EFESO
MANAGEMENT CONSULTANTS

PERFORMANCE BOOSTER

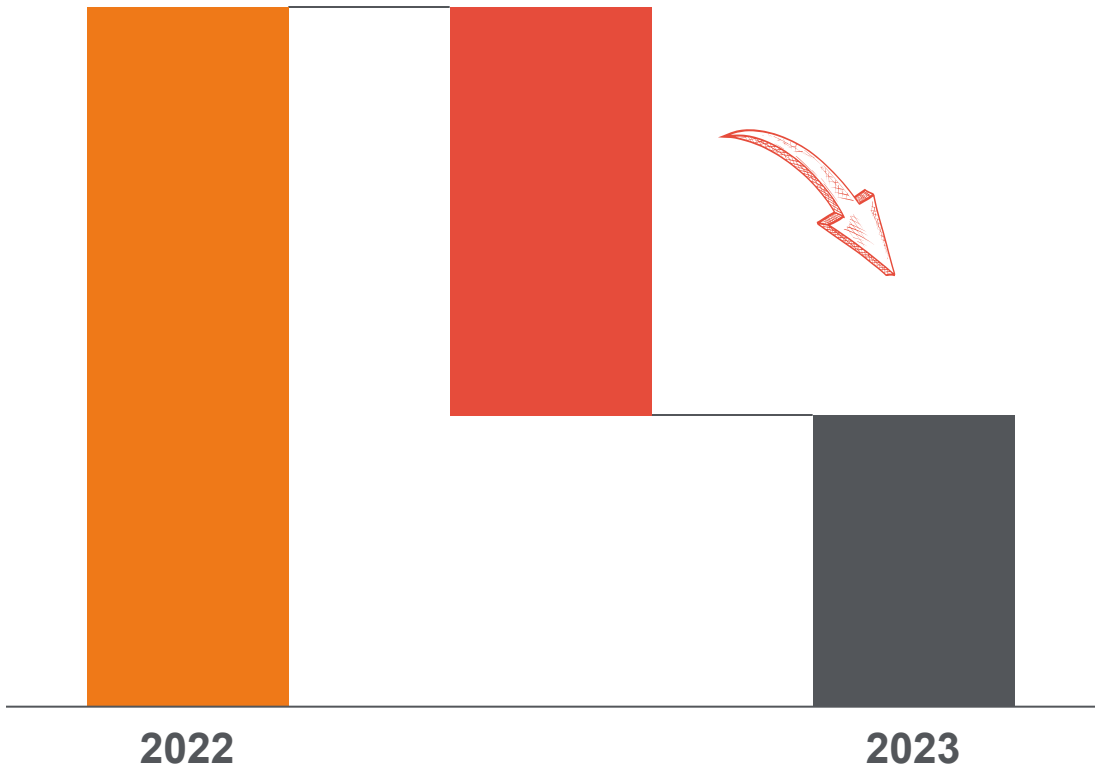
How to enhance your factory performance – NOW!

PERFORMANCE MANAGEMENT

INSIGHT

Situation: profitability is under pressure, due to significant cost increases
Risk: decreasing profits, or even losses

