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Modern Workholding - Workholding stabilization and non-traditional fixturing for machining, welding and other processes.

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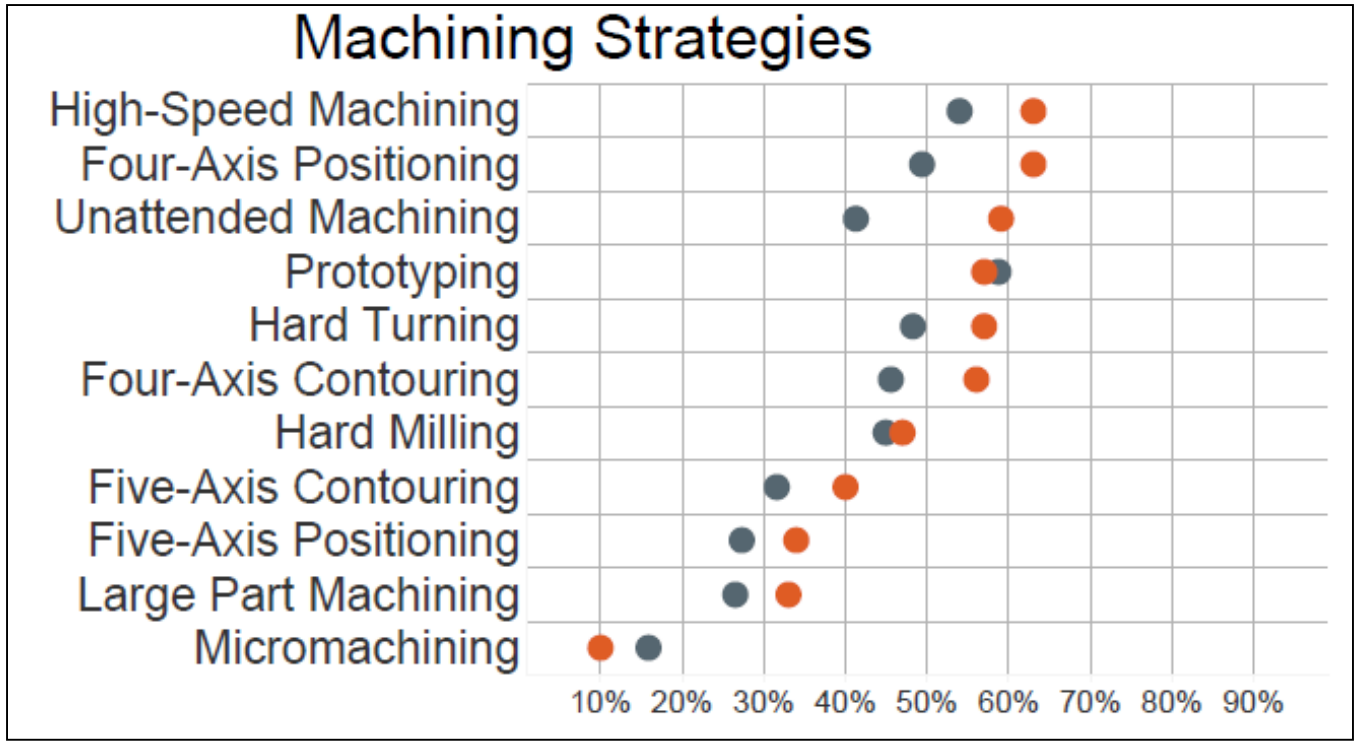
Abstract

In today’s marketplace where part mix is high and volumes are low, the ability for a shop to thrive requires flexibility with the ability to change at a moment’s notice, all while maintaining high part quality. Fixturing requirements are becoming more complex as workpiece complexity is increasing. We will look at how parts that have traditionally posed workholding challenges are being held rigidly and securely with modern-day solutions.

What has been driving this need for flexibility?

