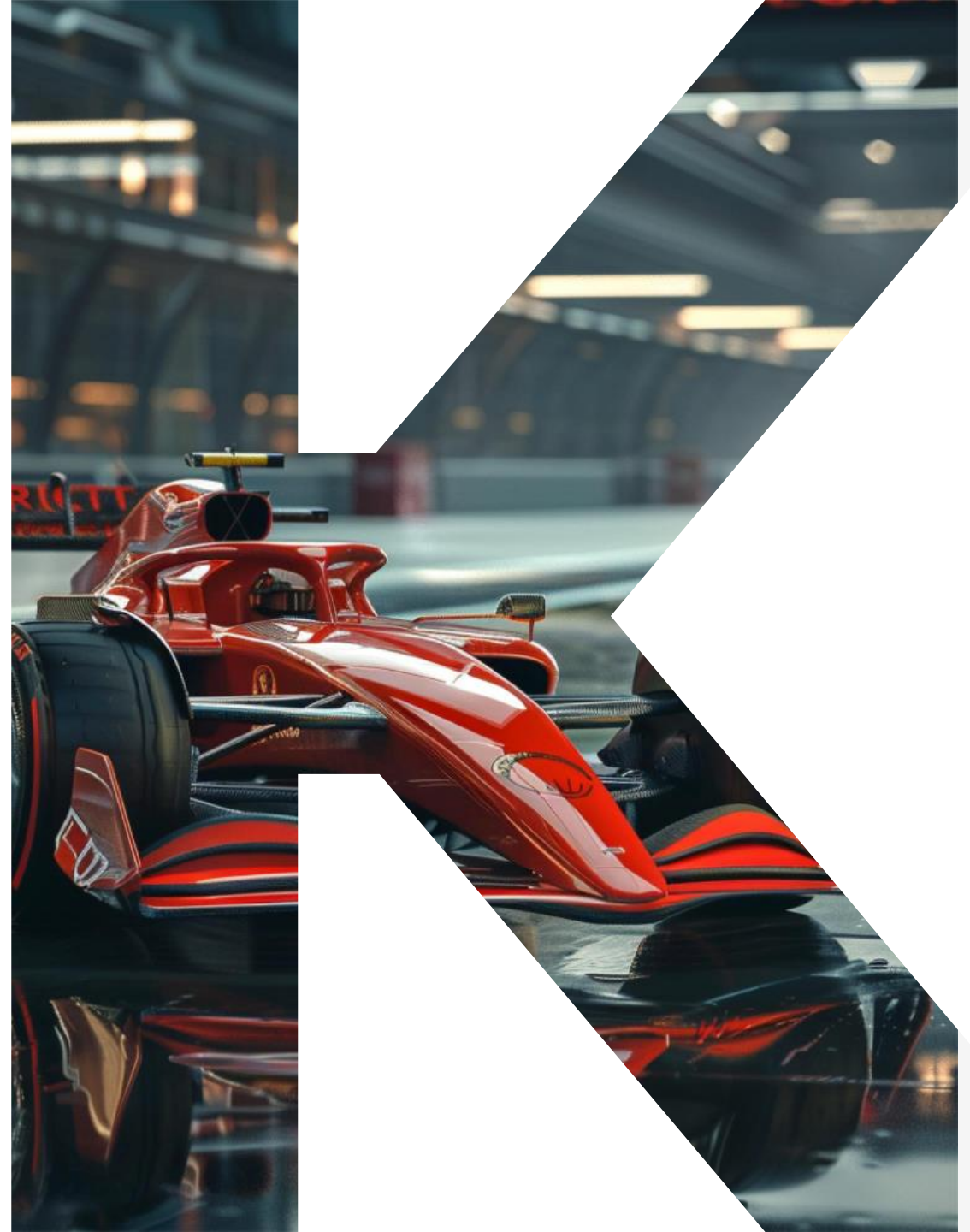


Training: Changeovers / SMED

March 2024

KEARNEY



SMED definition

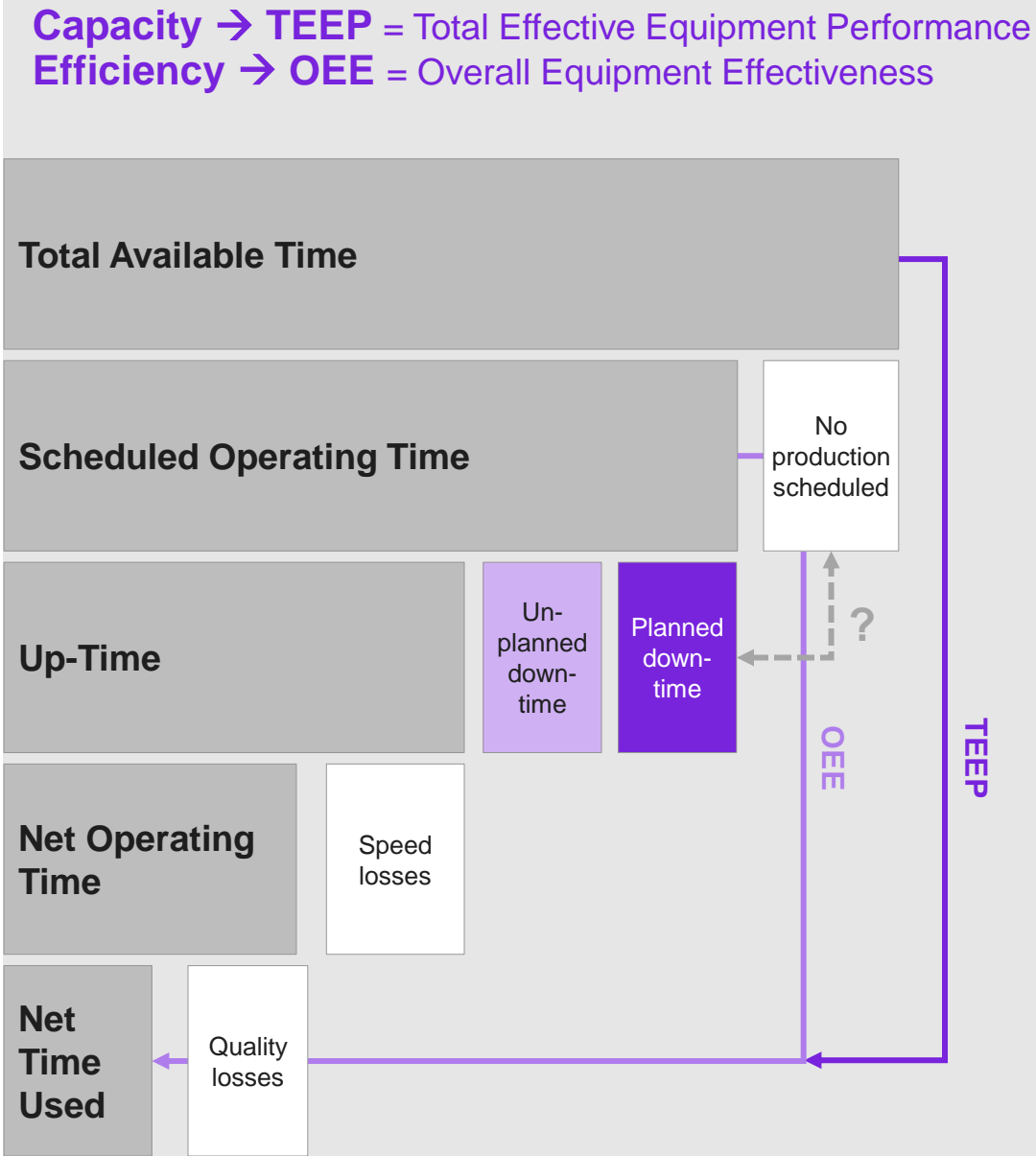


- SMED is used to represent the **Single Minute Exchange of Die** or setup time that can be counted in a single digit of minutes
- SMED or “quick changeover” are the practice of **reducing the time to change a machine from running one product to the next**
- The need for SMED and quick changeover programs is **more popular now than ever** due to:
 - Increased **demand for product variability**
 - **Reduced product life cycles**
 - Need to **significantly reduce inventories**