Example overview of change in cost structure



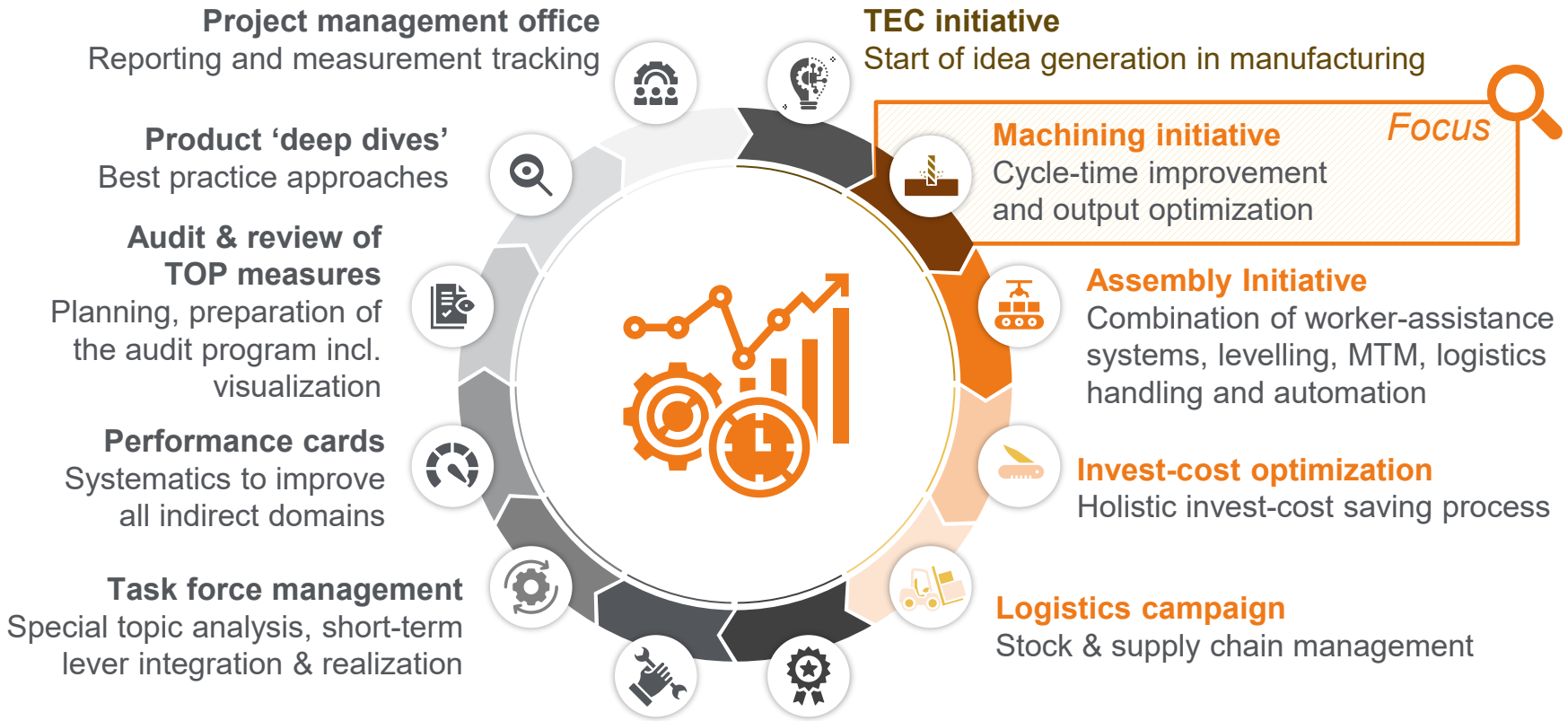
Key takeaway

Since 2021, **European production costs have spiralled**, due to…

- **energy cost increases**
- **wage-price inflation**
- **supply-chain disruptions**
- **labor cost increases**

Businesses that don't have risk mitigation measures in place can suffer significant cost increases and decreases in profits

The ‘Performance Booster’ approach provides a unique, yet proven framework that’s guaranteed to deliver results… fast!



We manage your project

END-TO-END!

- Rough analysis
- Workshop series for idea generation
- Target picture
- Define implementation packages
- Realization support
- Proof of success

Source: Check Report (ACT/FC) April 2020
FCM: Factory Contribution Margin; MSA: Measurement System Analysis

The ‘Performance Booster’ applied to existing machining infrastructure – areas covered

1

Video analysis incl. tool optimization
Non-productive time optimization & main-time optimization

