Level 5 – Continuous Improvement with Industry 4.0

Improve 3 – SMED

MADE
MANUFACTURE ADVANCED DESIGN ENGINEERING

Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Cronfa Gymdeithasol Ewrop
European Social Fund

Improve 3 - SMED

Single

Minute

Exchange of

Dies

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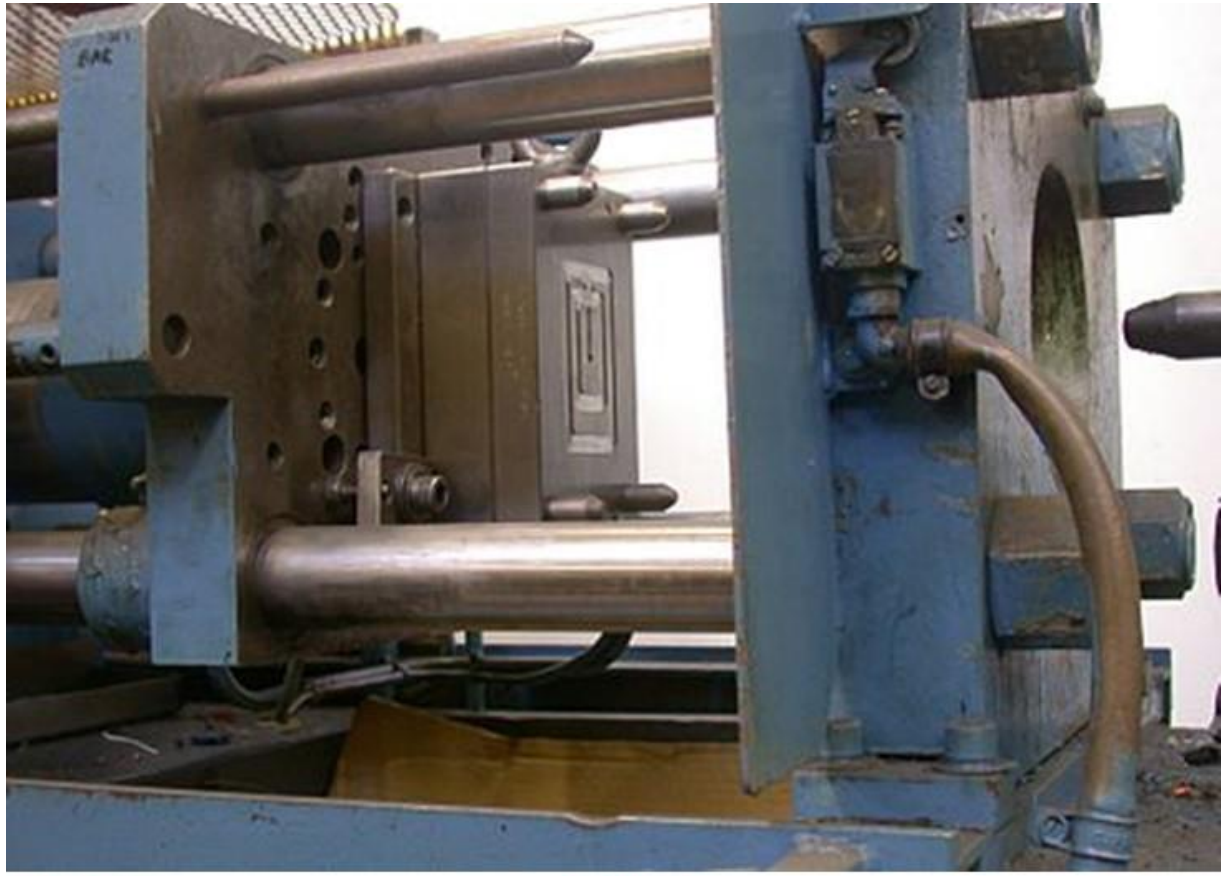

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Single Minute Exchange of Dies is the reduction or re-setting of tool changeovers

Its objectives are :-

Allow more changeovers
Become more flexible
Reduce batch sizes
Reduce inventory
Increase machine capacity

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- All equipment changeovers to be completed within single digit minutes (less than 10)
- Reduce labour to complete the changeover
- Reduce the parts, tools and materials in changeovers
- Standardise the changeover (SOP)
- Reduce the amount of material so first off is a conforming part

