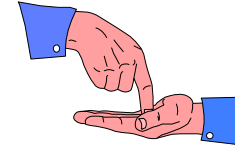


# SMED

Quick tool or process change

# Objectives of SMED

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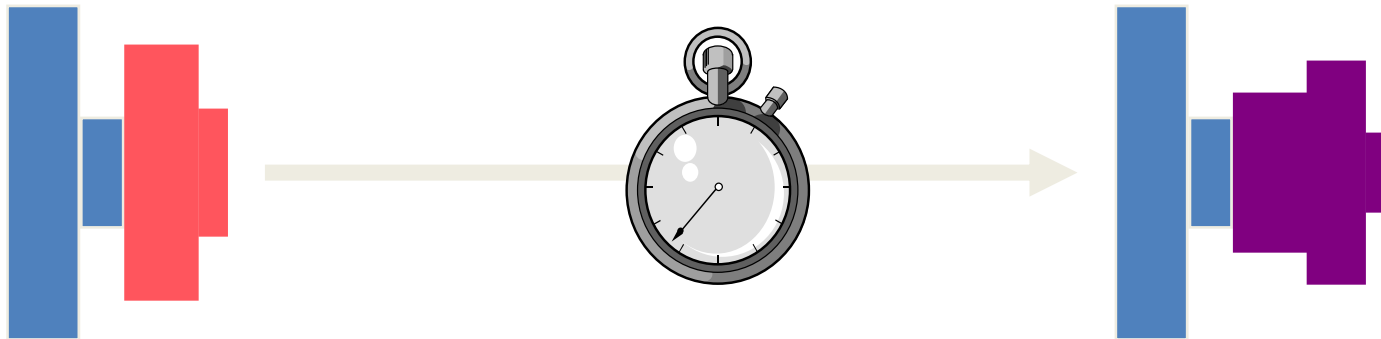
1. Identification of internal and external set-up operations
2. Convert internal set-ups to external
3. Elimination of waste, optimisation of each operation
4. Tools and equipment check list and storage method
5. Procedural chart (standardised set-ups)
6. Reduction of set-up time
7. Improvements without big investments

*“Only make what can be sold. Ideally produce only goods that have already been ordered.”*

# Definition of a Set-up

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Set-up is:



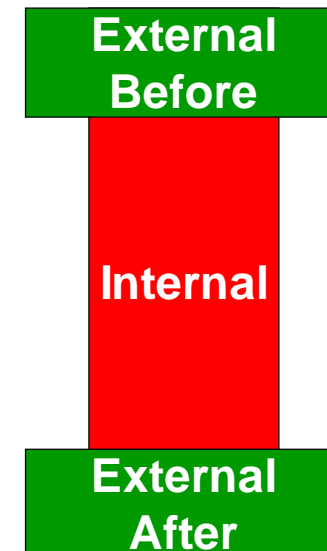
The time from the last good piece  
of **Batch A** to the first good  
piece of **Batch B**.

# Definition of internal & external operations

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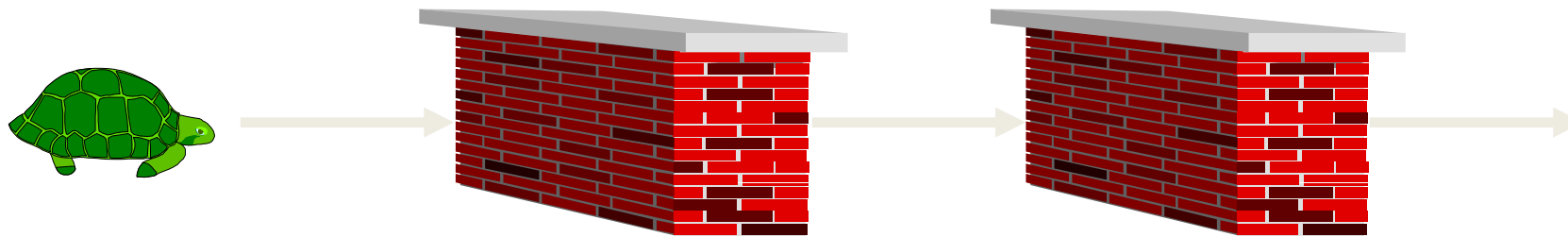
- **INTERNAL** – can only be carried out when the machine or process has stopped
- **EXTERNAL** – could be done whilst the machine or process is still running



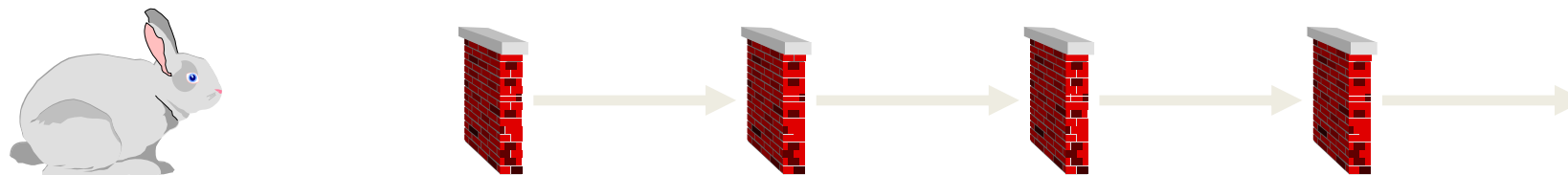
# Key to Remember

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Set-ups are roadblocks to flow...