Machining: turning, milling & grinding

Assembly & end-of-line test fields

Automatization

Food & beverage

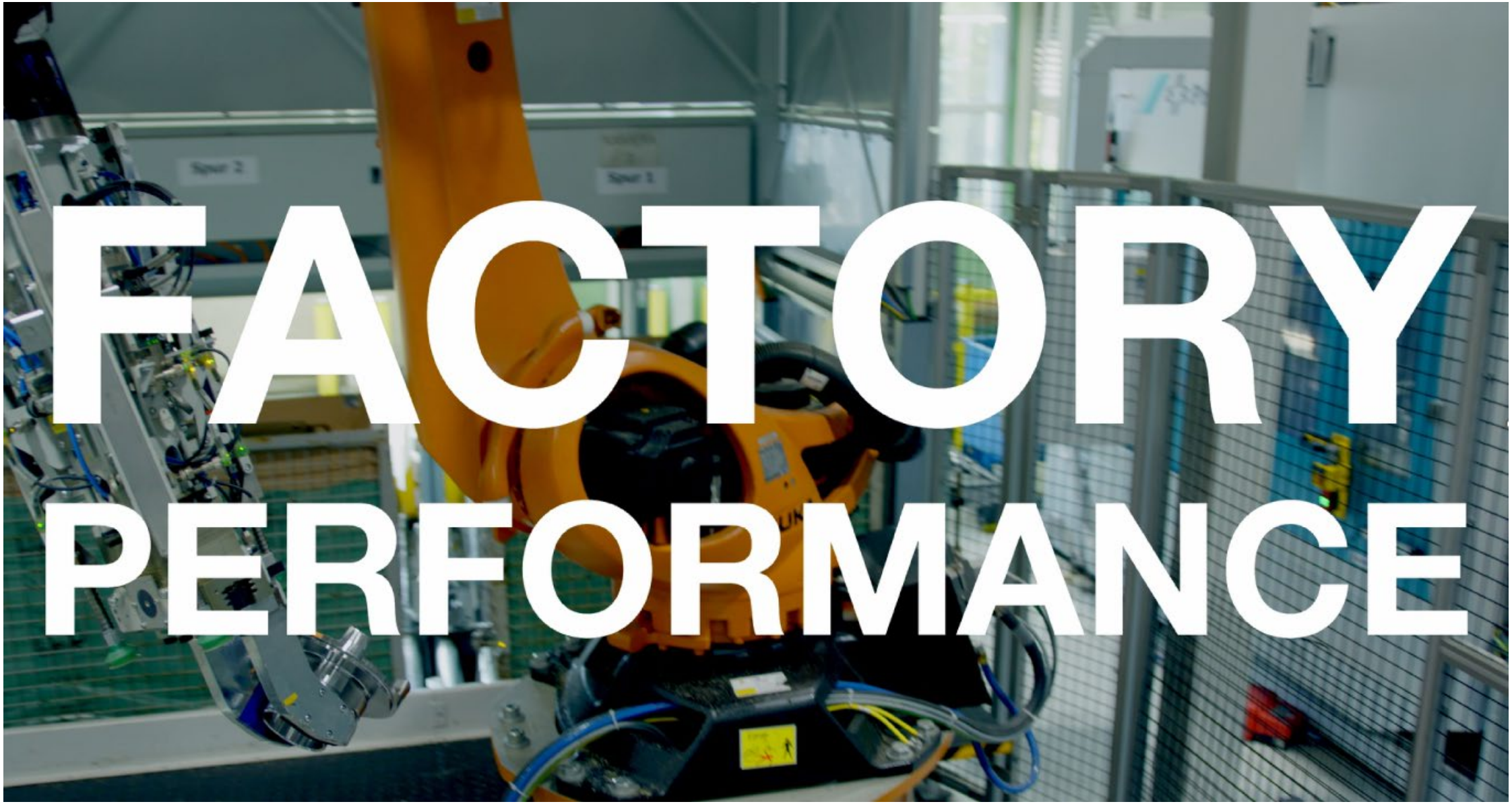
Printed circuit board assembly (PCBA)

2

Software-based machine tuning
Adaptive feed control for main-time optimization

1 *Maximise the efficiency of existing Infrastructure, especially due to e-mobility transformation*

2 *Stabilization of new ‘invest’ processes and machines in a ramp-up phase*



Video can only be shown if your e-mail is added to EFESO's confidential client list. If you do not have access, please contact d.wichmann@tsetinis.com.

Video analysis of existing infrastructure enables an increase in output of at least 9%

1

Video analysis with unique software

More output and tool optimization by deep-dive analysis

Insight into implementation process

- Multiple camera installation & video recording
- Sequencing with video-analysis tool
- Idea documentation, based on micro potentials
- Review of ideas with customer team & development of implementation plan (including realization)

Levers for optimization

- Reduction of non-productive time (incl. micro potentials)
- Improvement of workpiece change
- Optimization of cutting parameters and process-steps
- Optimization of combination tools, cutting geometry and materials, thanks to best-in-class tool know-how

Average project output

4 weeks
Throughput time

~9%
Output increase

~26 average[1]
Return on consulting

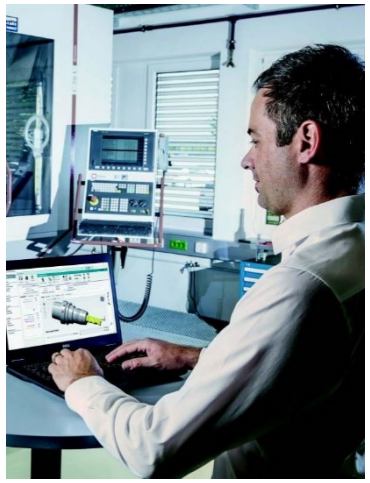
1) 4 years Timeframe ROC 8-40

Software tuning of existing infrastructure enables an increase in output of at least 8%