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- The changeover itself does not add value to the customer but is a NVA task thus must be minimised (as we have previously discussed)

- They cannot be eliminated but can be significantly reduced

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There are four main elements to the changeover task:-

- Delivery to the workplace of materials, jigs, tools etc
- Removal and fitting of replacement jigs
- Aligning, measuring and checking new jig
- Trial runs, checking materials and adjustments

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Typical problems encountered:-

- Lack of equipment and tools
- Drawing queries
- Material issues
- Labour allocation
- Lack of communication between departments
- Paperwork delays, permits to work etc
- No defined instructions

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There are though two fundamental categories we can split each task into:-

- Internal Activities (online) – removing and mounting the dies (only performed when machine is on stop)
- External Activities (offline) – transporting dies and tools, organising labour, materials and authorisation paperwork etc (can be performed when machine is still operational)

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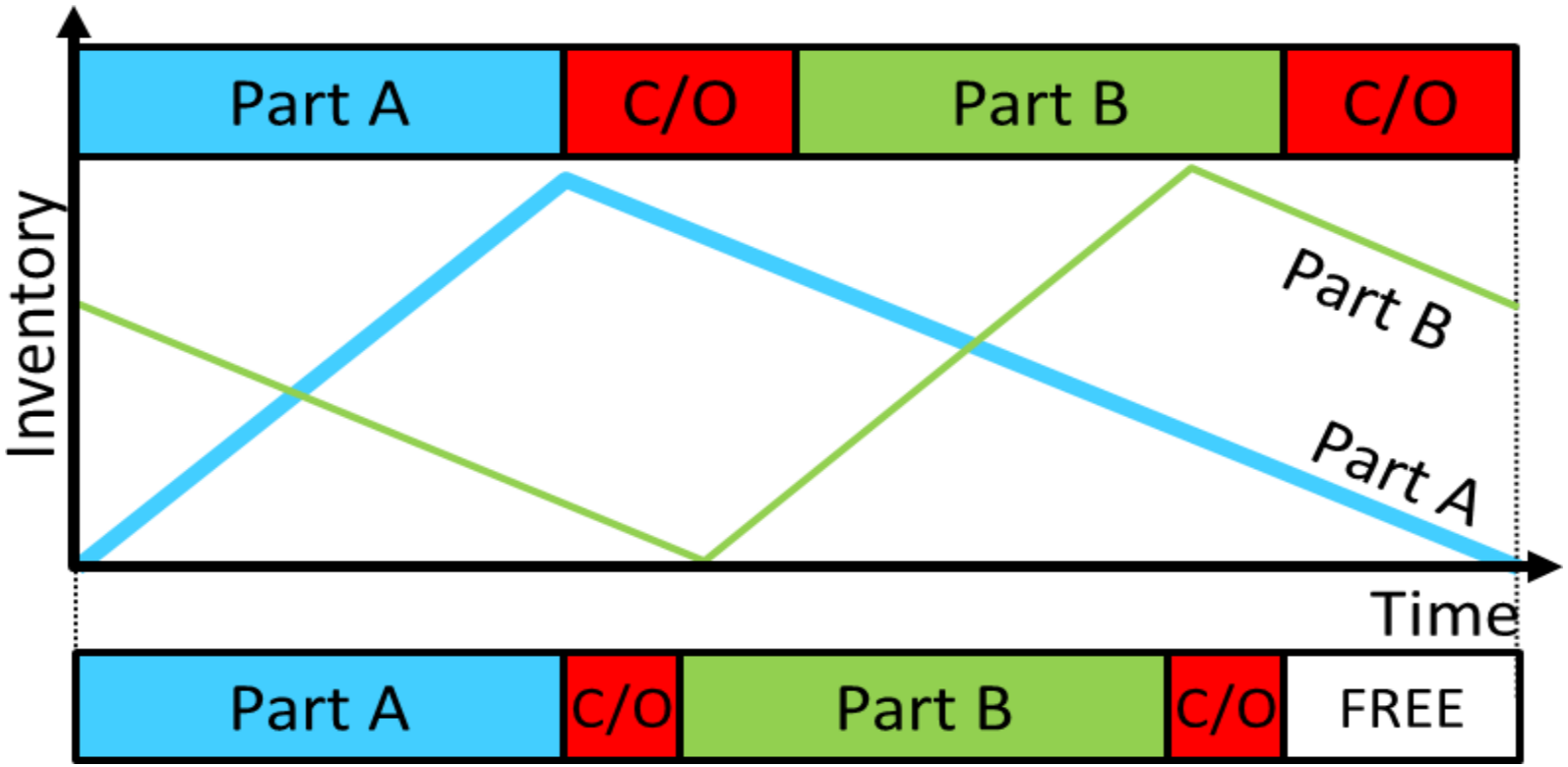