We want to eliminate the hurdles



SMED - Quick Tool Change

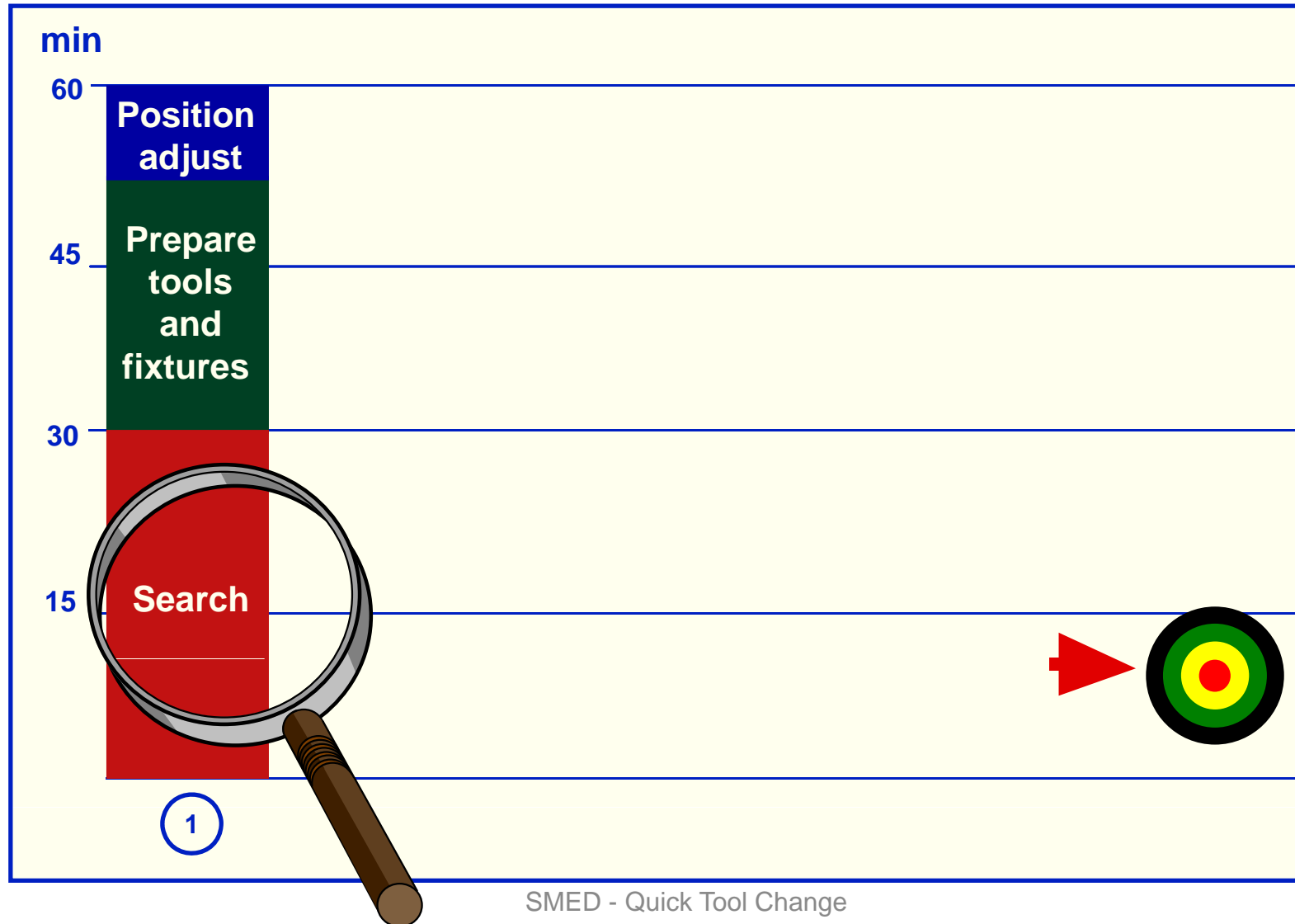
# Establish Priorities



M/C No.	Set-up Time	M/C Time	1 piece	2 piece	5 piece
1	2.5	0.5	3.0	3.5	5.0
2	2.0	2.5	4.5	7.0	14.5
3	3.5	1.5	5.0	6.5	11.0
4	1.5	2.0	3.5	5.5	11.5
5	0.5	3.0	3.5	6.5	15.5

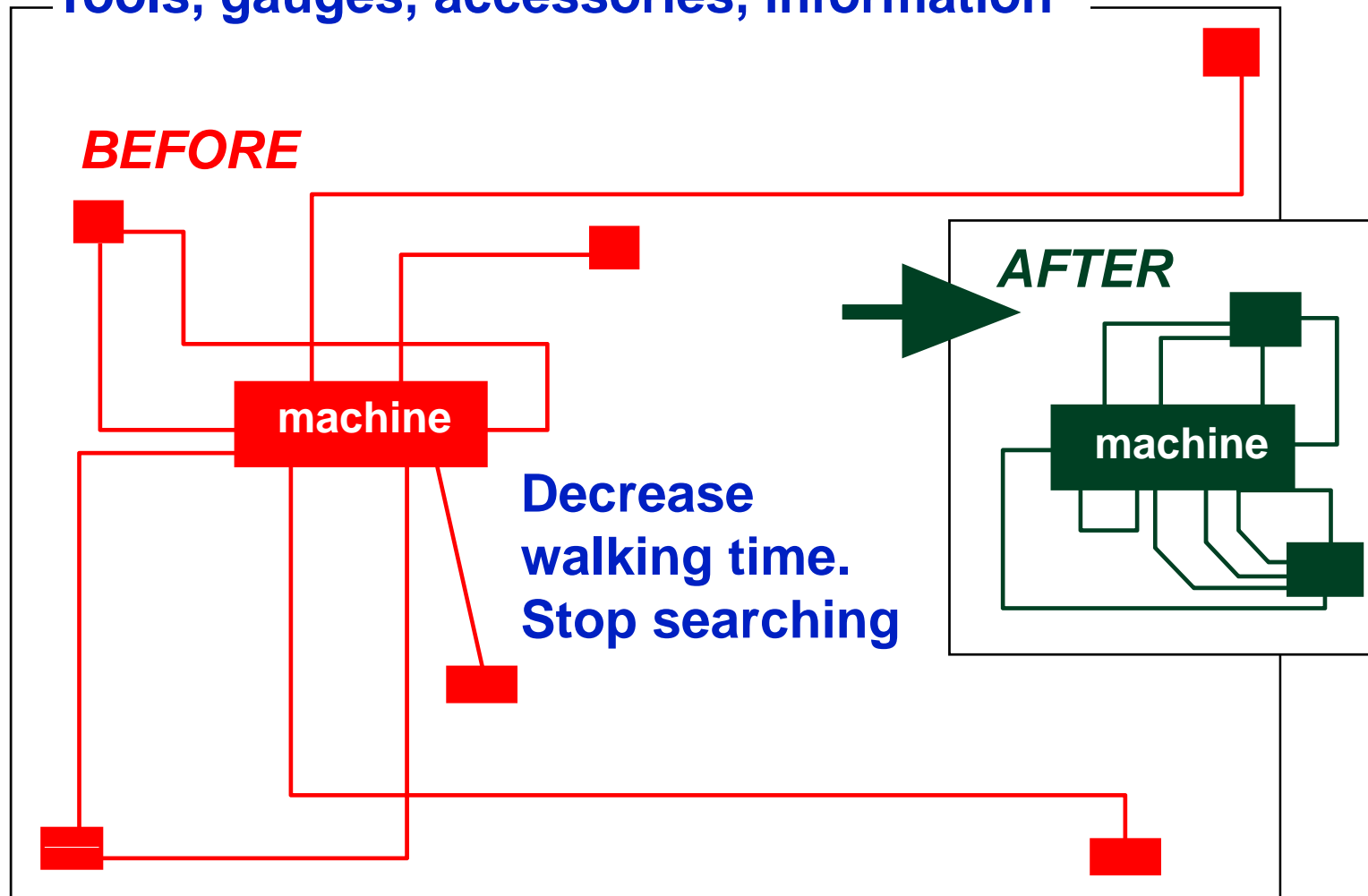
*i.e. It depends on lot size & frequency of set-ups*

