

Photonics4MedTech – Manufacturing & Smart Assembly2026

Intelligent Solutions for Low- and Medium-Volume Laser
Welding: Limitations and Future Needs

10 September 2026

MPS Microsystems

Rafaël Tobler

Table of contents

Contents:

- MPS field of activities
- History use of laser welding
- Low volume challenges
- Solution
- Future needs
- Conclusion

MPS Microsystems

- Innovative mechanical developments for high-end products in various fields



— Linear systems



— Optics & photonics



— Science

Medical



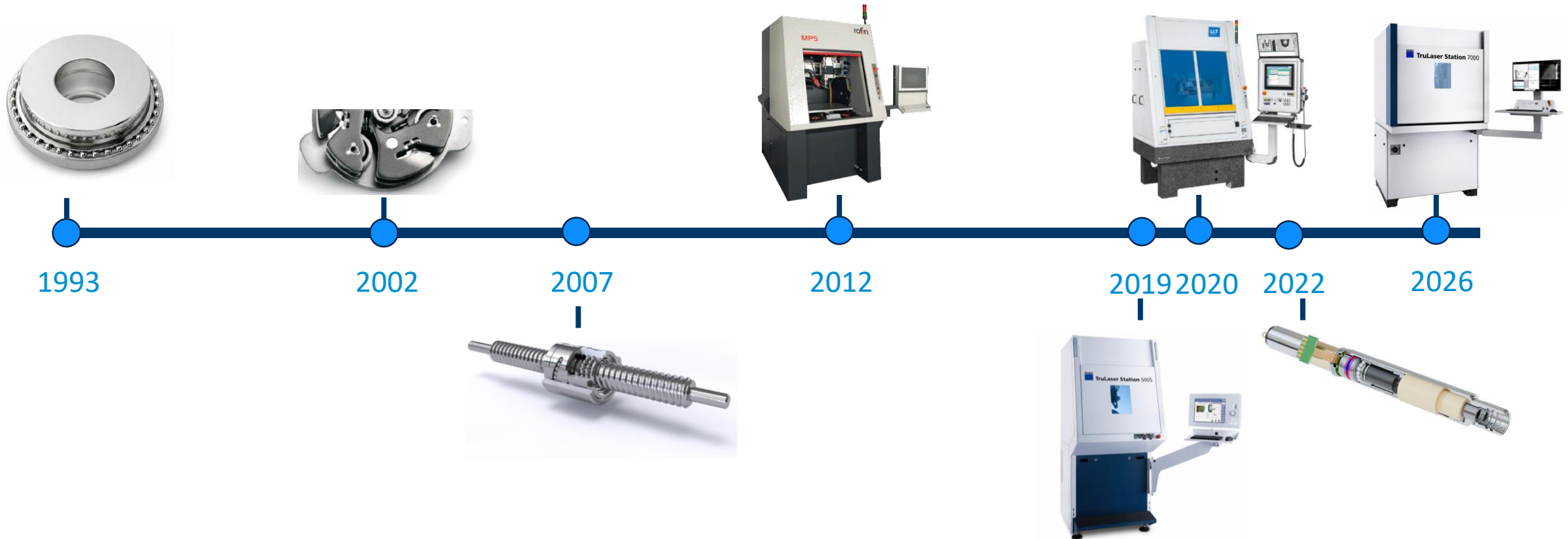
Aerospace & defense



Semiconductor

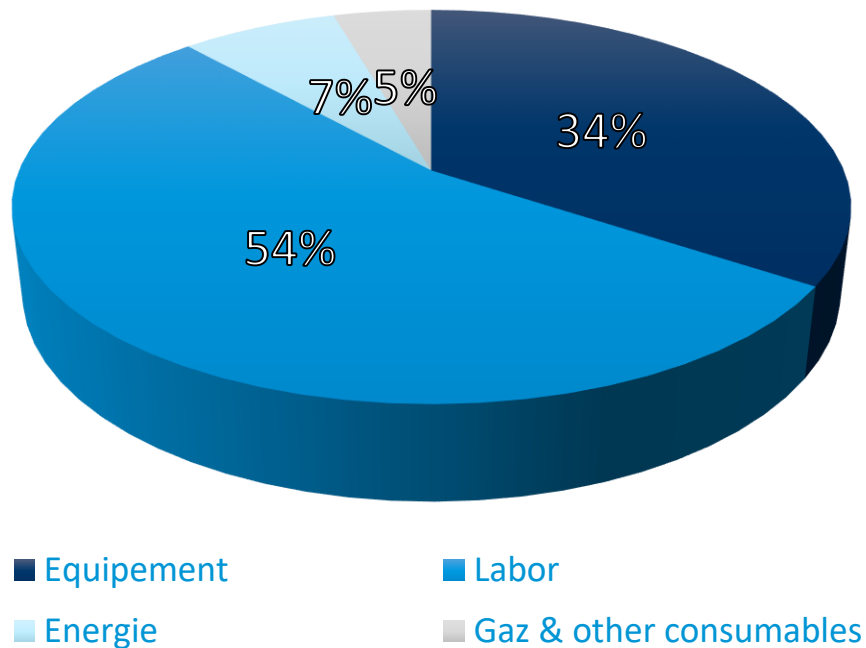