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The steps to improve the process:-

- Observe the current process
- Clasify each task by either online or offline
- Eliminate online activities or convert to offline
- Improve online activities
- Improve offline activities

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Observe the current process:-

- Watch (record) the tool change
- Make a drawing of layout and movements
- Record all elements and times – see work combination tables (p186 The Lean Toolbox)
- Record all machine settings and parameters
- Analyse the process Capture opportunities

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Differentiate between online and offline:-

- Move all the elements which can be moved from online to offline

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Convert from online into offline:-

- Move all the elements which can be moved from online to offline

- Eliminate the activity – dedicate machines or material sizes, grades etc
- Use pre-set tooling

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Improve online Activities:-

- Minimise number of tools
- Standardise bolts/head sizes
- Minimum thread length
- ‘C’ washers
- Colour code tools/fittings
- Standard setting blocks
- Positive location

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Improve 3 - SMED

Improve offline Activities:-

- Store tooling next to workplace
- Tooling readily available
- Pre changeover checklist
- Detailed SOP’s

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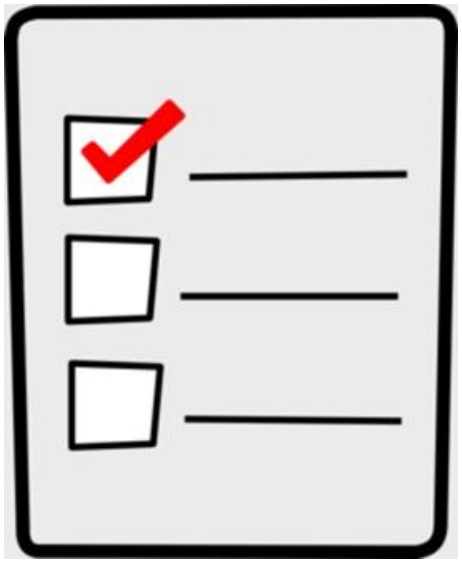
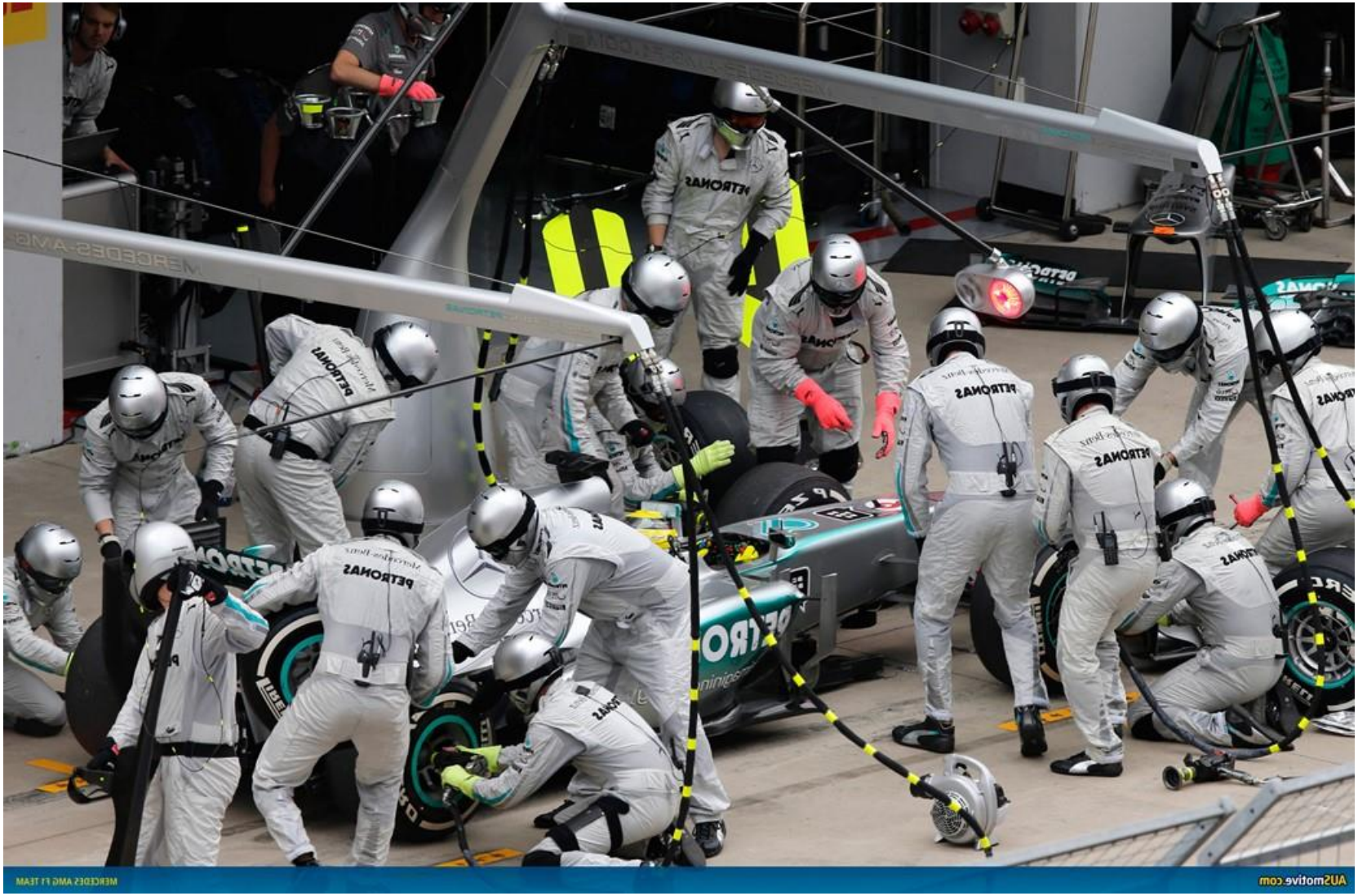