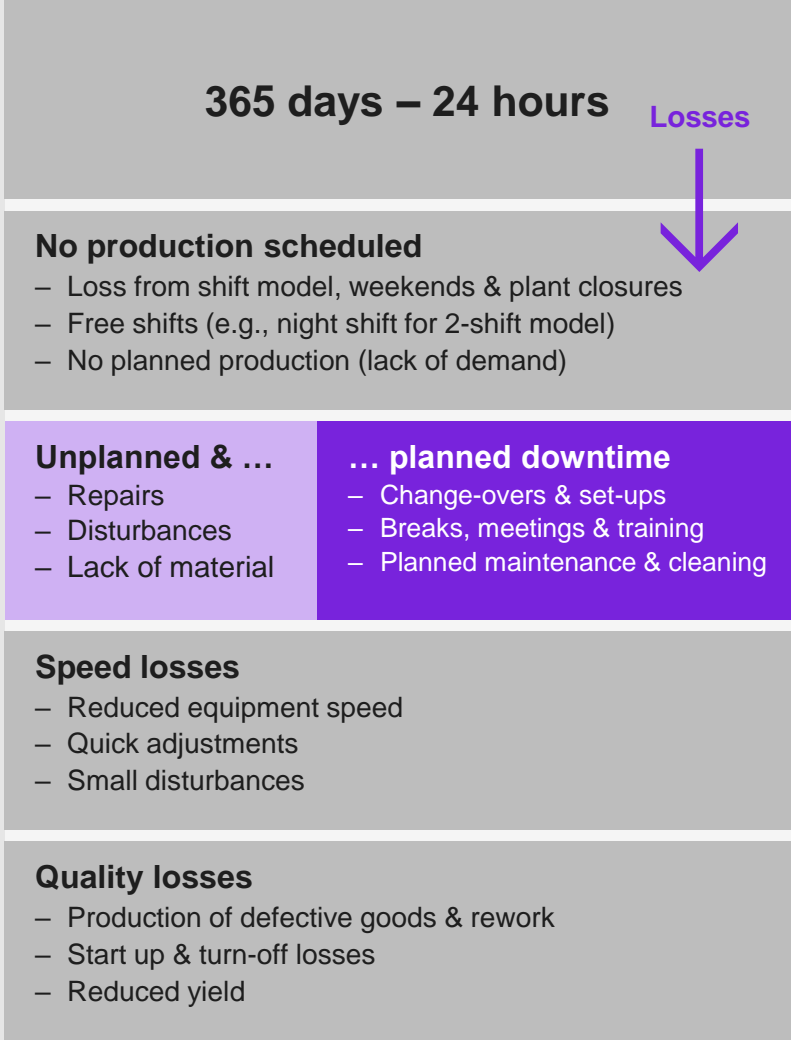
For measuring asset performance there are two main KPIs

TEEP = Net Time used / Total available Time

OEE = Net Time Used / Scheduled Operating Time



Source: Kearney



SMED Workshop - Overview

Step-by-Step-Reduction of the Setup Time

1

Observation of the setup process

2

Evaluation and separation of internal and external setup

3

Evaluation by ECRS (Eliminate, Combine, Rearrange, Simplify)

4

Preparation and implementation of the target concept

Activities, responsibilities and dates

5

Standardization

Stabilization, controlling and repeatability



Step 1 – Observe the setup process



Video analysis



Deep dive on next slides.

- Setup process is filmed, and every process step is analyzed afterwards
- The process/ video can be stopped or split up for a discussion and an analysis



Spaghetti graph



Deep dive on next slides.

- All movements of the operator are drawn on the shop floor plan
- Overview of required and repeated movements is done; Waste by movement is visualized



Process analysis setup process



- A list of actions to fulfill the setup process is created: Basis for timing
- The shorter the given setup time the higher the level of detail for the different process steps



Time study



- The time for each process step is measured and noted
- Detailing level according to the details in the process analysis



Step 1 – Observe the setup process

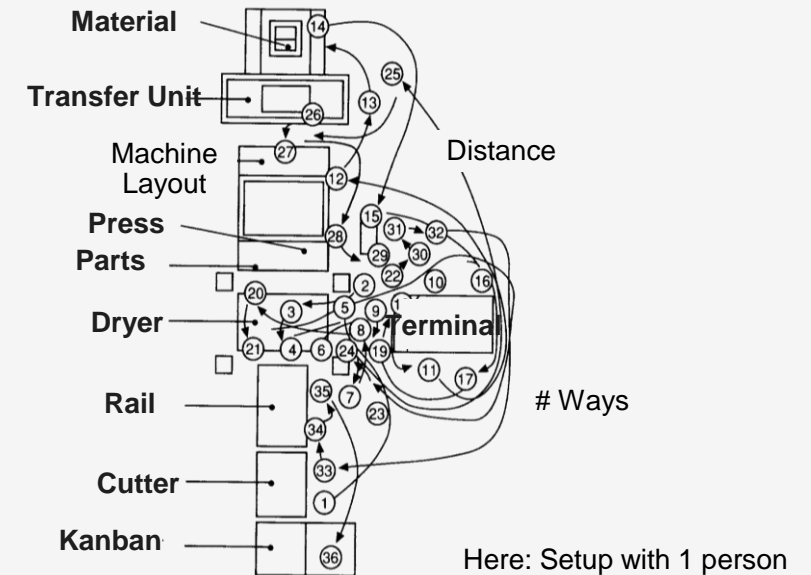
Examples: Video Analysis and Spaghetti Graph