Historic needs for laser Welding



What are the costs in low volumes

Standard cost repartition



Main Triggers

- Volumes
- Welding strategy
- Cycle time per part
- Positioning
- Security

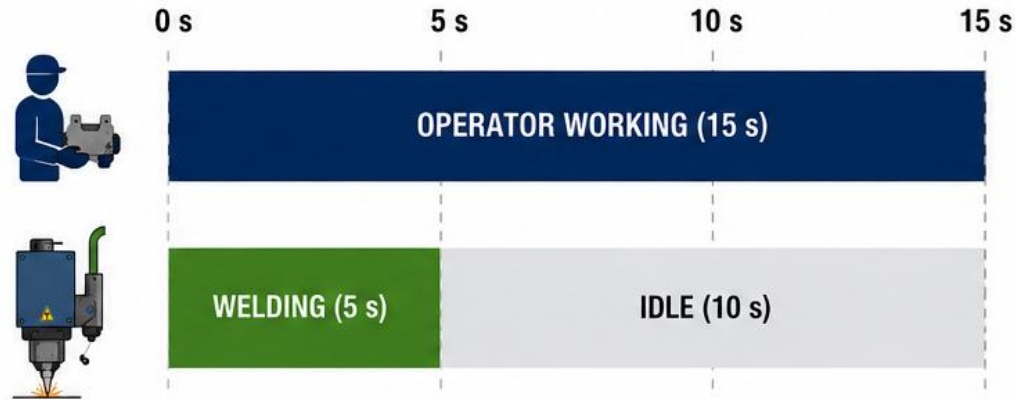
Costs are linked to production time per part

What is the bottleneck

CASE 1

OPERATOR BOTTLENECK

Operator time
> Machine cycle time



OPERATOR BOTTLENECK

Operator takes longer
than the machine cycle.
Machine waits.

CASE 2

MACHINE BOTTLENECK

Operator time
< Machine cycle time



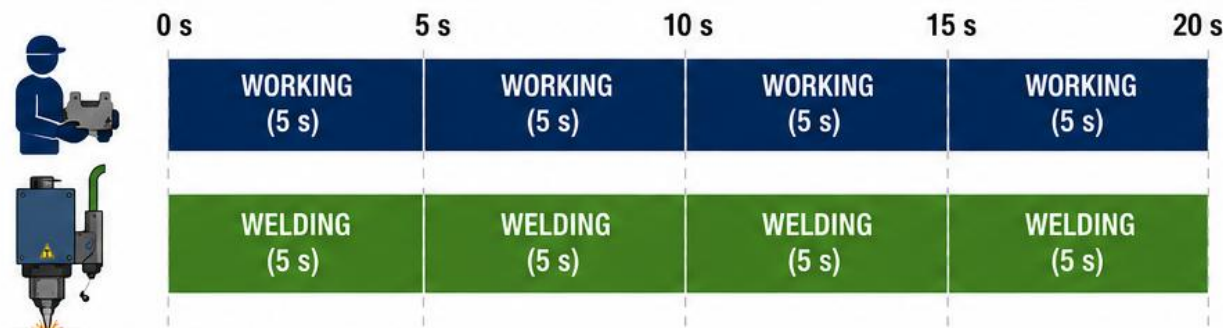
MACHINE BOTTLENECK

Machine cycle is longer
than the operator task.
Operator waits.