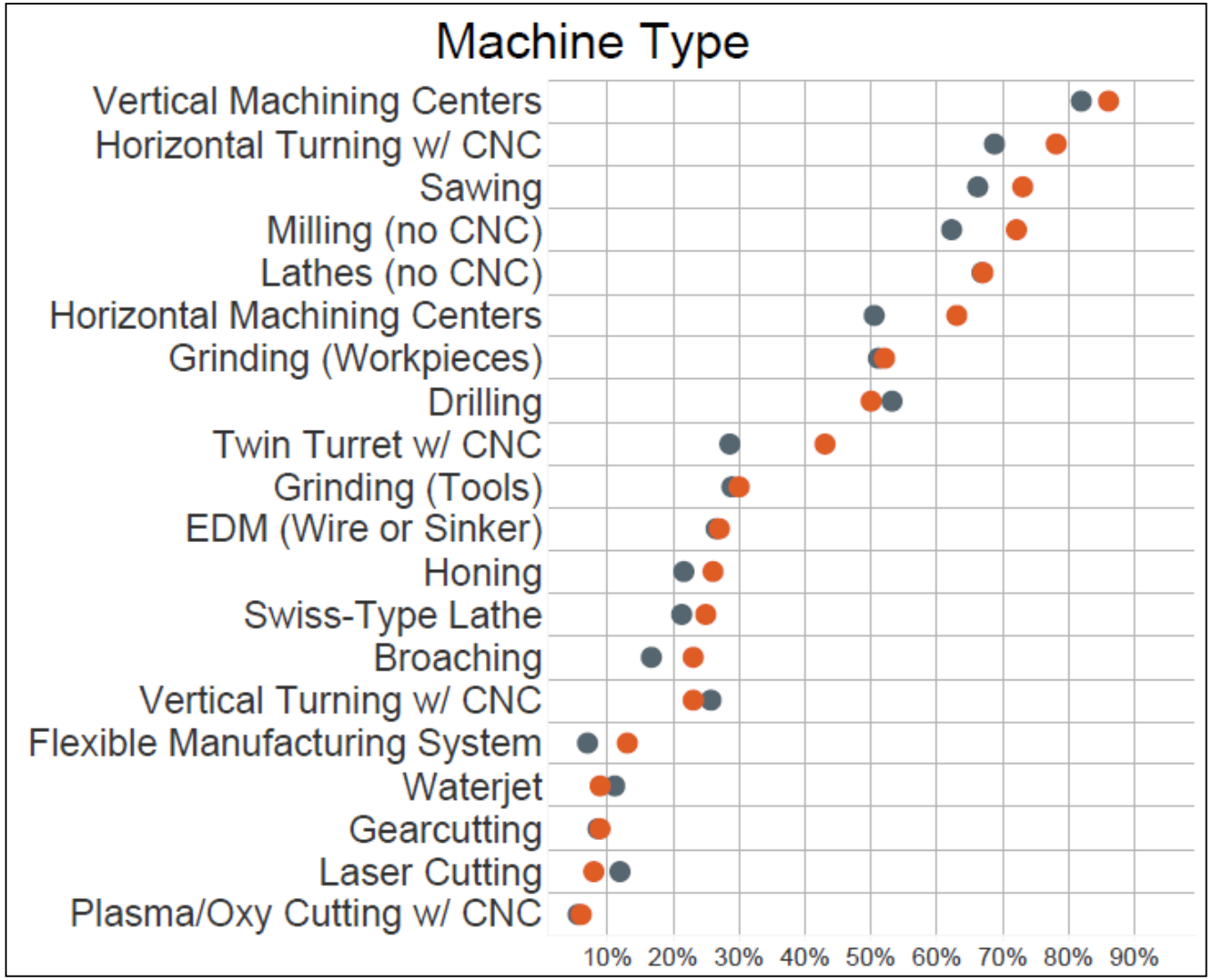
1. New Machining Strategies
2. New Machine Types
3. New Workholding Technology