2

Software-based machine tuning

Increased efficiency and safety in cycle times, without cutting speed-limit change



Insight into implementation process

- Quick check & pre-analysis of machine software
- Offline preparation of software installation
- Software installation and implementation of tools at the machines
- Cut-check data to confirm efficiency improvement

Levers for optimization

- ‘Adaptive feed control’ with smart real-time data analysis
- Reduction of tool wear by adaptive feed control
- Our self-learning analysis method reduces tool breakages
- Optimization of both individual machines and entire production lines

Average project output

4 weeks
Throughput time

~8%
Output increase

~31 average[1]
Return on consulting

1) 4 years Timeframe ROC 20-64

Machining initiative at one plant: results

Video analysis

52	-11%	€4.3m	3 months
Number of machines analyzed	Cycle-time reduction in average	Savings per annum.	Payback period, in months

Machine tuning

48	-8%	€3.1m	3 months
Number of machines software installed on	Cycle-time reduction, on average	Savings per annum	Payback period, in months

As of today, the Machining initiative at the plant has generated an ongoing annual cost saving of €7.4m

As a next step, we would suggest a site-visit to see one of our many projects

I. Reference-site visit

… to see a ‘Performance Booster’ project in action

Showcase

- Site visit of a running project
- Live demo with production machine(s) to demonstrate the starting position, as see the added value that ‘Performance Booster’ measures can add
- Talk with client

1 day

II. Piloting

…of a ‘Performance Booster’ project

Proof-of-concept

- Definition of suitable machinery for the piloting phase – with leverage potential for a global rollout
- Setup of piloting team (customer, EFESO)
- Execution of pilot, impact evaluation and estimate of overall benefit for you

4-6 weeks

III. Project

…planning and execution for relevant production lines

Tangible results

- Setup and detailed planning of project (mixed team from customer, EFESO)
- Execution of project incl. business plan development (benefits, investments, etc.)
- Transformation roadmap and rollout planning
- Sign-off with management