CASE 3

BALANCED

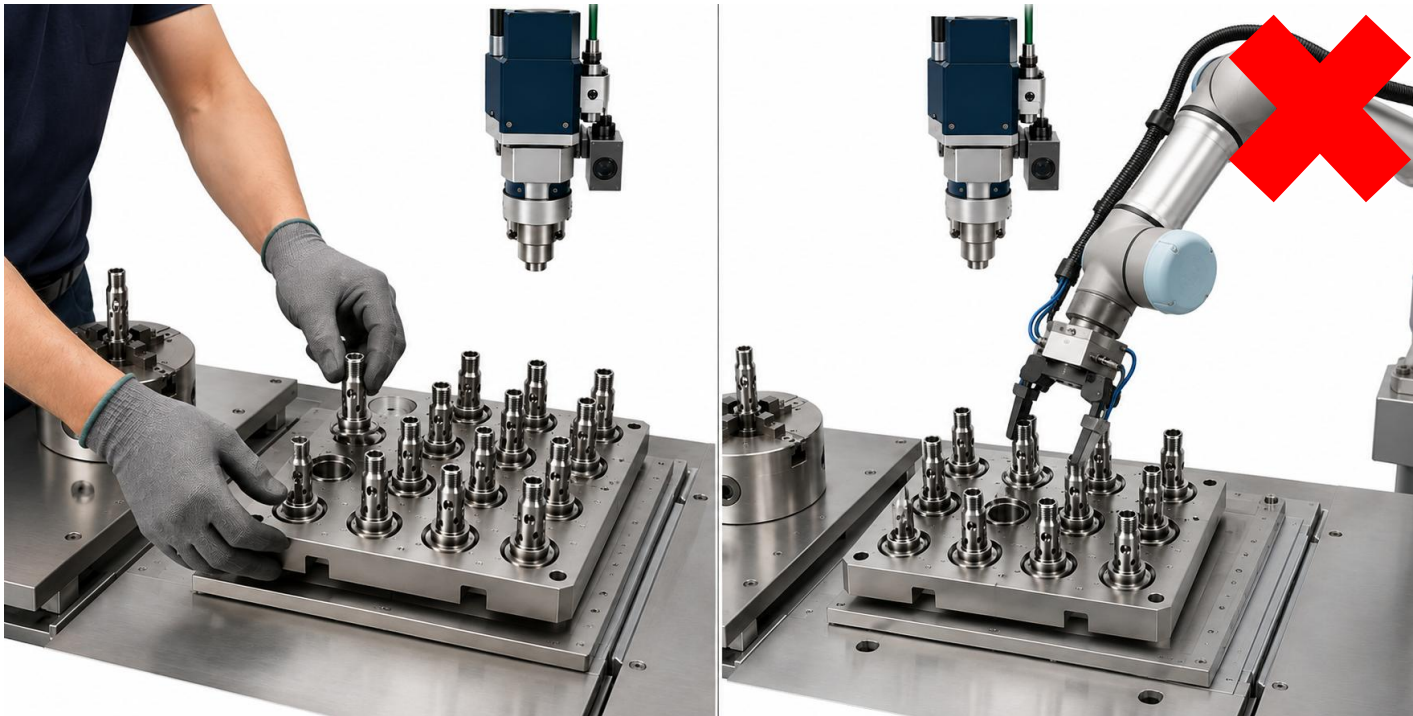
Operator time
≈ Machine cycle time



BALANCED