Video analysis



- Use a video camera to record the setup process
- Film only the activities not the worker as a person
- Special allowance necessary!
- Benefits:
 - Visualization is better than verbal description
 - More detailed view possible: Number of screws, sequence of activities, ...
 - Time estimation according to the video possible

Spaghetti graph



- The spaghetti graph shows the movement of the worker during a setup process
- Draw a spaghetti graph for every worker during the setup; Draw a line for every movement
- After the process calculate the distance travelled based on the number of lines/ bars
- Results: Distance per worker, Focus where the operator is working, Exceptions from the regular working procedure

Step 2 – Separation of internal and external elements

External setup

- Identify actually internal setup steps and check if they can be done externally
- Examples: Searching for tools/drawings/sheets/masters, supplying tools and equipment, material handling, doing specific setup steps, ...

Internal setup

- Concentrate changes and sample production internally
- Examples: Changing tools in the machine, adjusting parameters, fixing tools in the machine, fixing dies in the machine, ...

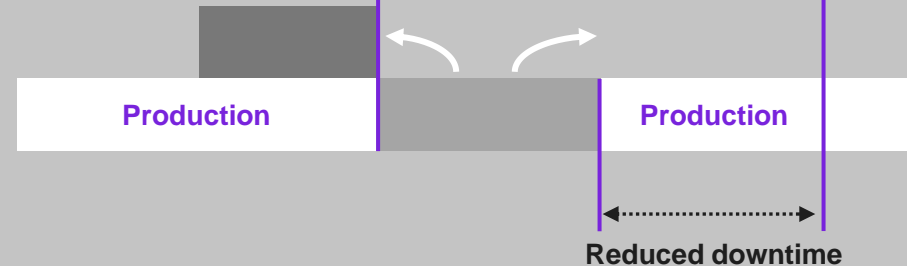
2a

Identify internal and external setup and split up



2b

Move external setup to steps before/after downtime



Source: Kearney



Step 3 – Evaluate using ECRS principles



	Effect	Example
E liminate	Avoid all unnecessary steps to save time	<ul style="list-style-type: none">– Avoid ways to take tools by locating them at the machine– Avoid adjustment by using mechanical stops
C ombine	Do steps in parallel	<ul style="list-style-type: none">– Use adapters for parallel positioning instead of different steps for positioning in x and y
R earrange	Change the sequence of process steps	<ul style="list-style-type: none">– Make previous internal process steps external– E.g. prepare tools before the setup starts, cleaning after the setup, ...
S implify	Reduce time consumption and complexity	<ul style="list-style-type: none">– Avoid different type of screws and use quick fasteners– Make adjustment faster by using different fixed positions instead of screwing

Three exemplary best practices for setup process optimization

Example:
Mechanical Assembly

Area

As-is setup process

Best practice

Utilization of motorized tools



Quick clamping systems for tool changes



Centering elements



Step 4 – Preparation of the Target Concept

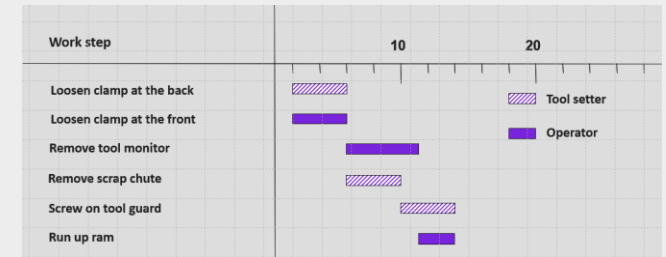
Define the New Standard Process to Train the People & Ensure Sustainability