12+ weeks

IV. Delivery & Rollout

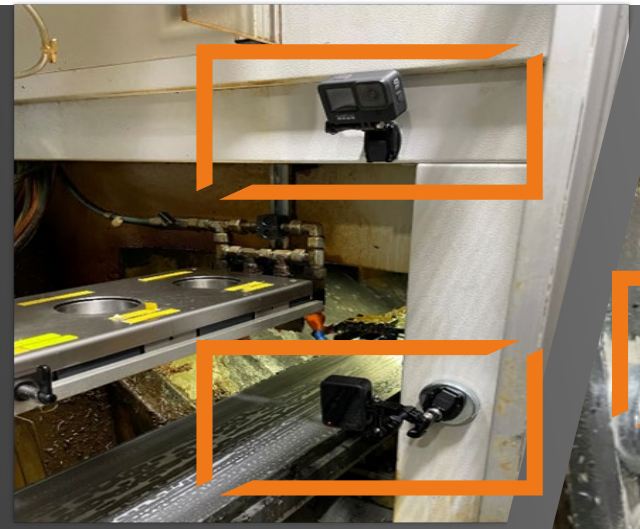
…of ‘Performance Booster’ globally

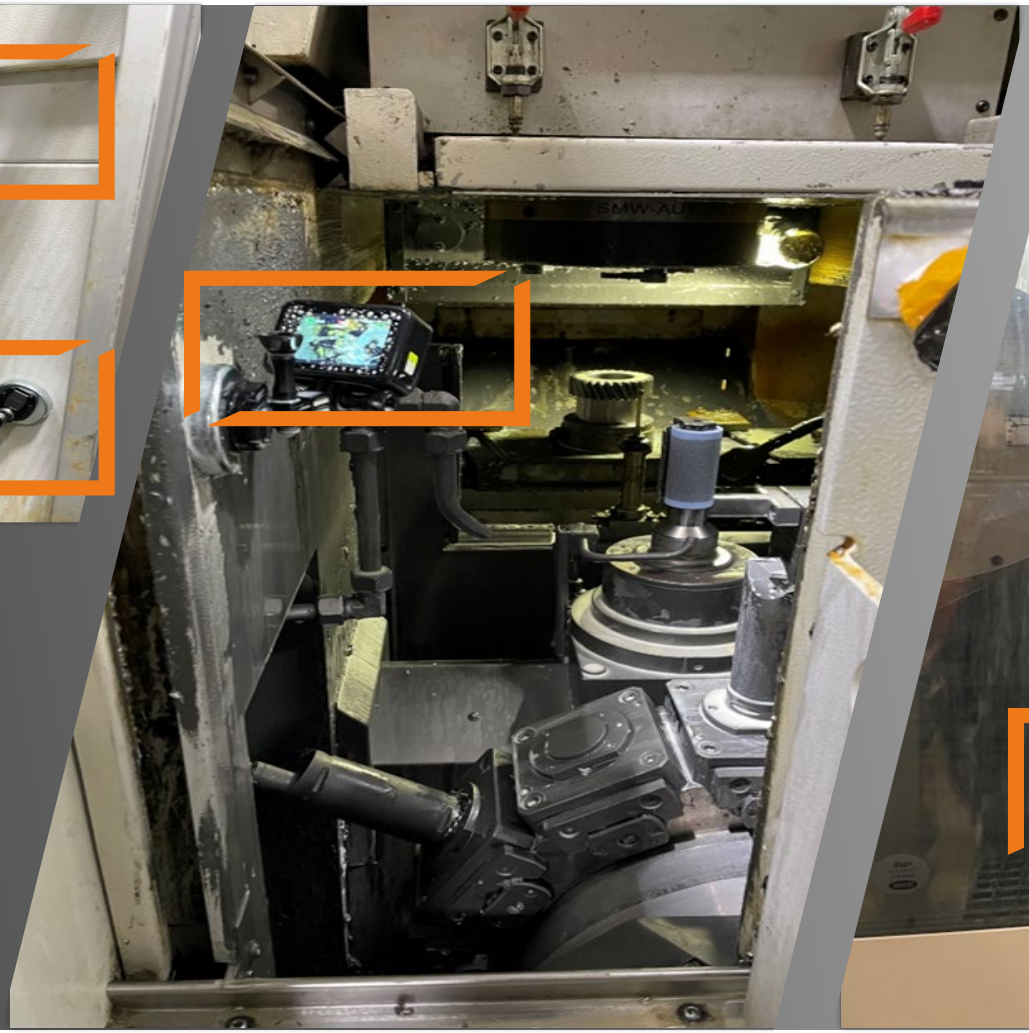
Global leverage

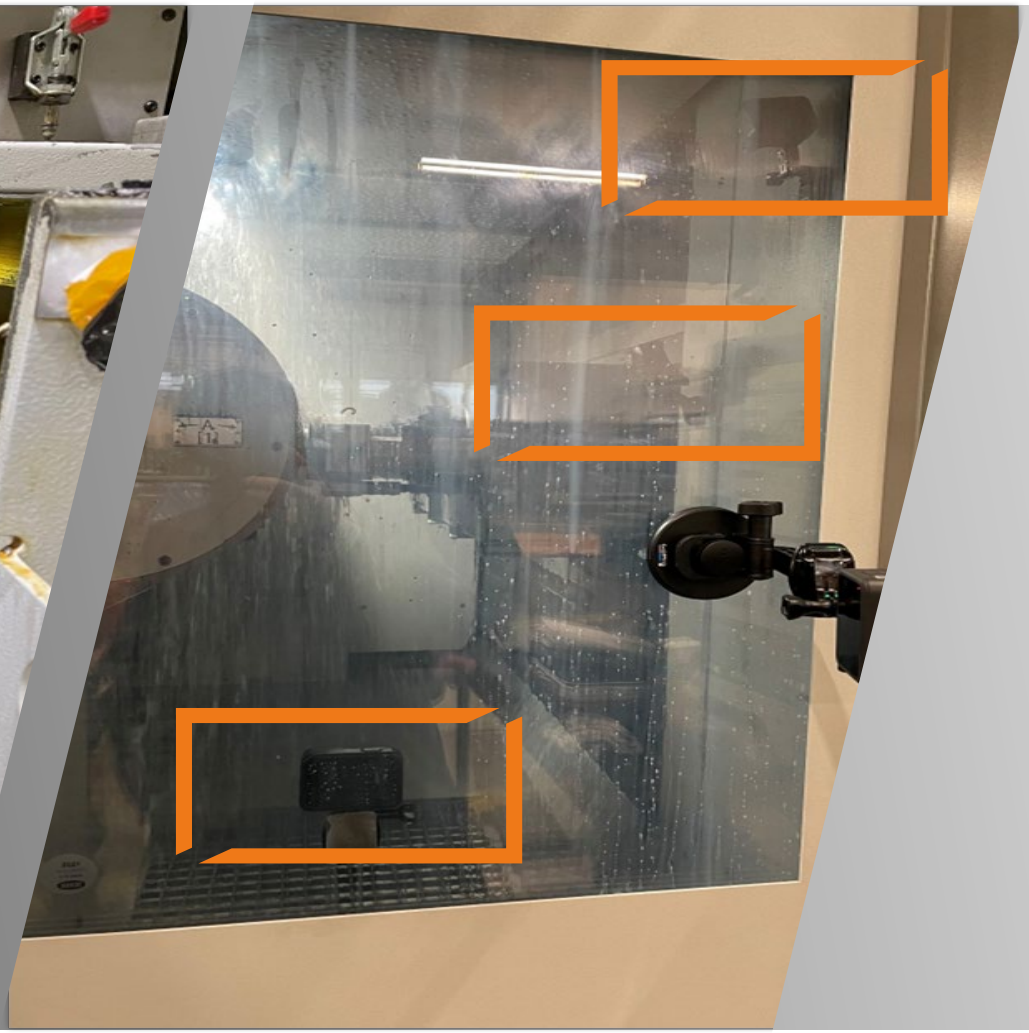
- Setup of global rollout team (factories, countries, regions)
- Execution of global rollout
- Tracking and reporting of deliverables and generated impact
- ‘Lessons learned’ feedback loops created to optimize roll-out program on the fly