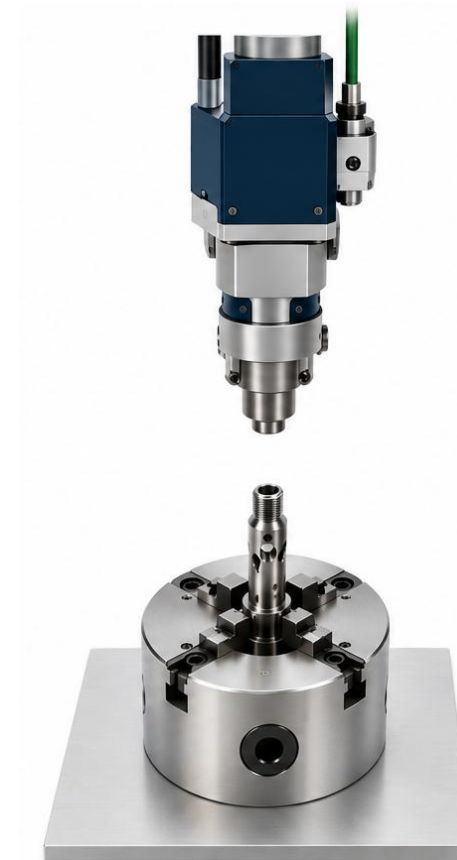
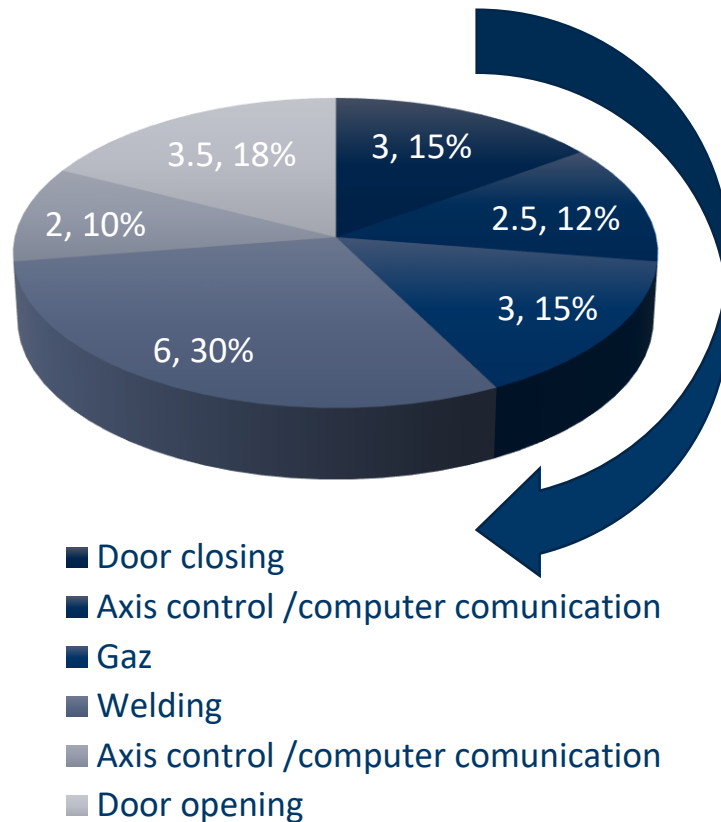
Operator and machine
times are aligned.
Minimal waiting.