# A Typical Set-up

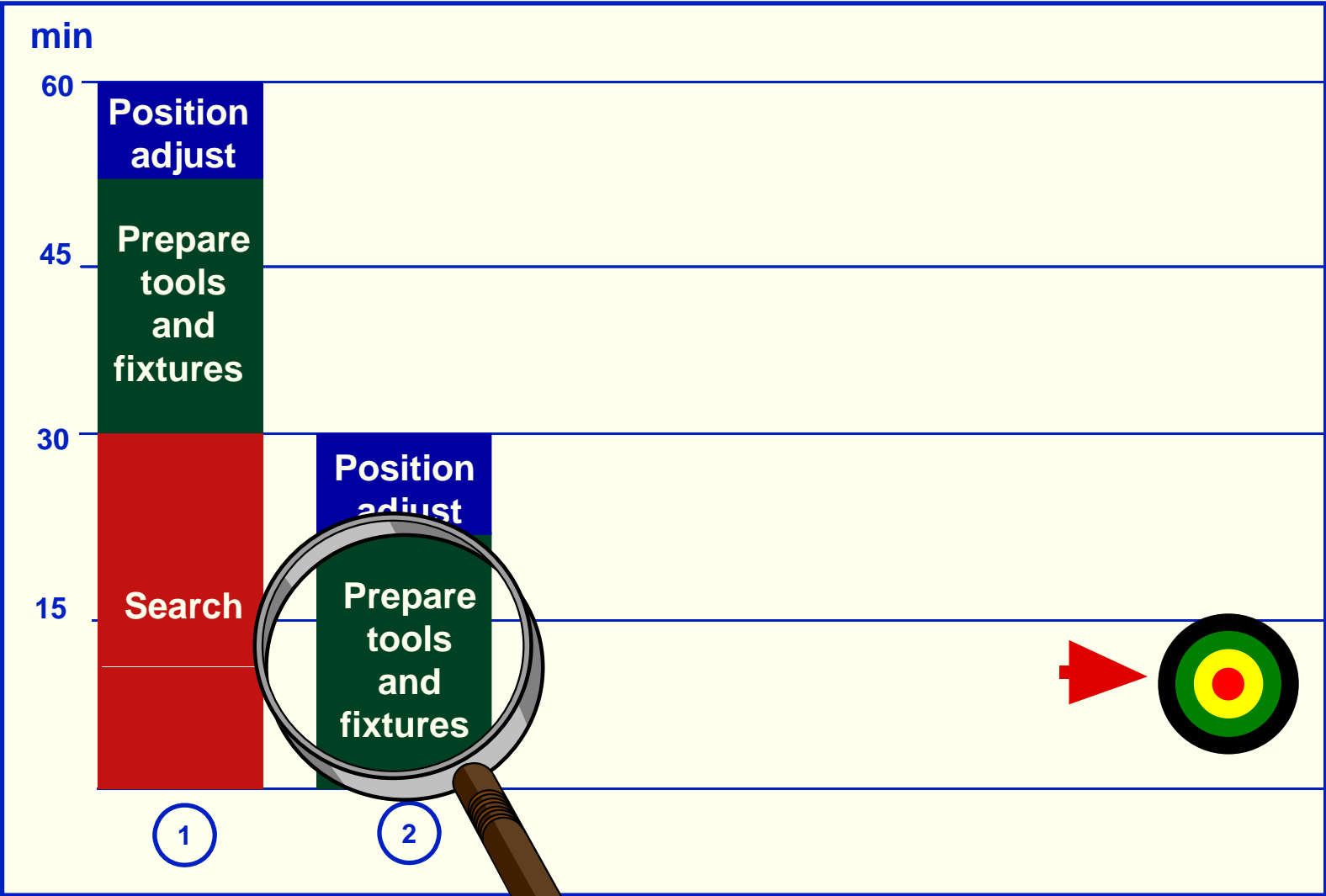


# Set-up tricks Bring together

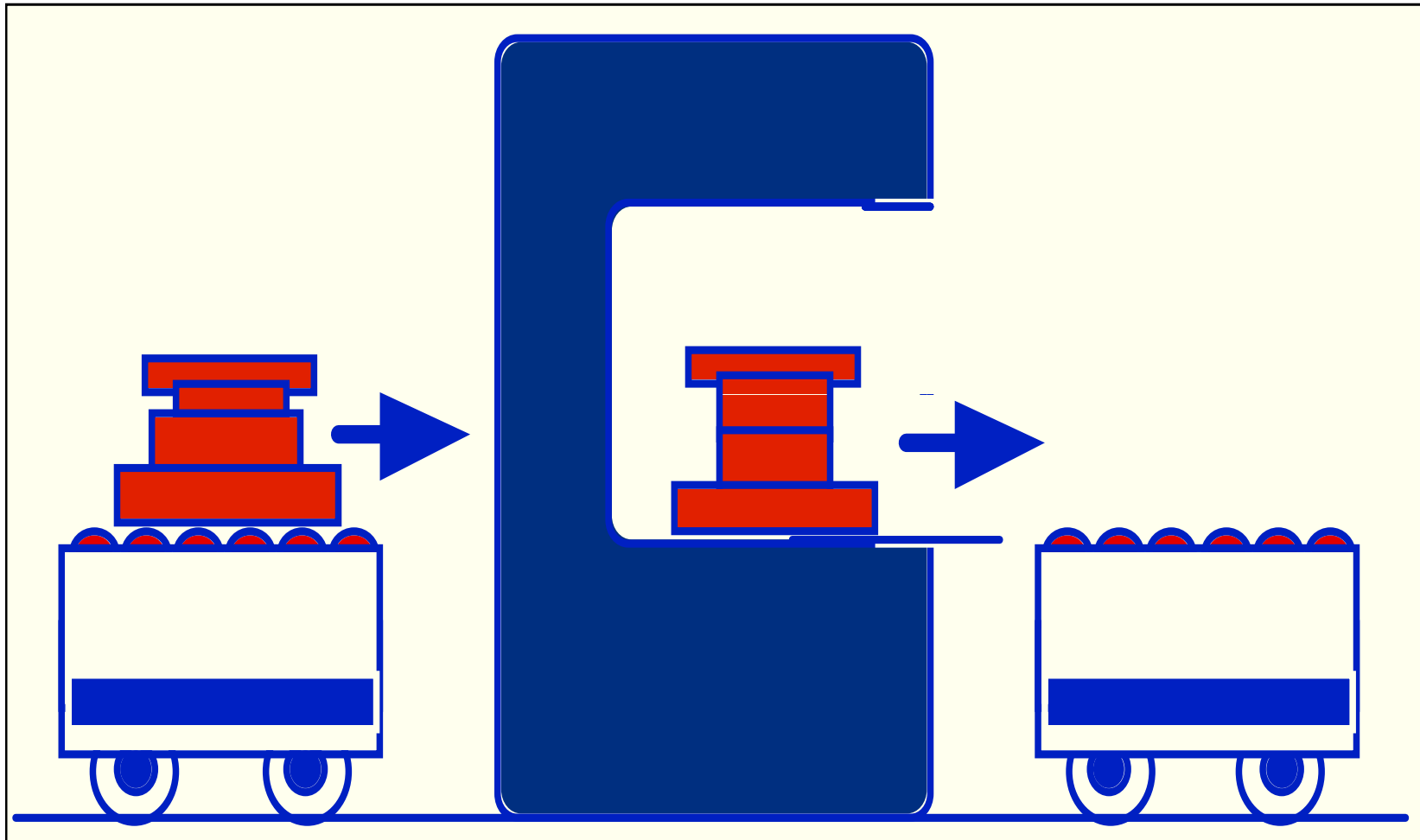
## Tools, gauges, accessories, information