Gardner Intelligence, Top Shops Survey 2018

TOP SHOPS

OTHER SHOPS



Gardner Intelligence, Top Shops Survey 2018

TOP SHOPS OTHER SHOPS


15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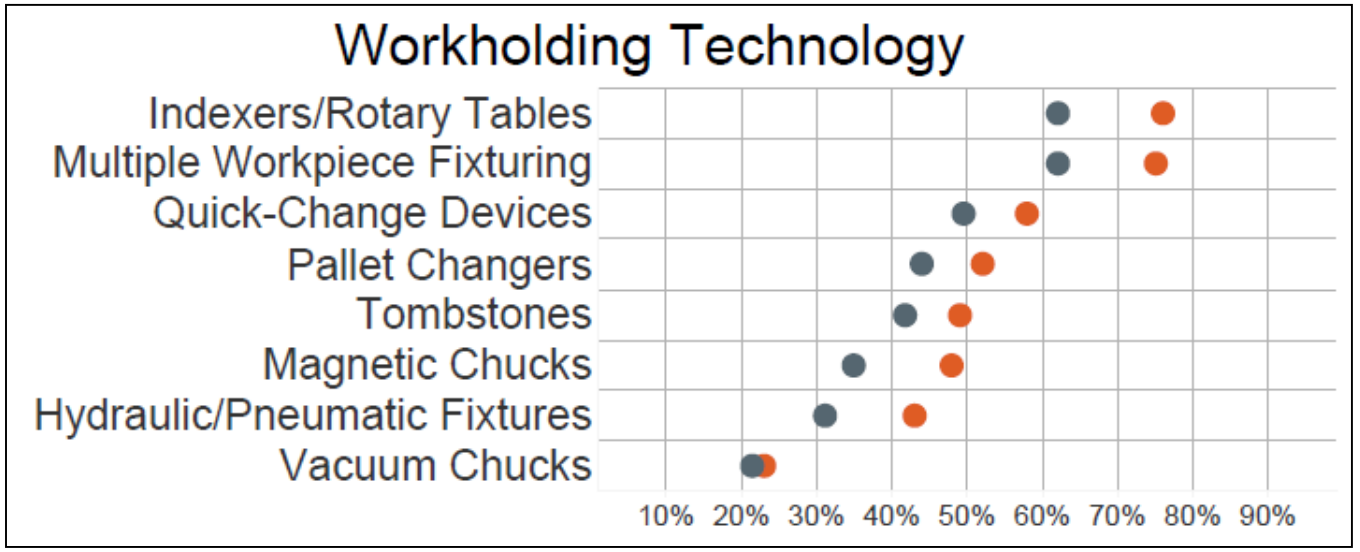

Gardner Intelligence, Top Shops Survey 2018

"The use of different workholding technology at Top Shops, particularly indexers/rotary tables and multi-workpiece fixturing, fits right in with the above story. Also of note, having a pallet changer is significantly correlated with being in the top quartile of profit margin for all shops for the last six or seven years of the survey."