12+ months

The ‘Performance Booster’ video analysis – an example setup







Video analysis

- 1-5 cameras, covering all needed perspectives, installed in the machine
- An additional 2-3 cameras filming workpiece change

Video analysis approach: Typical use cases…

1. Bottleneck machines

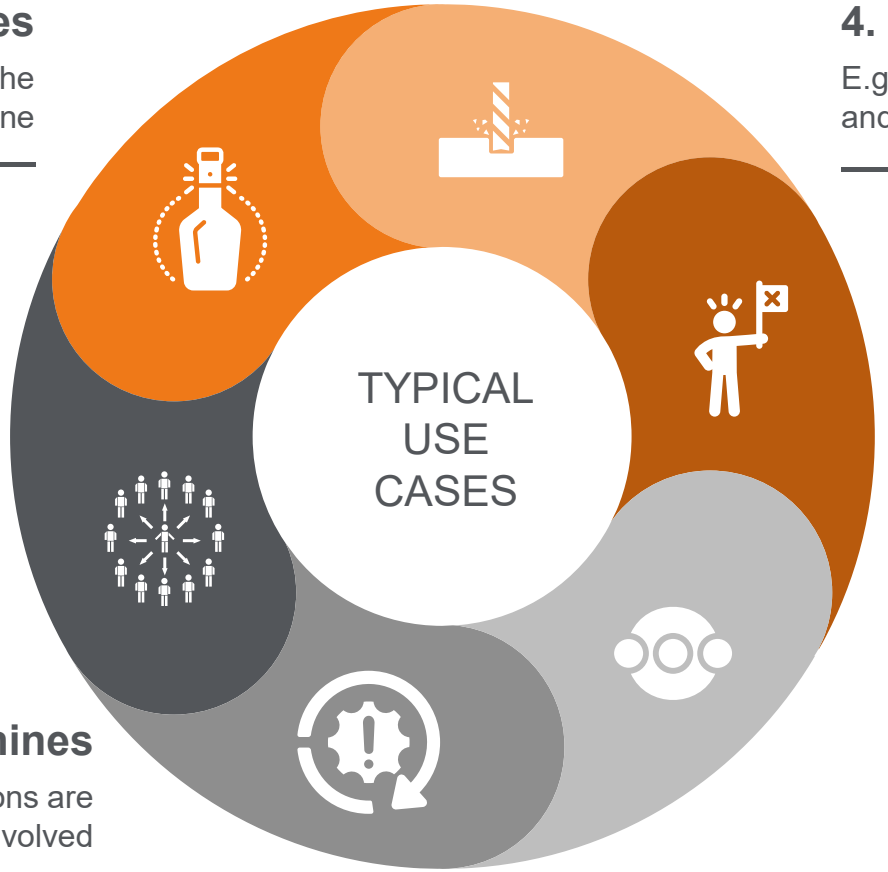
Focus on a bottleneck process/machine in the manufacturing line, or a single bottleneck machine