Evolution of welding strategies

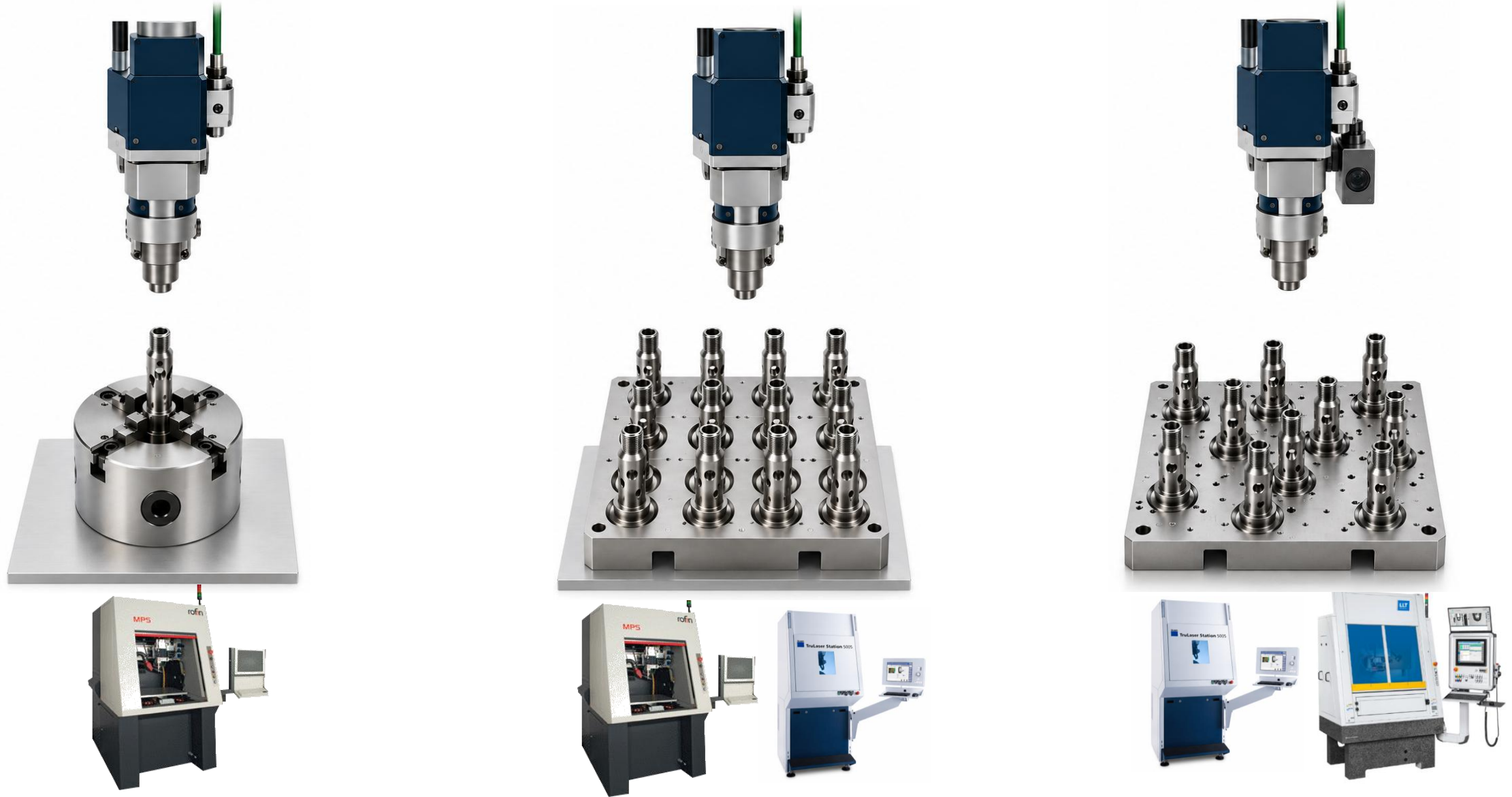


Evolution of welding strategies

Process steps and associated time (s)
MPS nut welding in housing on Rofin



Evolution of welding strategies