# An Improved Set-up

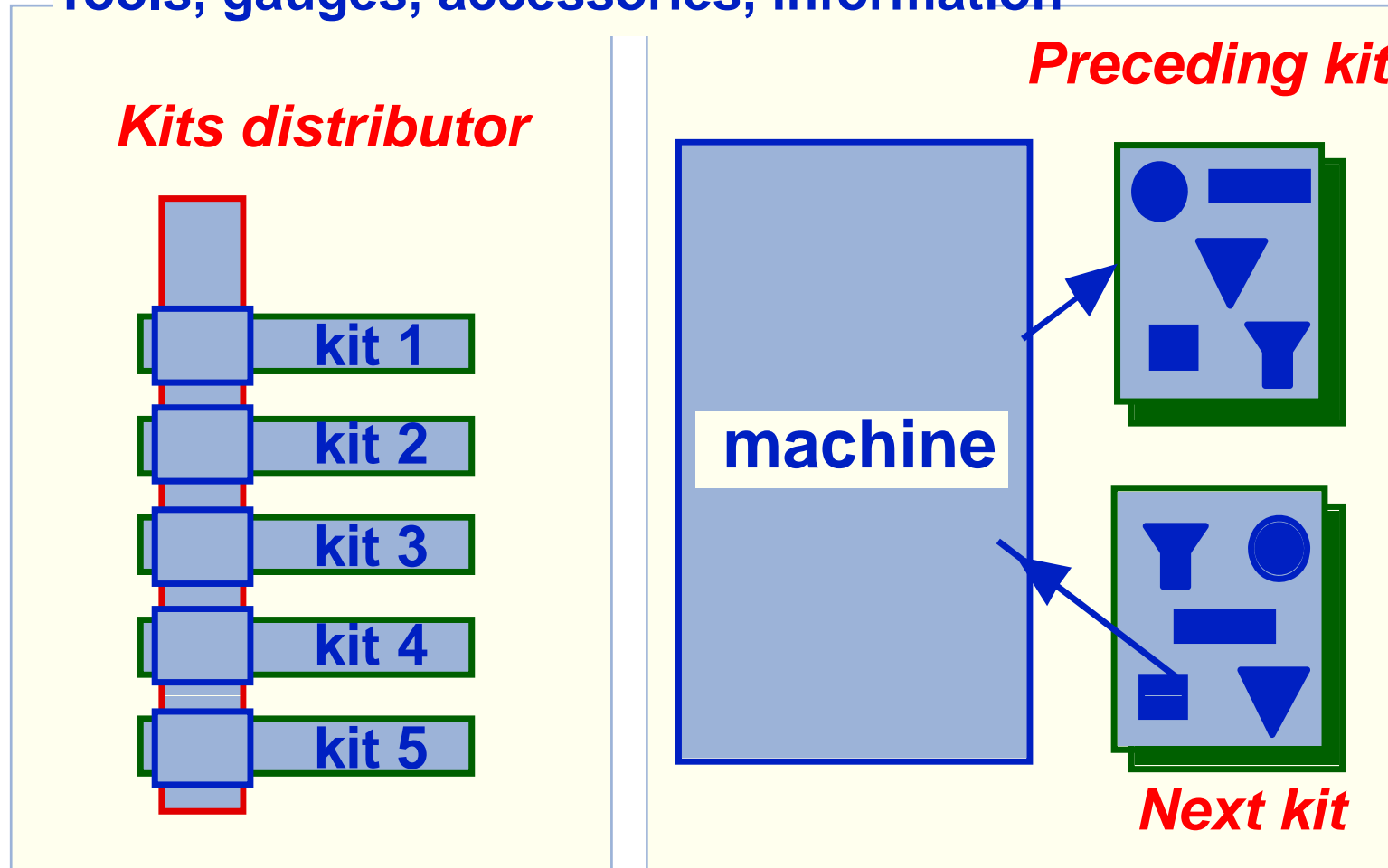


# Set-up tricks Prepare tools ahead of time

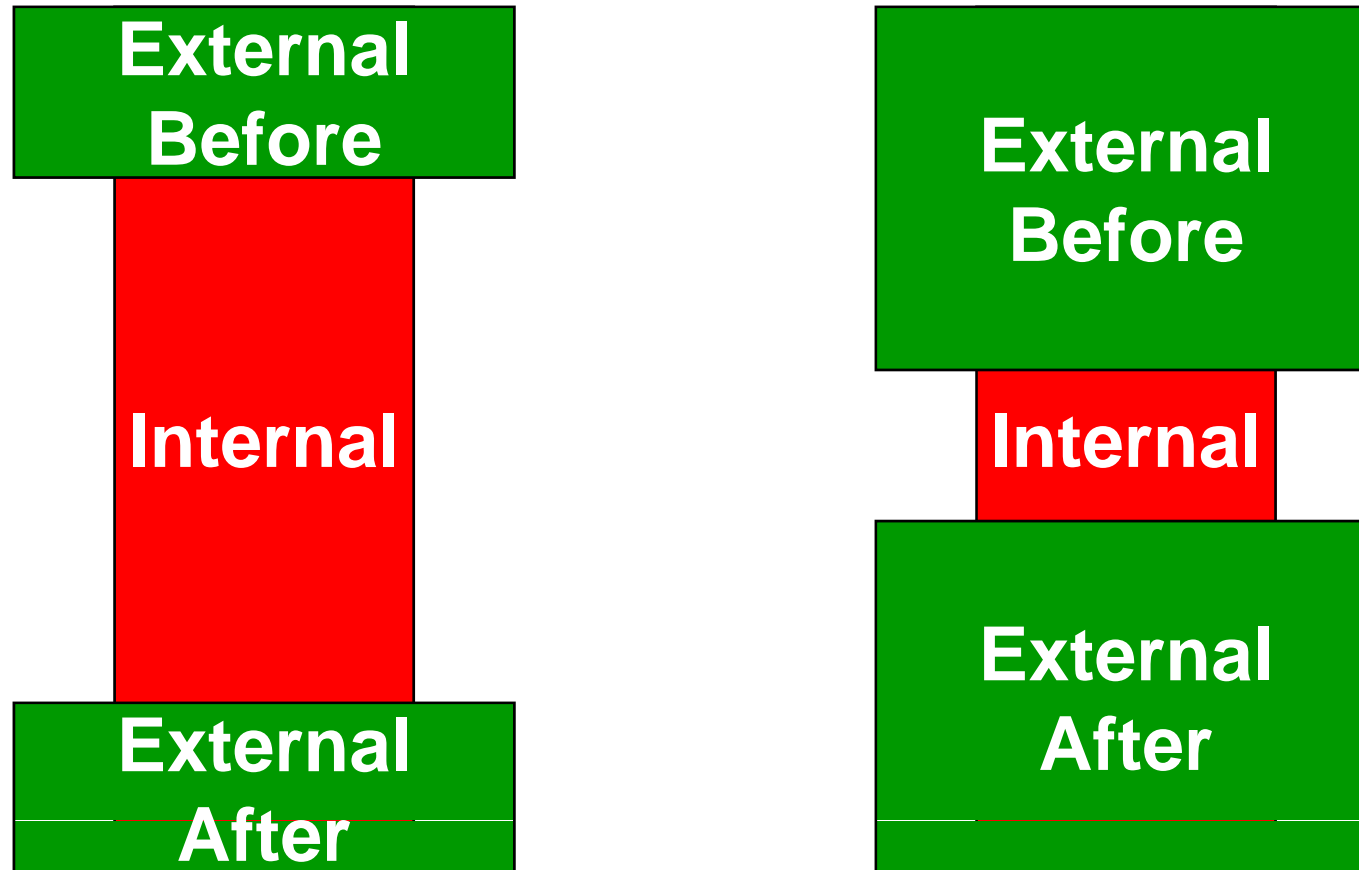


# Set-up tricks Reassemble (kits)

## Tools, gauges, accessories, information

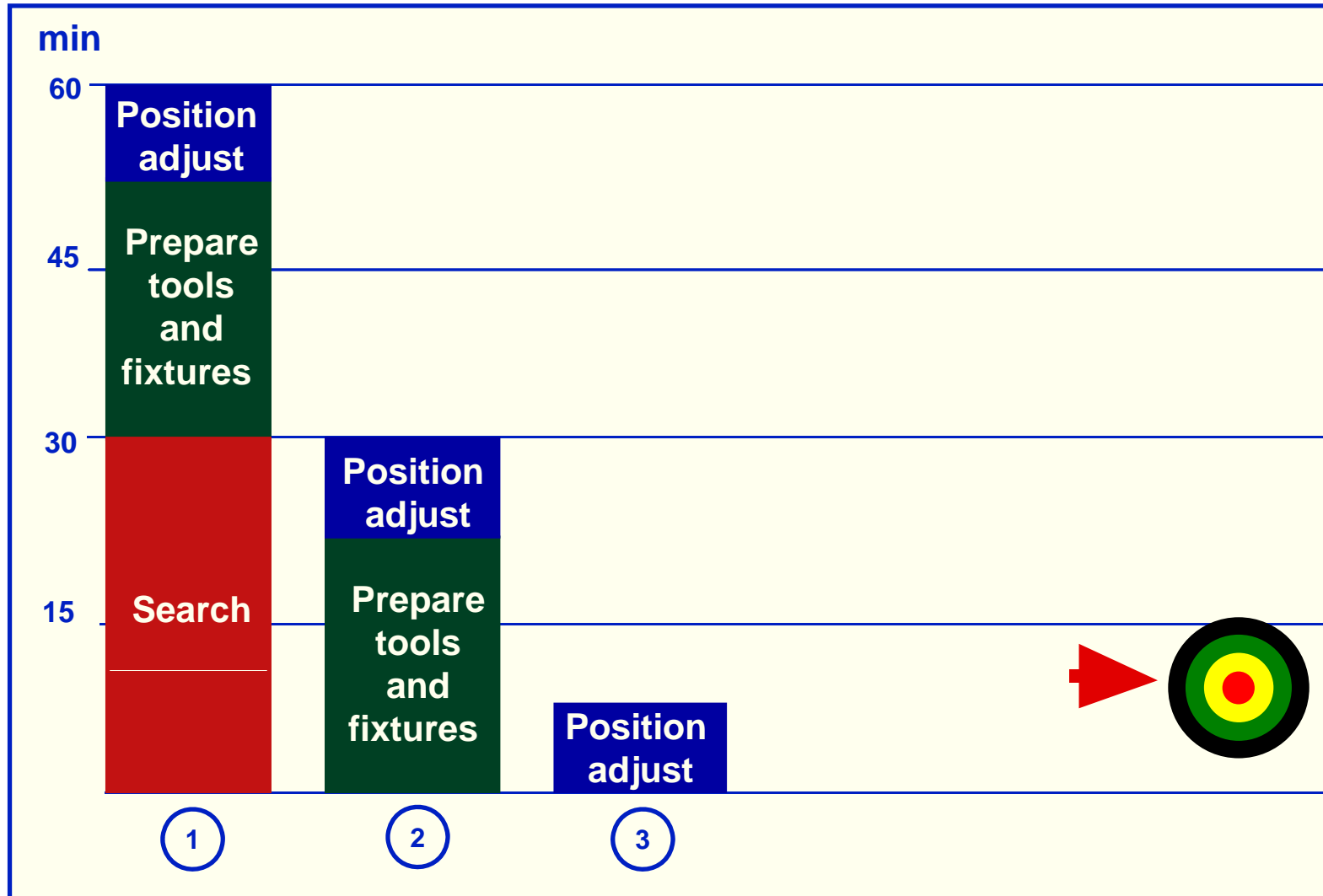


# Internal vs External

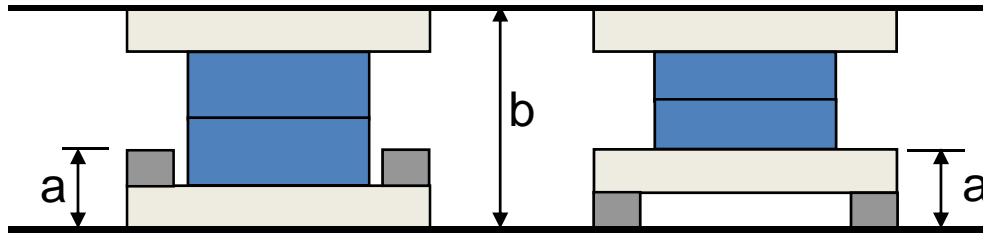


*Convert as much internal work as possible to external Work*

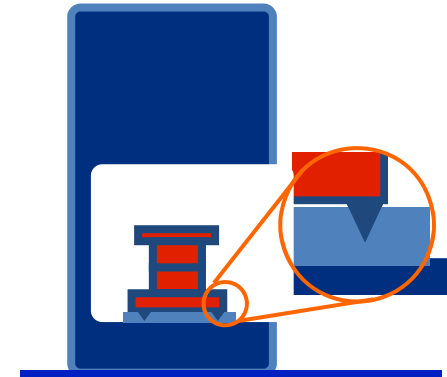
# A Further Improved Set-up



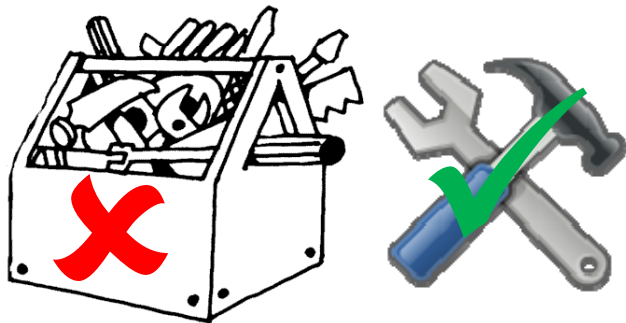