2. Bottleneck machines with multiplicator

Video analysis of one reference machine, with carry-over to multiple similar machines

3. Problem machines

Machines where immediate solutions are required, and special tasks are involved



4. Optimization tooling

E.g., combination tools, optimizing cutting geometry and materials with best-in-class tool know-how

5. Fault analysis at ‘end-of-line’

Analysis of event video observations with visual analysis of automation processes

and many other variations…

The five typical use cases will be explained in the following

Video analysis approach: 1) Bottleneck machines

Situation

A bottleneck machine in a chain with a downstream process

In short

- A known bottleneck machine
- Root cause and elimination of bottleneck necessary
- (e.g., additional external processing currently needed, as output is not sufficient)

Approach

Root cause was likely to be multi-causal, so a multi-stage solution approach was required. Firstly, we focused on processing time and off-time. Secondly, we carried out a tooling analysis. Lastly, we focused on processing time and off-time

Video analysis

- Initial assessment
- Focus on off-time

Result

In this instance, by quickly implementing program optimization, a direct saving of 16.3 sec was achieved

Measures

- Retract plane and path optimization
- Parallel Programming
- Program flow changes
- Part-change optimization

- 16.3 sec. (-11.4%-p)

- €112k p.a.

Optimizing the bottleneck machine in a production line typically leads to one of the biggest savings

Video analysis approach: 2) Bottleneck machines with multiplicator

TYPICAL USE CASES

Situation

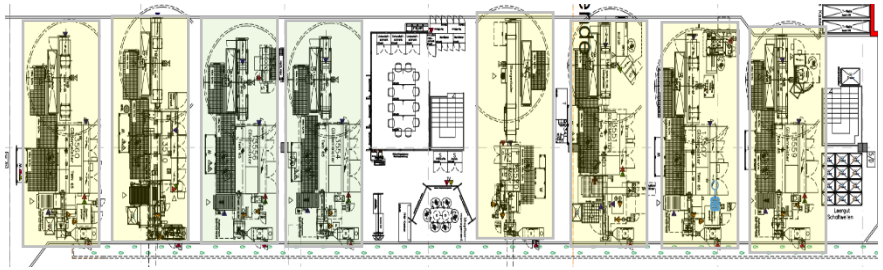
Setup of identical machines with the same program structure

Analysis of machine A

- 33 ideas generated
- - 15.4 sec (-11%-p)

Approach

Use the multiplier effect by rolling out the savings from one machine (machine A) to all machines wherever possible.



The way forward

- Analyze the machining cycle and tool changes for machine A.
- Transfer the reduced cycle time to all the networked machines

Result

Seamless transfer of results was possible in this case

In a nutshell:

- 8 machines upgraded
- resulting ratio leveraged

- 11%-p

- €313k p.a.

Optimizing a machine with several same machine settings typically leads also to one of the biggest savings

… Initially analysed Machine A

… Roll out to other machines

Video analysis approach: 3) Problem machines

TYPICAL USE CASES

Situation

In September, a broach needle broke, leading to a 3-week analysis with no clear outcome. Two more breaks occurred in October, resulting in €100k of damage. Now, a high-speed camera system will be used to capture and evaluate the issue, focusing on kinetic force analysis.

At the core

- €100k damages
- Inconclusive 3-week analysis

Break seen at the top row of teeth (on the right side)

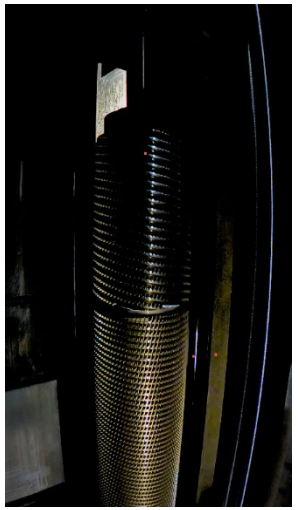
Approach

Table movement likely

- The process involves filming the system using high-speed cameras and analyzing individual images of the recorded footage
- By using two cameras, it's easier to spot any abnormalities

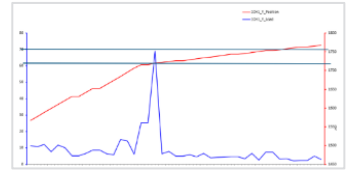
Camera 1: ***Roughing***

Camera 2: ***Smoothing***



Result

Conclusion: Wear on the drives (ball screw) at a height of 1720mm



Root cause fixed

- Shifting the switching point to 1650mm
- Eliminated vibration and noise
- Stable process, no eruption of teeth detectable

n/a

- €250k p.a.