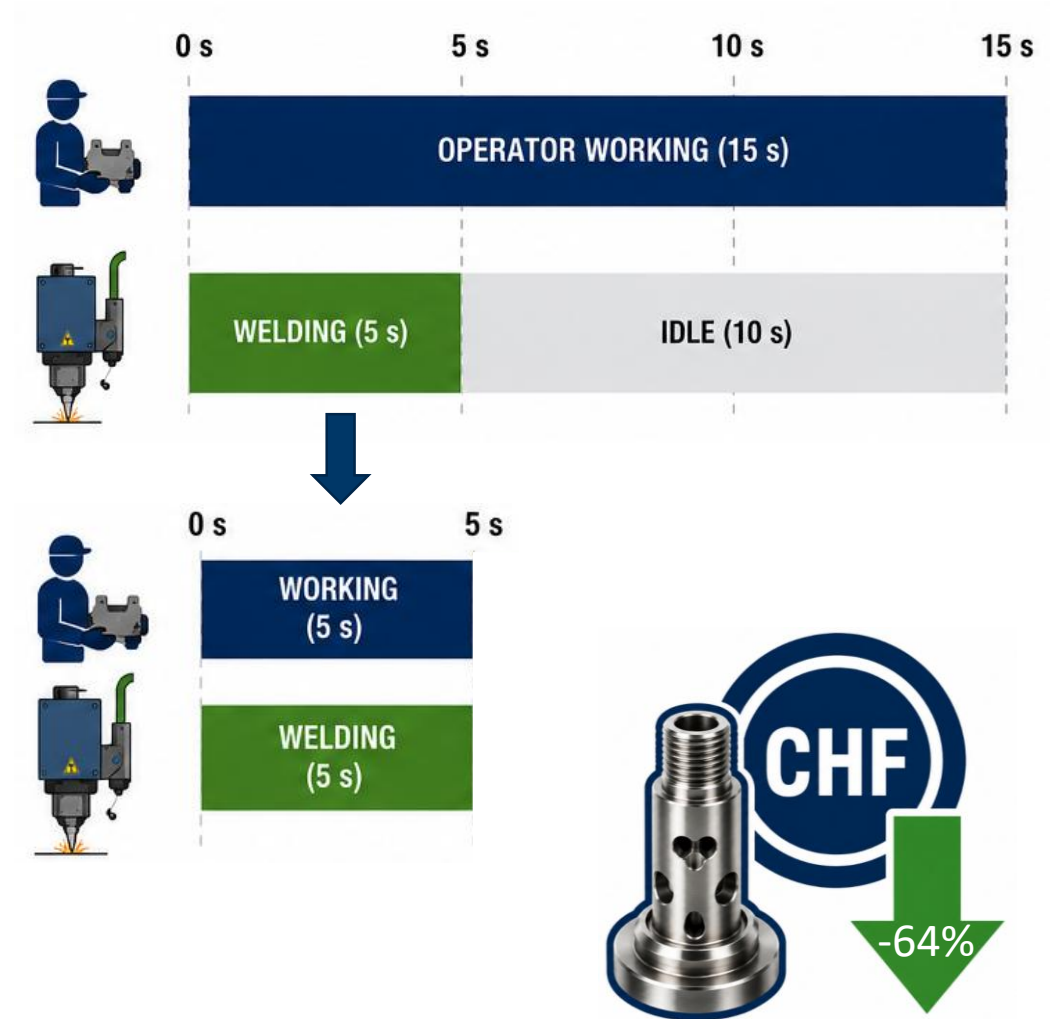


Improvements Case 1



Changes

- From single to multiple parts jigs
- Work area Optimization
- Tooling strategy
- Transfer activities to the equipment