Improve 3 – SMED example



Improve 3 – SMED example

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Improve 3 - SMED

Comparison

- **Tools available**
- **Tyres available**
- **1 nut on F1 car**
- **Operators available**
- **F1 cycle time under 3 seconds**
- **Jims cycle time 30 mins!**

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Improve 4 – TPM

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Improve 4 - TPM

Total

Productive

Maintenance

Improve 4 - TPM

Improve 4 - TPM

Total Productive Maintenance traditionally seen as the maintenance Dept activity

Many of the maintenance activities are well within the abilities of the machine operators (car maintenance, checking fluids, changing light bulbs etc)

If we can free up some of the routine tasks like checking machine condition we can free up the maintenance function for more involved activities

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- Process owners are often the best people to spot condition abnormalities
- Minor faults can be rectified quickly when spotted
- Process owners can often give the best feedback on machine performance

Improve 4 - TPM

- The 5 pillars of TPM

- Autonomous Maintenance
- Planned Maintenance
- Training
- Improvement Activities
- Design for Manufacture

Improve 4 - TPM

Autonomous Maintenance:-

- Appropriate maintenance performed by operators on their own equipment
- Elimination of waste through operator involvement
- Data collection and developing action plans to resolve
- Improve the machine OEE (availability, performance and quality)

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Planned Maintenance:-

- More in depth tasks performed by skilled trades (although sometimes as emergency repairs!)
- Is periodic and routine developed in conjunction with past performance and designated engineers
- Developed from supplier knowledge and recommendations
- Skilled trades can act as coaches to operators

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Training:-

- Decide what is appropriate and achievable to the workforce
- Provide applicable training to the workforce
- Provide technical support initially to support the activities
- Train in data collection
- Fully document the processes and required outputs from the activity

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Improvement Activities:-

- Everyone within the area to participate
- Set achievable targets
- Multi-discipline teams
- Show the current state (may use OEE to identify problem areas)
- Document the outcomes and improvements (FMEA and control plan updates)
- Celebrate the success

Improve 4 - TPM

Design Activities:-

- Feed back to designated engineers
- Feed back to equipment suppliers and change current designs and/or incorporate in future machine design reviews
- Mistake Proof (Poka Yoke) where possible

Improve 4 - TPM

Further reading ‘The Lean Toolbox’ P149 SMED, P129 TPM