# Set-up tricks **Standardise**



***Shimming for standard heights***



***Use stops or centering grooves set positions***



***Select only the tools you need***

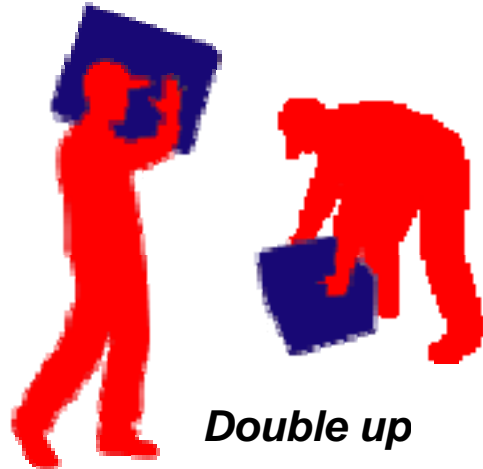


***Use checklist or standard operating procedure***



***Use equipment readout for setting – avoid human 'feel'***

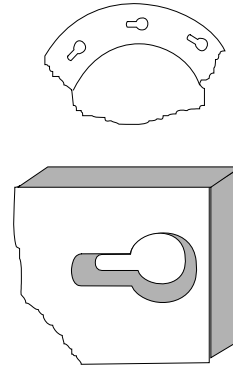
# Set-up tricks Reduce



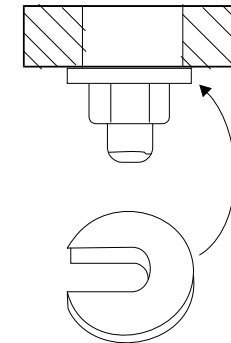
**Double up**



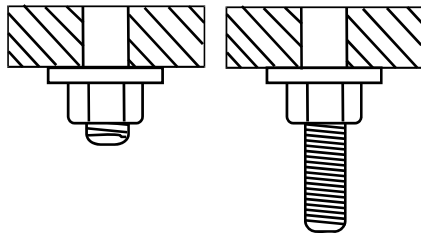
**Don't use adjustable tools**



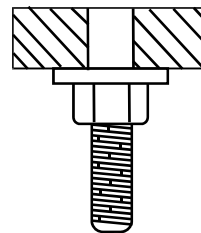