Steve Kline
Chief Data Officer
Gardner Intelligence

TOP SHOPS OTHER SHOPS

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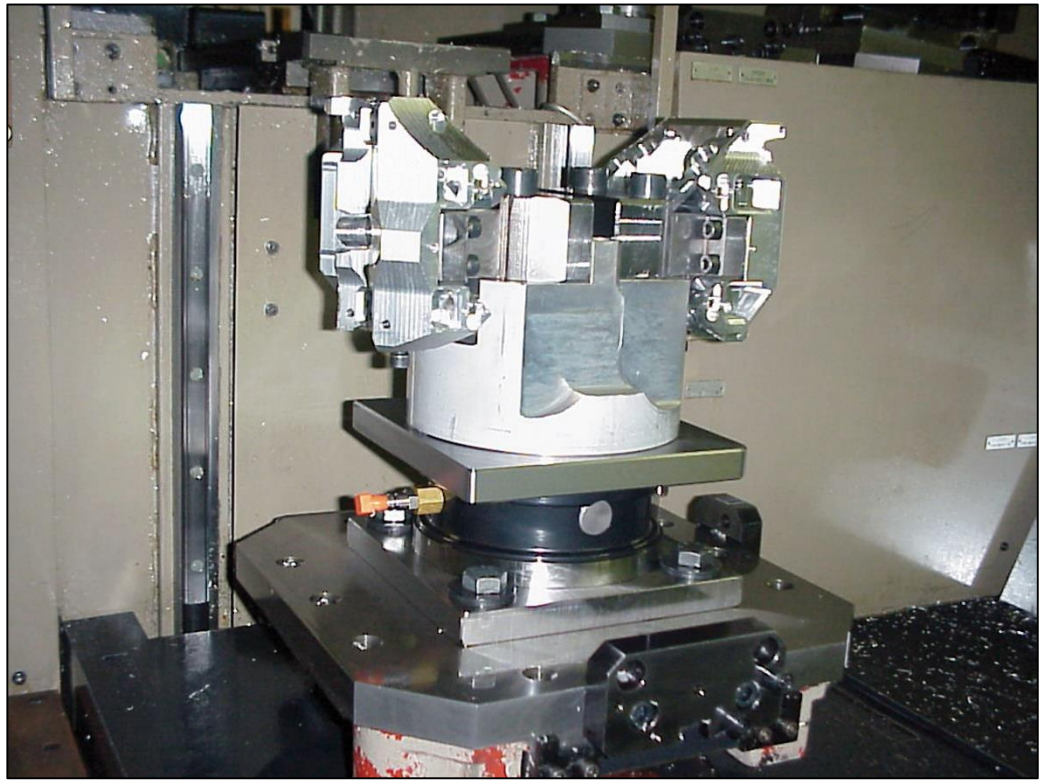