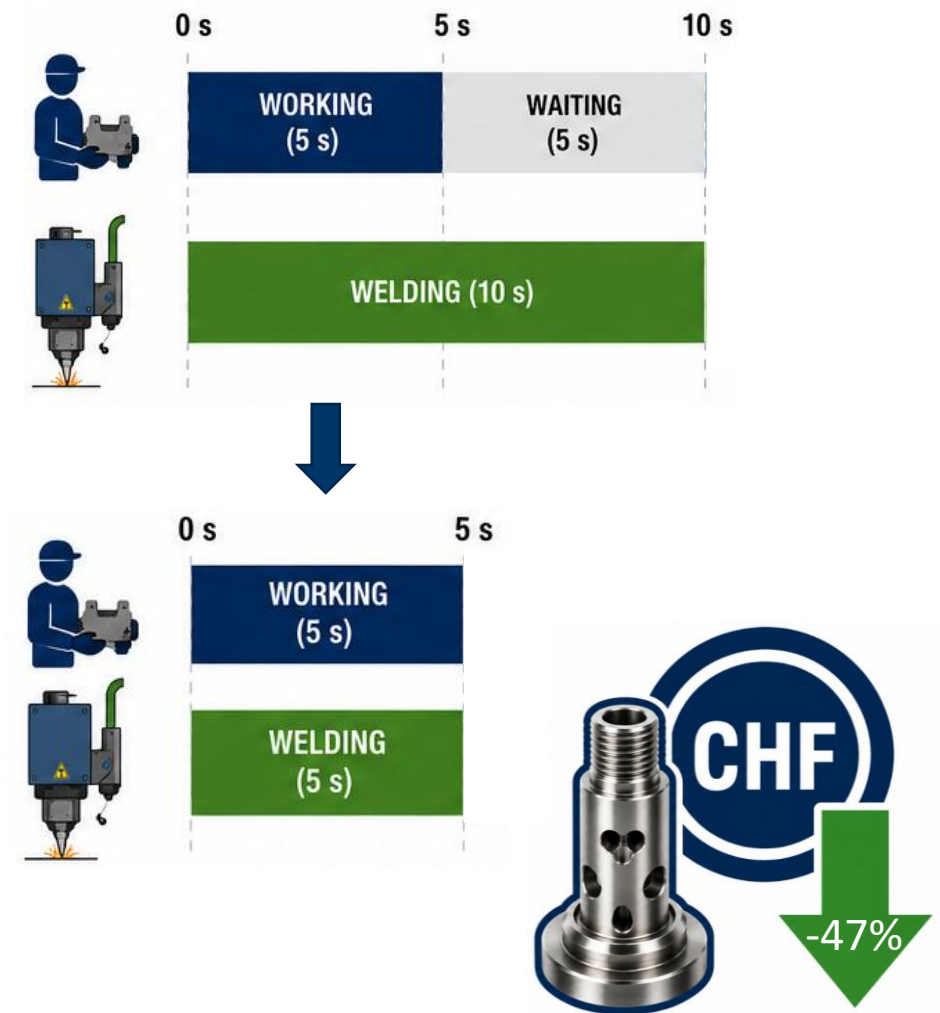


Improvements Case 2

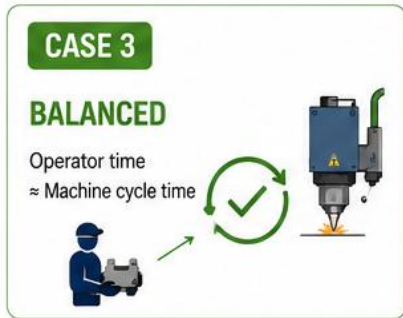


Changes

- From single to multiple jig part
- Equipment change -> more axis / type of



Improvements Case 3

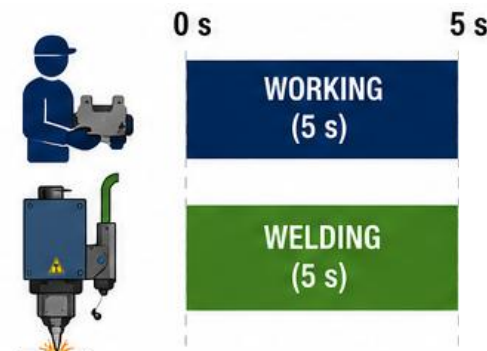
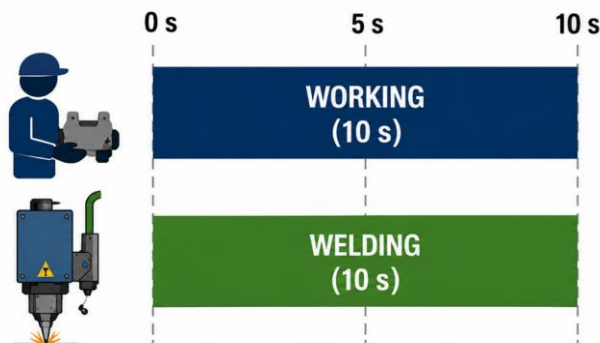


Triggers

- Volumes
- Equipment availability

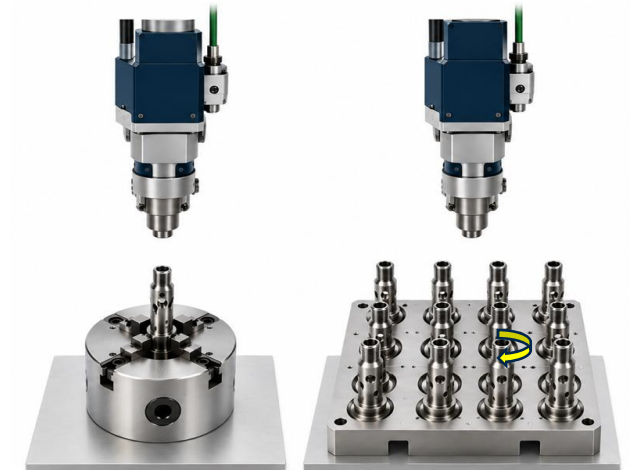
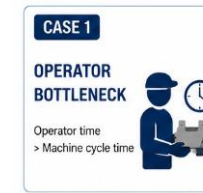
Changes

- From single to multiple
- Tooling strategy
- Welding change / optimization
- Transfer activities to the equipment