**Pear shape holes quick bold release**



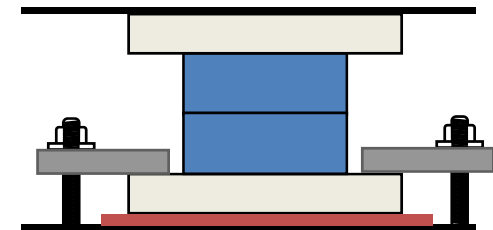
**'C' Washers for quick release**



**Minimise bolt lengths**

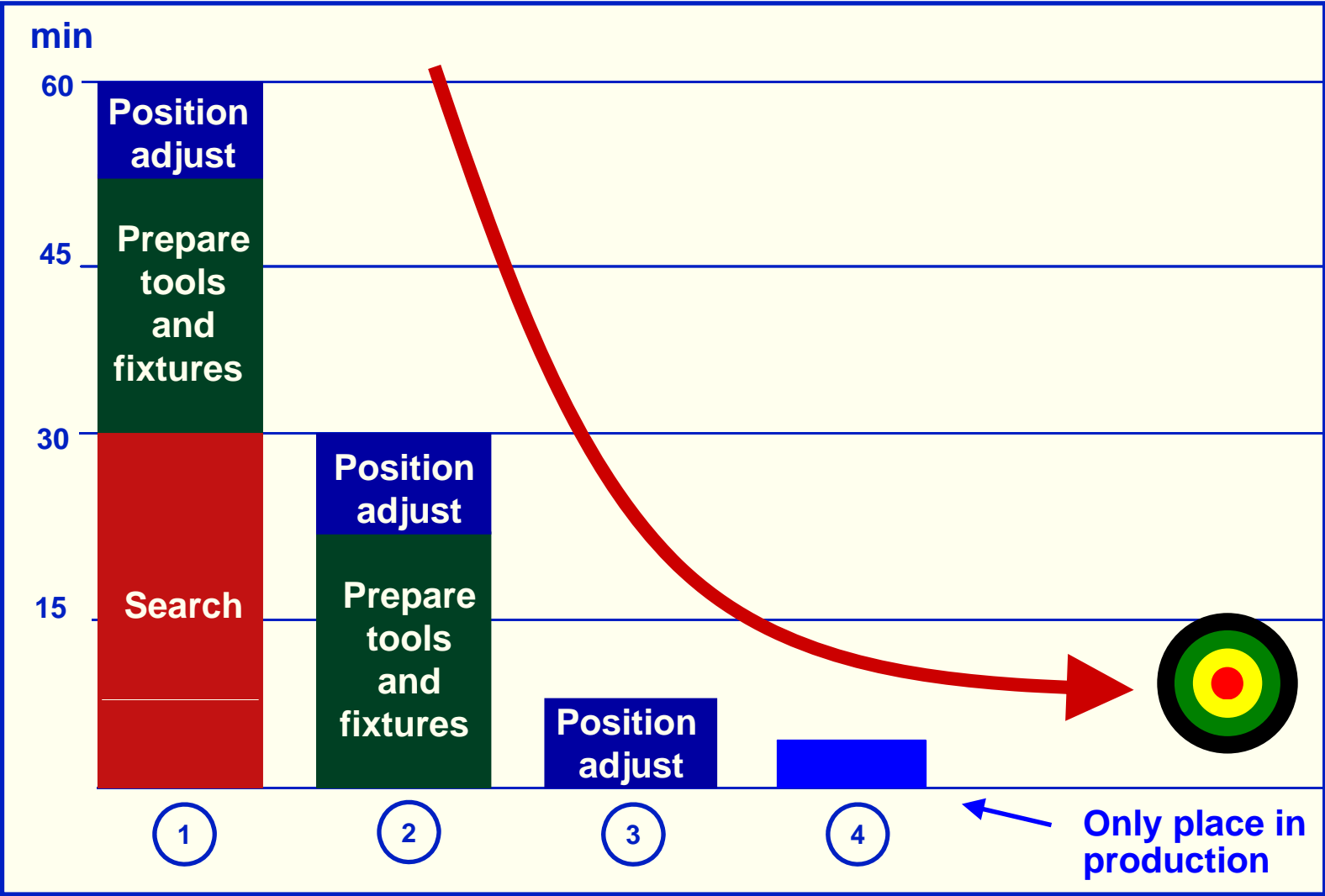


**Split threads (1/3 turn locking)**



**Intermediate surface to avoid movement during clamping**

# An Ideal Set-up



# The Three Tricks of Set-ups

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**1. Eliminate**

**2. Combine**

**3. Simplify**

# What is TPE?

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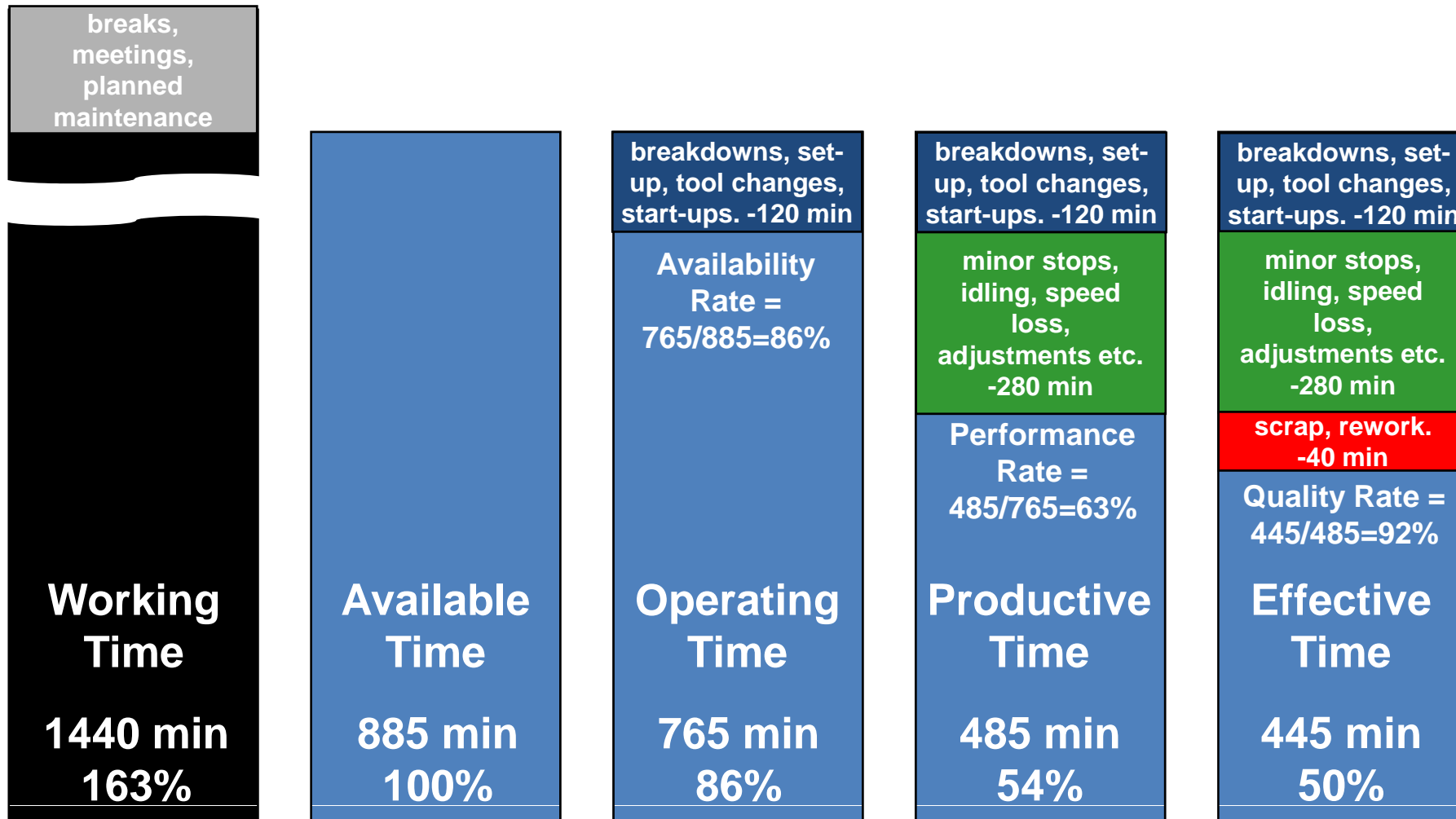
Total Productive Effectiveness (%) =