Describe new setup process & workplace

Visualize the setup process

- Checklist for the preparation and the follow-up of the external setup (necessary equipment, tools, materials)
- Checklist for adjustment parameters
- Describe the sequence of the setup steps in a standard work sheet
- Define and communicate rules and responsibilities
- Define locations for tools etc. (5S)
- Define times for the process steps
- Define new batch sizes

Gantt graph

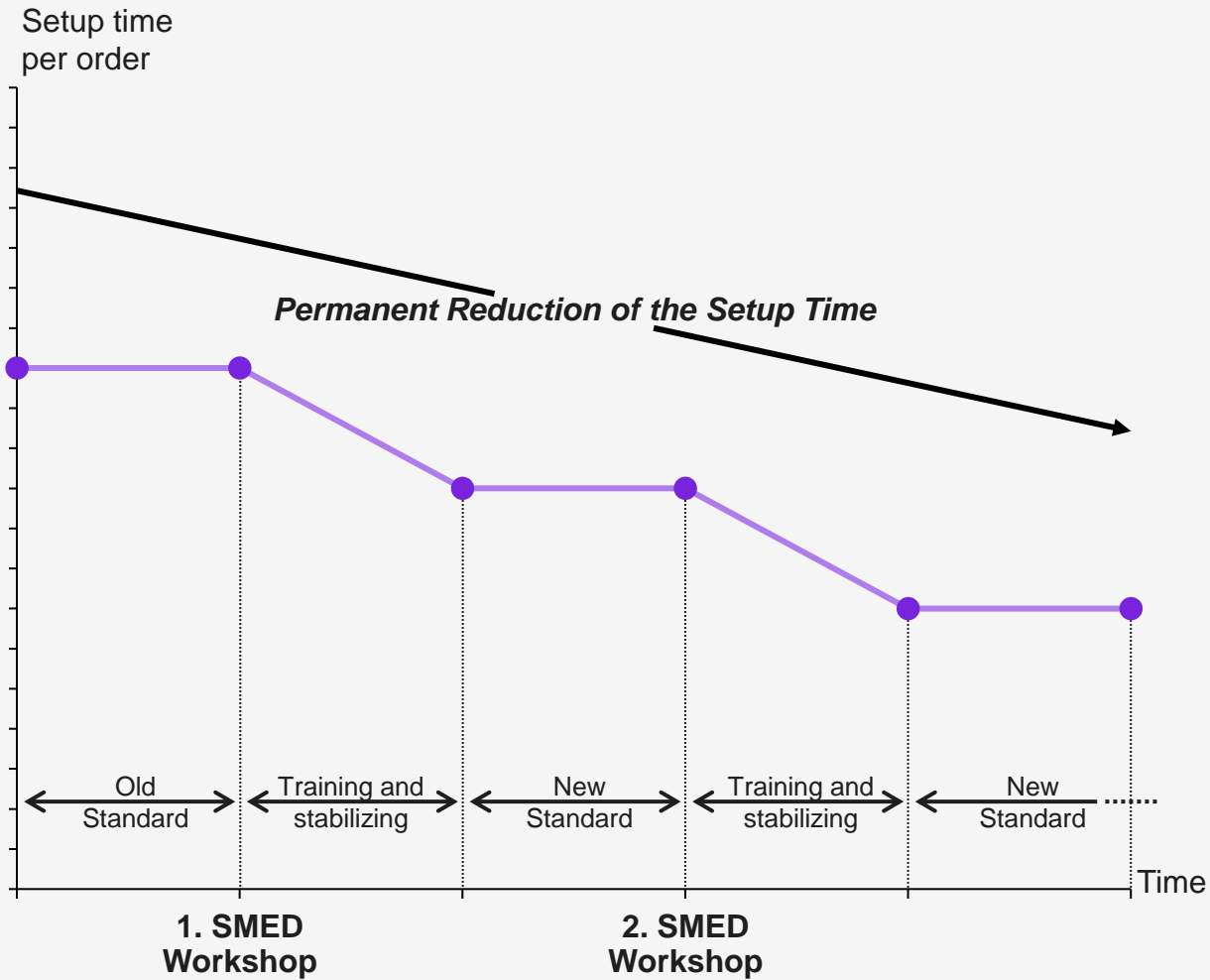


Defined locations



Step 5 – Standardization

SMED Ensures the Sustainability With a Training Concept



Benefits

- Continuous reduction of setup times
- High reliability of the setup times
- Controlled by the organization



Thank you

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