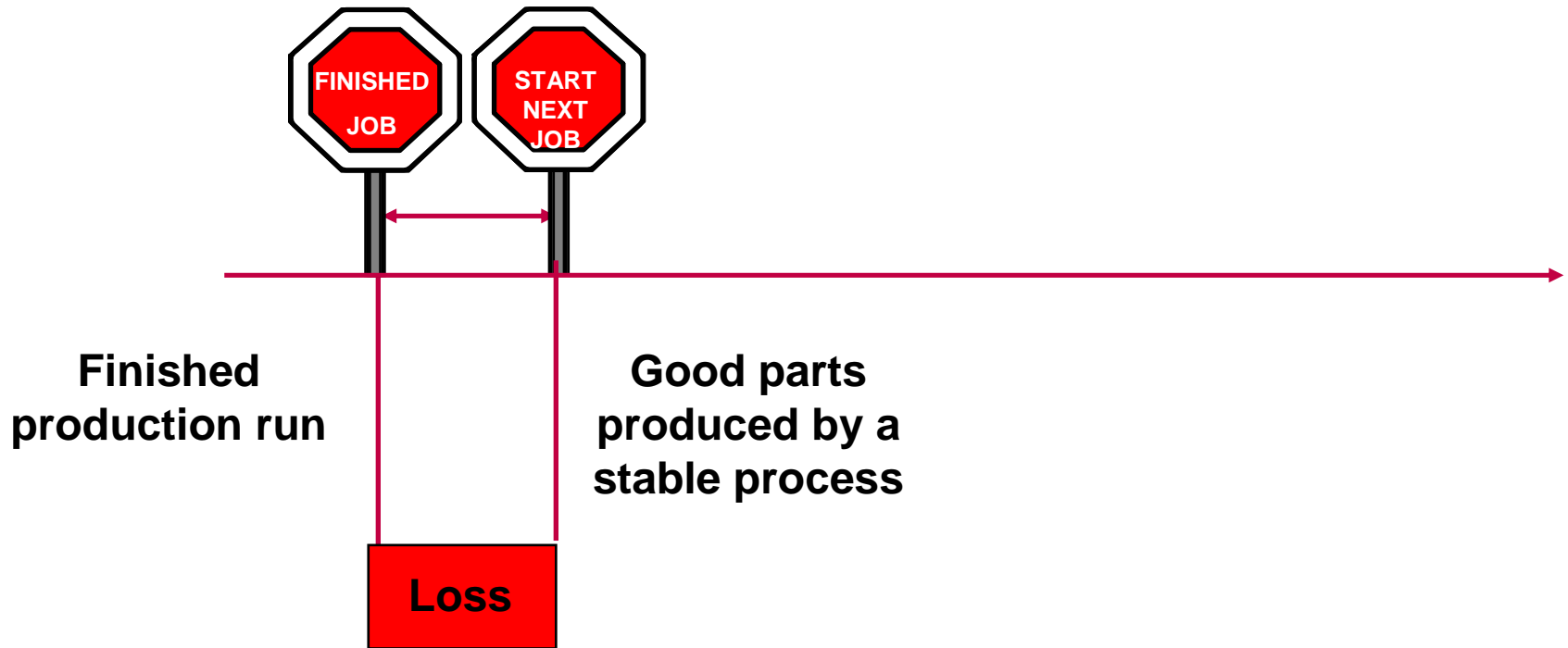


No.	Item Description	Resp	Time

Before



After



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Did we succeed ?