Availability Rate x Performance Rate x Quality Rate

*How do we calculate that ???*



# Total Productive Effectiveness (TPE)

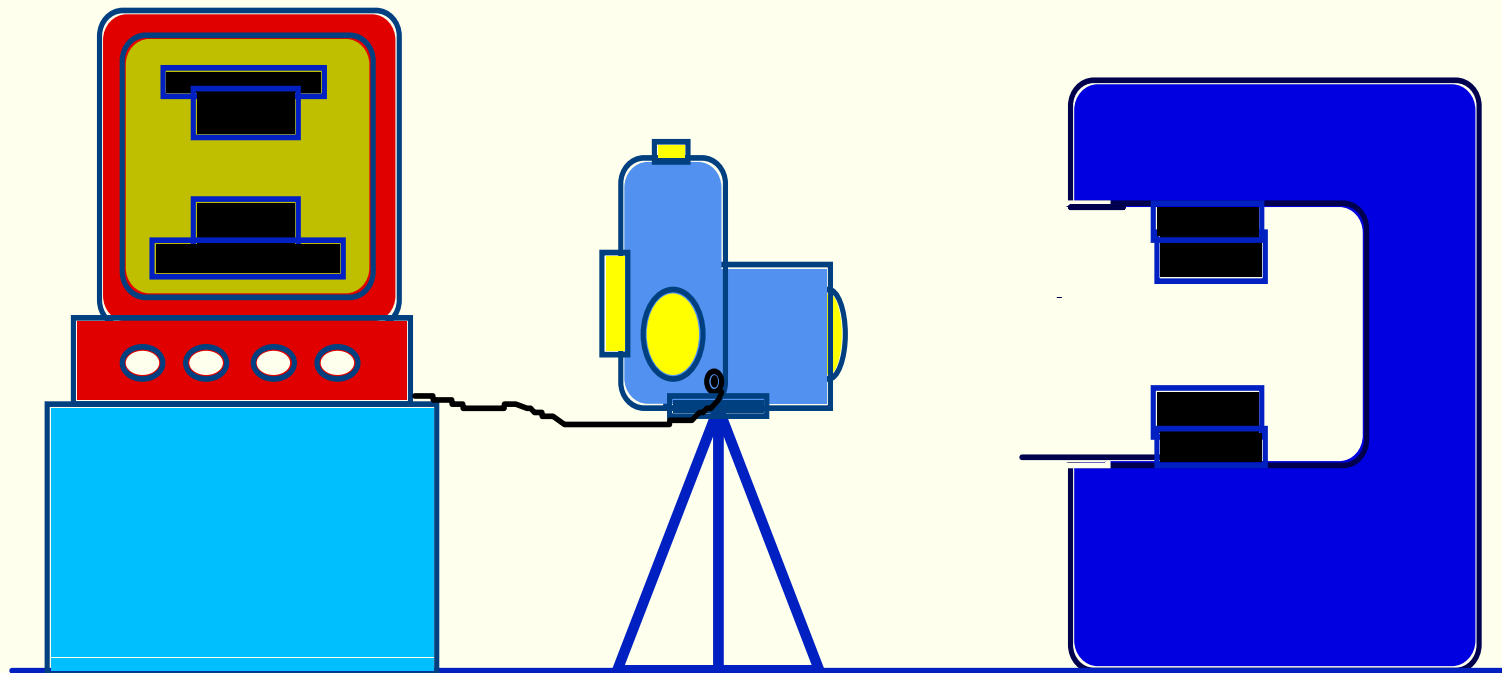


SMED - Quick Tool Change **TPE is 50%**



# Observation and Analysis Method

Observe with a video



If there is no one on the screen = waste

# Four Stages of Set-up Reduction



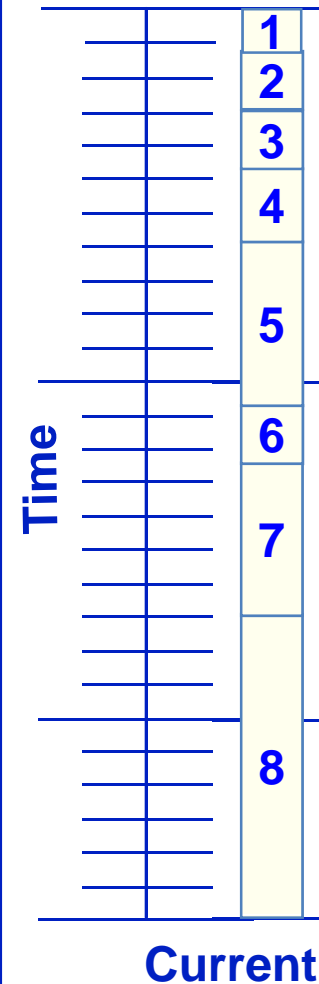
<b>Preliminary Stage (CURRENT)</b>	<b>Internal and External are not Distinguished</b>	<b>External is done as internal (long set-up)</b>
<b>Stage 2</b>	<b>Separating Internal and External Set-up</b>	<b>Set-up are reduced by 30% to 50%</b>
<b>Stage 3</b>	<b>Converting Internal to External Set-up</b>	<b>Simplify positioning, centring, fixing, adjusting. Use team to perform internal activities in parallel; Set-ups are reduced by 30% to 50% more.</b>
<b>Stage 4</b>	<b>Improving each element of the Set-up</b>	<b>Analyse each element in detail and improve it. Less than 10 minutes.</b>

# Analysis steps

# Graph



- 1. Identify the set-up**
- 2. List every step**
- 3. Measure the time required for every step**
- 4. Distinguish between internal and external steps**
- 5. Plot the current graph set-up time**
- 6. Convert as many internal steps to external steps**
- 7. Reduce the internal steps time**
- 8. Reduce the external steps time**
- 9. Plot the improved graph set-up time**
- 10. Define the ideal set-up**
- 11. Plot the ideal graph and strive toward it.**