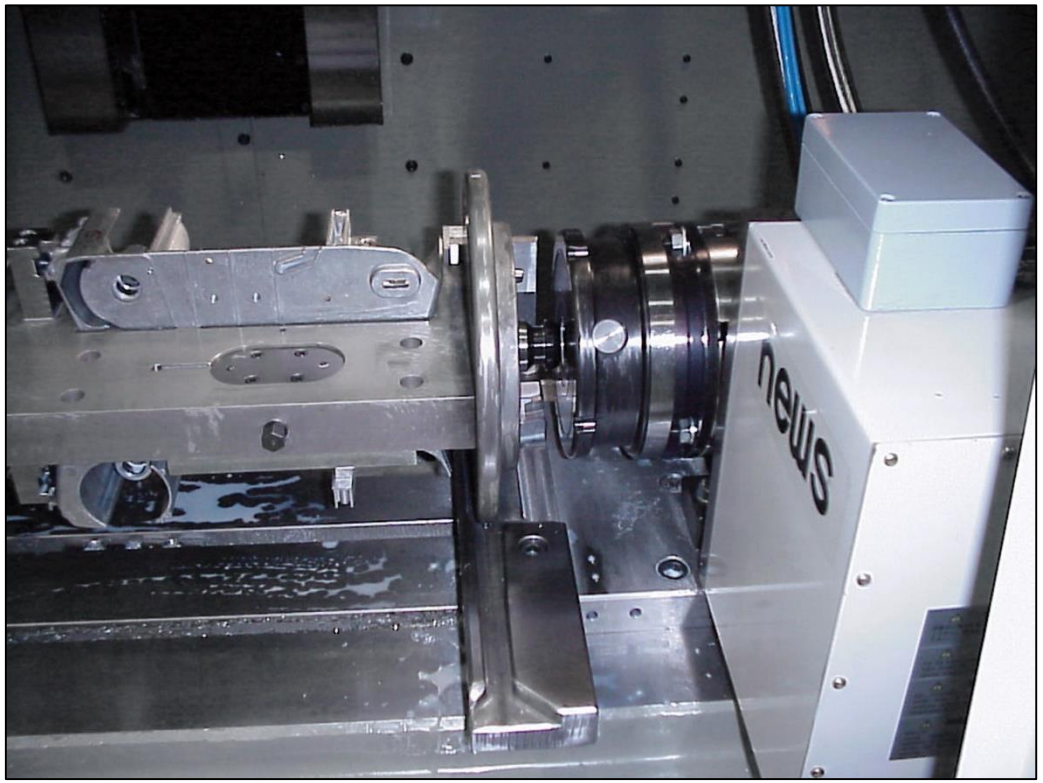

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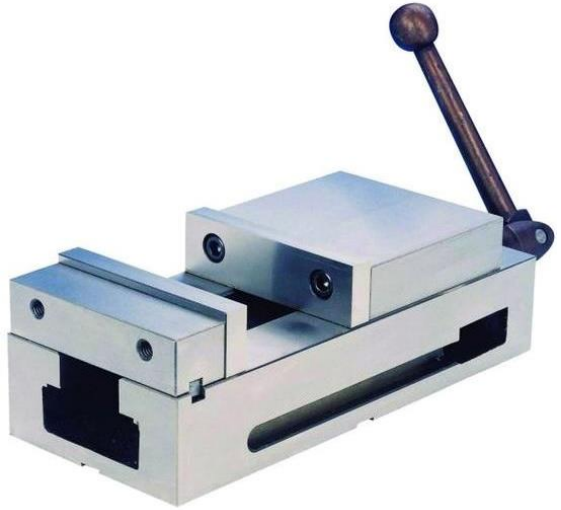
When do I need to start looking at alternative fixtures?

Standard Vise



PROS:

- ✓ Tried and True
- ✓ Easy starting off point for most parts in the raw or cast form
- ✓ Flexible
- ✓ Pneumatic/hydraulic options with clamping pressure regulation
- ✓ Soft jaw options
- ✓ Fast changeover between part batches
- ✓ Cheap
- ✓ Great for one-off parts or prototypes
- ✓ Multi-position and self-centering types

CONS:

- Point of diminishing returns where operators can only load so many parts at a time and at a certain rate
- Operator variations in speed and repeatability of loading
- Generally not intended to be moved due to weight or lack of ease in setup
- Secondary operation setups can be cumbersome for certain part shapes and part surfaces
- Consume machine travel and volume

Palletized Systems

PROS:

- ✓ Allows for higher part density
- ✓ Can still be starting off point for most parts in the raw form
- ✓ Can be setup for Secondary operation or other operational steps
- ✓ Generally intended to be removed and swapped with other pallets
- ✓ Faster change over between batches of parts
- ✓ Can reduce the number of tool changes
- ✓ Lighter

CONS:

- Decreased rigidity
- Operator variable only in terms of speed of swapping parts
- ROI can take longer to recoup if the production volume is not high enough
- Can take up more machine travel and volume due to stacking

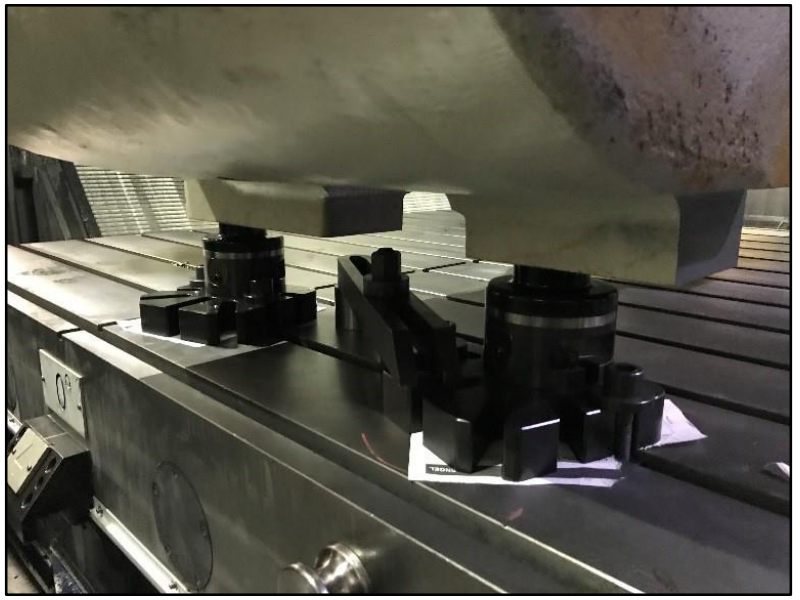
Directly mount to table

PROS:

- ✓ Most stabile or rigid
- ✓ Allows for max machine travel and volume
- ✓ Generally only needed for large parts that cannot be fixtured
- ✓ No fixture costs
- ✓ Most economical for prototype or one-off parts

CONS:

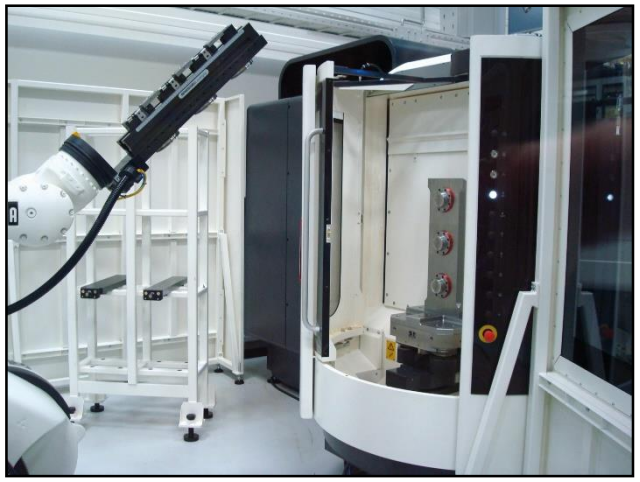
- Cannot perform operations that go all the way through the part
- Operator variable
  - They can put the part anywhere on the table
- Fixture costs are offset by labor costs due to setup time
- May cause a bottleneck in production



Automated Systems

PROS:

- ✓ No operator variability or human speed limitation
- ✓ Highly repeatable
- ✓ Allows for unattended machining as well as overnight production
- ✓ High throughput capability
- ✓ Requires few personnel to operate
- ✓ Frees up personnel to other tasks



CONS:

- Higher start-up costs
- ROI can take longer to recoup if the production volume is not high enough
- System dependent on part consistency or fixture consistency
  - In some cases it has a lower flexibility

BIG KAISER Application Examples

1) Modular welding application
2) Stabilizer application
3) Laser deposition, machining and measuring application

1) Modular Welding Application

Customer: Manufacturer of height adjustable office desks and hospital beds

Problem: Wasting time resetting fixtures between batches of parts

Cause: Multiple bolts needed to be loosened and retightened and then “touching up the points” when fixtures where changed

Solution: Use modular fixture plates with a zero-point retention clamping system

Time Study (Old Method)

6 bolts per fixture @ 10-15 secs per bolt to undo the fixture	1-1.5min
1 min to pick up & set down old fixture on a transport cart	2-2.5min
2-5 min clean the base	4-7.5 min
1 min to pick up new fixture and set it down on the base	5-8.5 min
6 bolts per fixture @ 10-15 secs per bolt down the fixture	6-10 min
4 fixtures per setup	24-40 min
30-45 min “point touch up”	54-84 min
2-3 batches per week	108-252 min
5 weld cells	540-1260 min or 9-21 hours

Time Study (New Method using modular fixtures)

~~6 bolts per fixture @ 10-15 secs per bolt to undo the fixture~~	0
~~1 min~~ 30 sec to pick up & set down old fixture on a transport cart	30 sec
~~2-5 min clean the base~~ 1 min to clean the top face of the chucks	1.5 min
~~1 min~~ 30 sec to pick up new fixture and set it down on the base	2 min
~~6 bolts per fixture @ 10-15 secs per bolt down the fixture~~	0
4 fixtures per setup	8 min
~~30-45 min "point touch up"~~	0
2-3 batches per week	16-24 min
5 weld cells	80-150 min or 1.3-2 hours