Cut-check & video analysis enables troubleshooting of problem machines in the shortest possible time

Video analysis approach: 4) Optimization tooling

Situation

Initially this machine was a bottleneck in the machinery network.

Moreover, the processing time was too long.

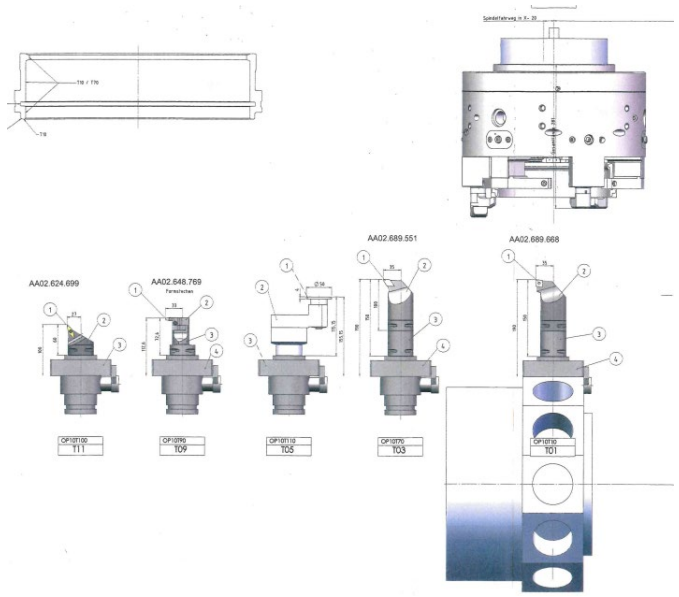
In short

- Processing time was too long
- Consequently, external processing in the value chain was required

Approach

Change of processing time

- Tool-cutting, edge-plate optimization
- Iterative improvement loops
- Tool-change optimization



Result

Service life optimization of the tools is still ongoing.

Interim statement

- After the first tool tests, 7,7 seconds (- 4,9%-p) were saved by changing the cutting process

- 7.7 sec. initially

- €48k p.a.

With video analysis, we also optimize the tools and tool changes

Video analysis approach: 5) Fault analysis at ‘end-of-line’

TYPICAL USE CASES

Situation

End-of-line test-bench automation failures
(test bench #1, assembly)

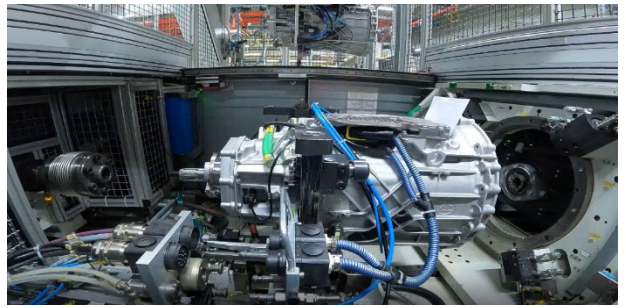
At the core

- The bottleneck was in the test bay
- Influence on OEE (Overall Equipment Effectiveness) of assembly and test bay

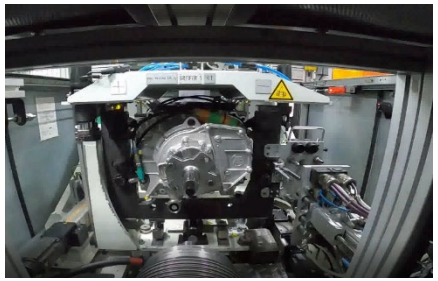
Approach

Video analysis of event observations with visual analysis of automation processes

Camera 1:



Camera 2:



Camera 3:

Result

Video material captured **5 malfunctions** and generated documentation of incident sequences, alongside information on **potential causes and influencing factors** for the issues.

Continuous improvement

- using short repeat sequences, optimizing processes,
- and retaining cost-effective equipment for incident reduction and process enhancement.

OEE + 15%-p

n/a

With video analysis, even machines that are susceptible to faults can be analyzed

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REAL RESULTS, TOGETHER

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