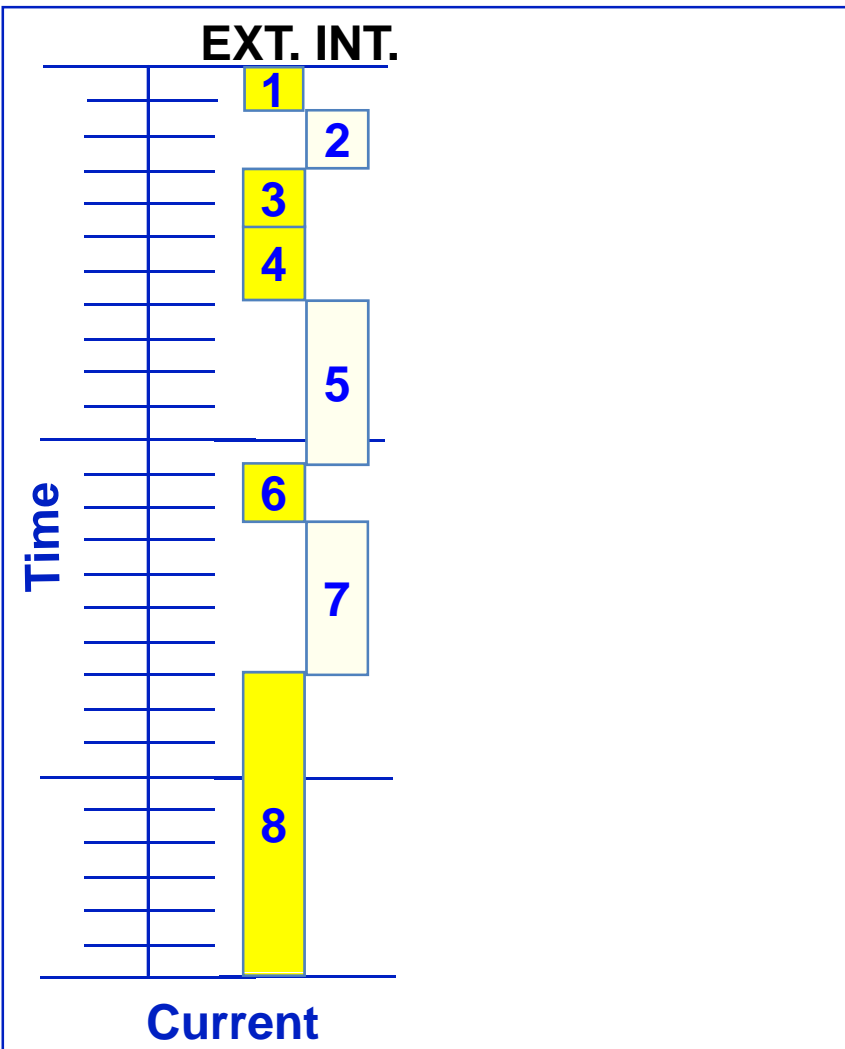


# Analysis steps

# Graph



1. Identify the set-up
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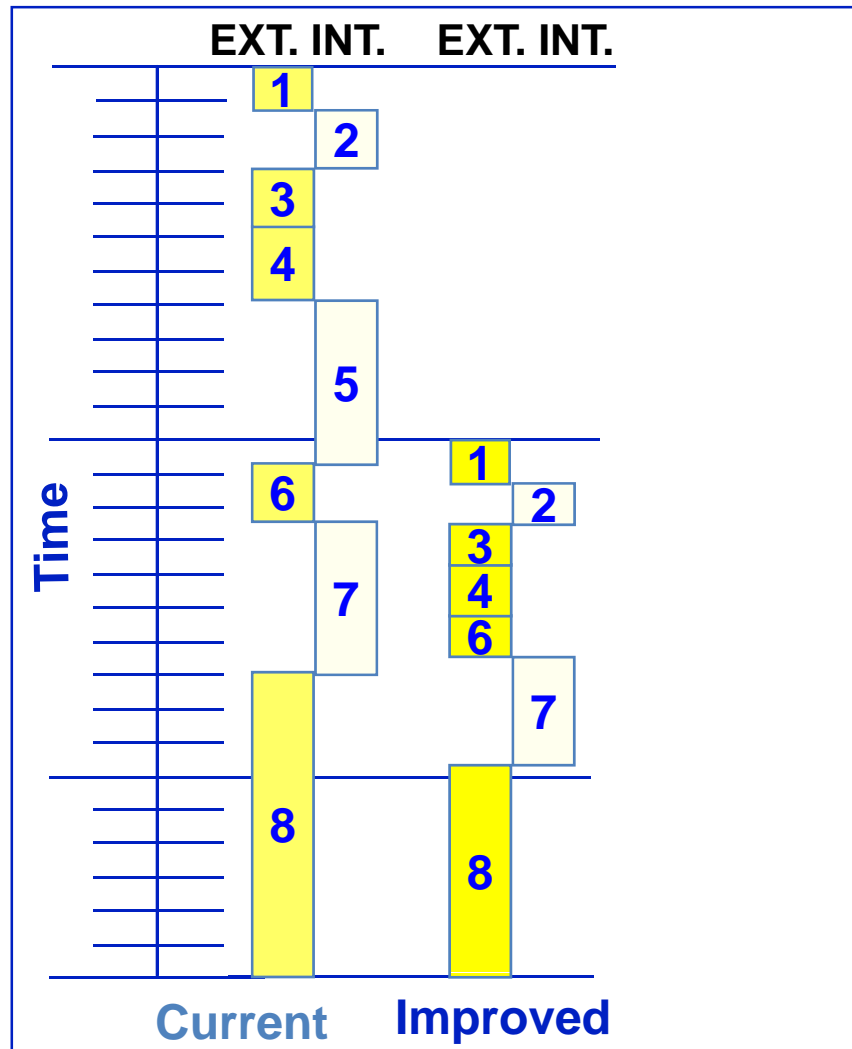


# Analysis steps

# Graph



1. Identify the set-up
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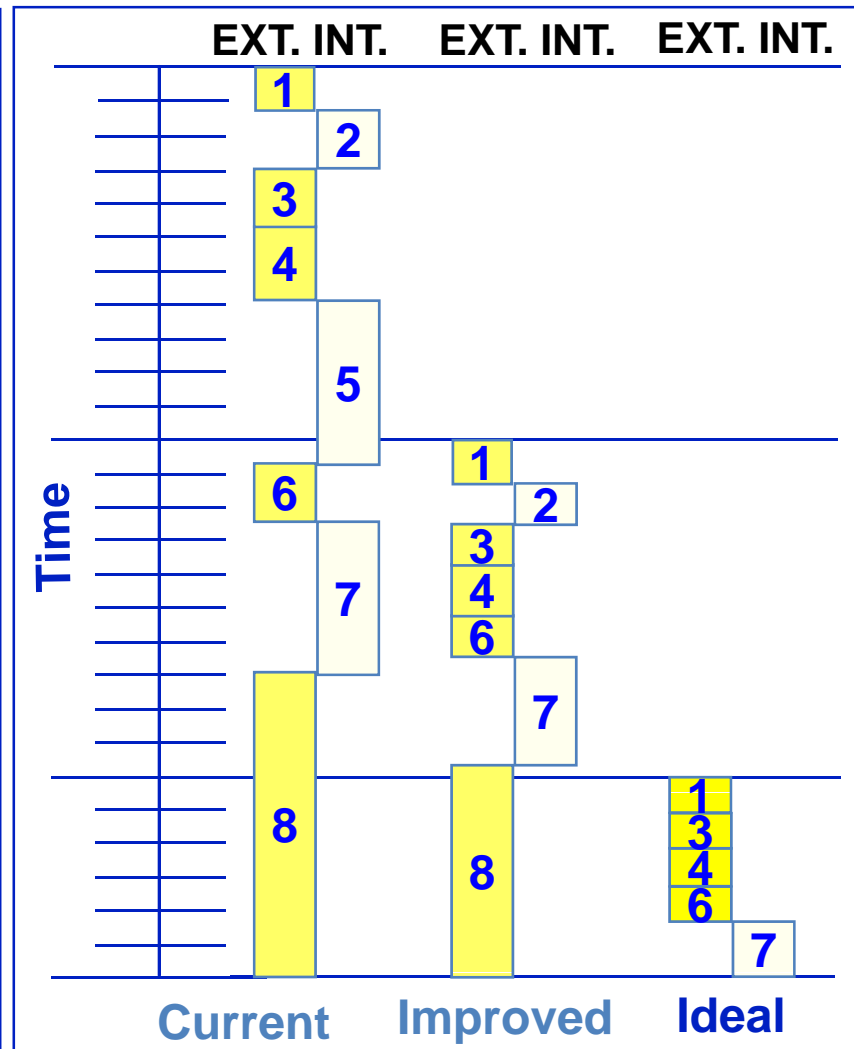


# Analysis steps

# Graph



1. Identify the set-up
2. List every step
3. Measure the time required for every step
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# SET-UP Checklist

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- Is everything set-up & on hand?
- Have tools been identified & organised/stored?
- Has unnecessary handling been eliminated?
- Have slots/grooves replaced bolting?
- Have new set-up procedures been written?
- Have setting standards & instructions been written?
- Has optimum run time to set-up time been determined?
- Has optimum number of set-up operators been determined?

***Can tools be changed in less than 10 mins?***