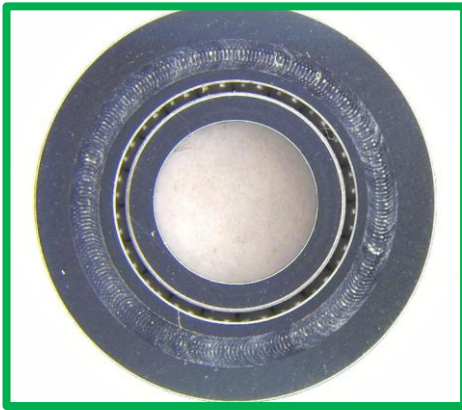
Solutions that will be implemented

- Vision combined with AI in laser welding

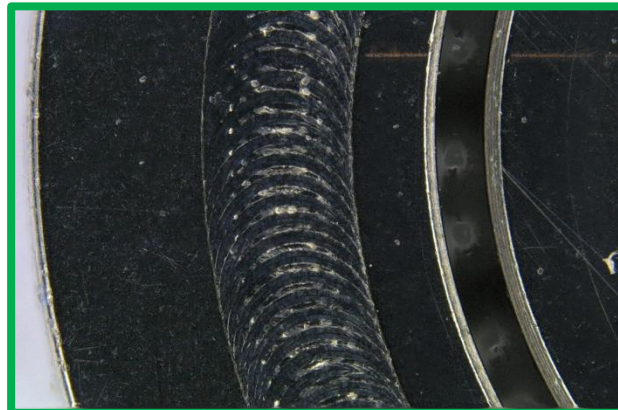


Future needs

In process Visual inspection



11 mm



1 mm

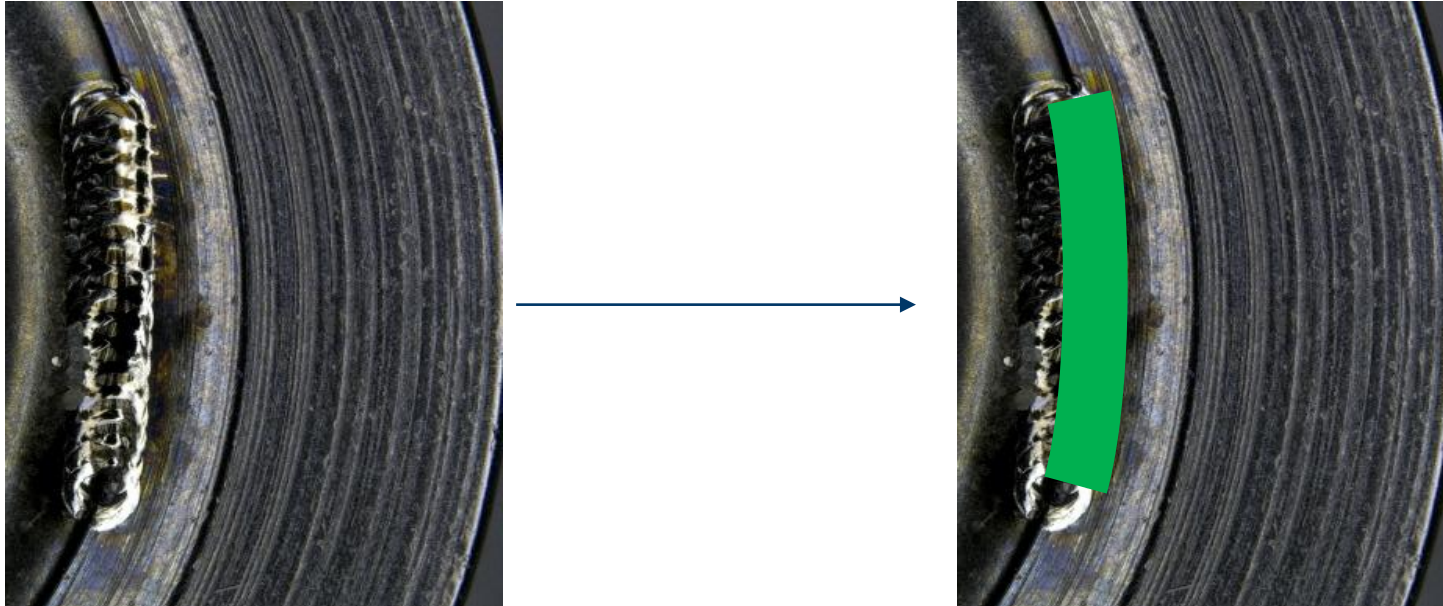


2 mm



Future needs

Adaptive Trajectory learning



Intelligent Solutions for Low- and Medium-Volume Laser Welding: Limitations and Future Needs

Conclusion

- In low volumes improvements are mainly possible on welding strategy and tooling,
- Robotic is not an option due to diversity of products
- Change of equipment's can be a game changer, vision, AI
- Future needs, in inspection & smart decisions

Intelligent Solutions for Low- and Medium-Volume Laser Welding: Limitations and Future Needs

Thank you for your attention