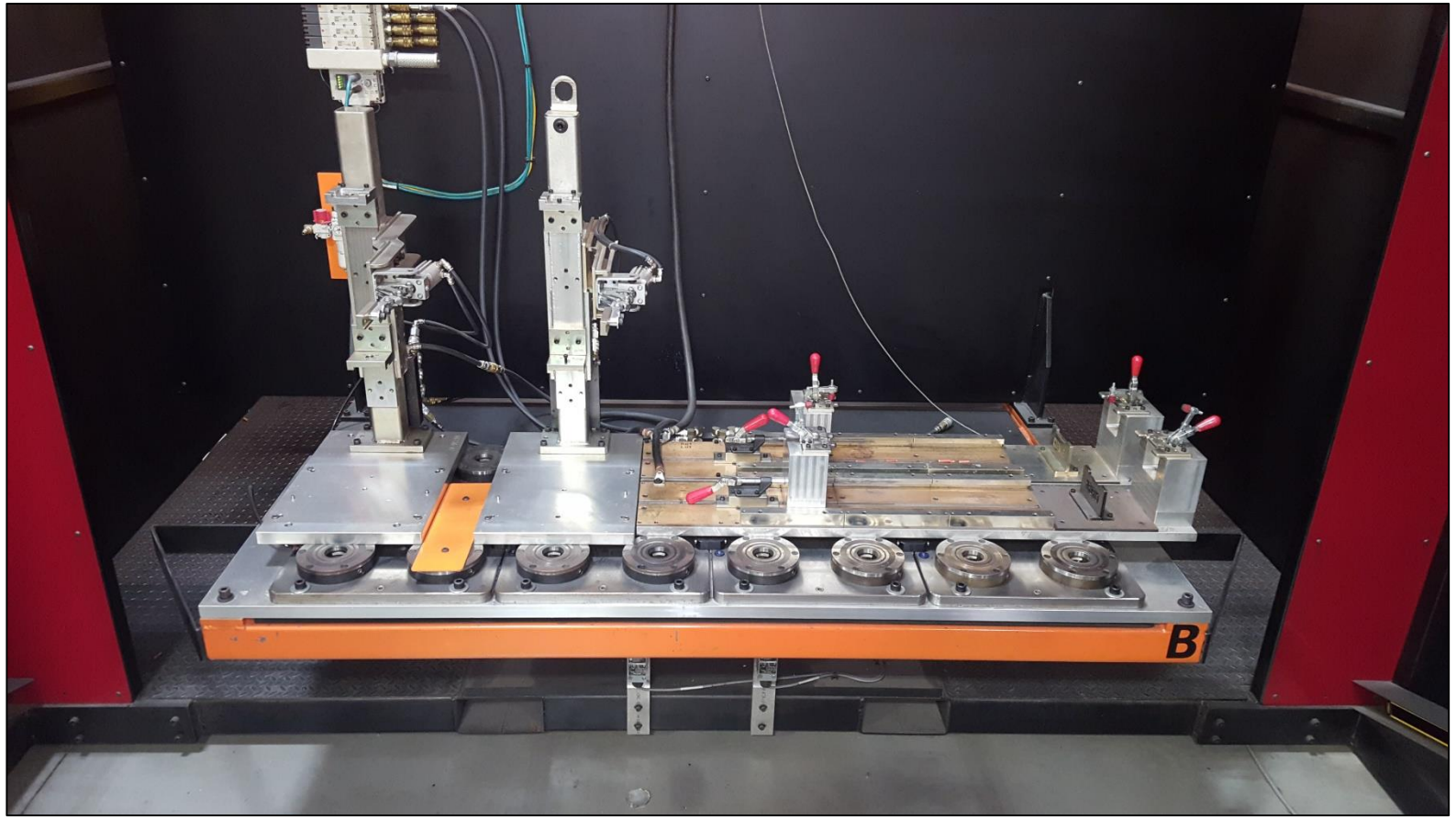


Image curtesy of: OMT VEHAL, Grand Rapids, MI

2) Stabilizer-Based Application Examples

Customer: Large-part job shop serving multiple industries

Problem: Wasting time resetting fixtures between machining large parts and/or weldments

Cause: Current support system was time-consuming to setup or part was not compatible

Solution: Use a new system that was faster and could be adjusted or reconfigured without modifications

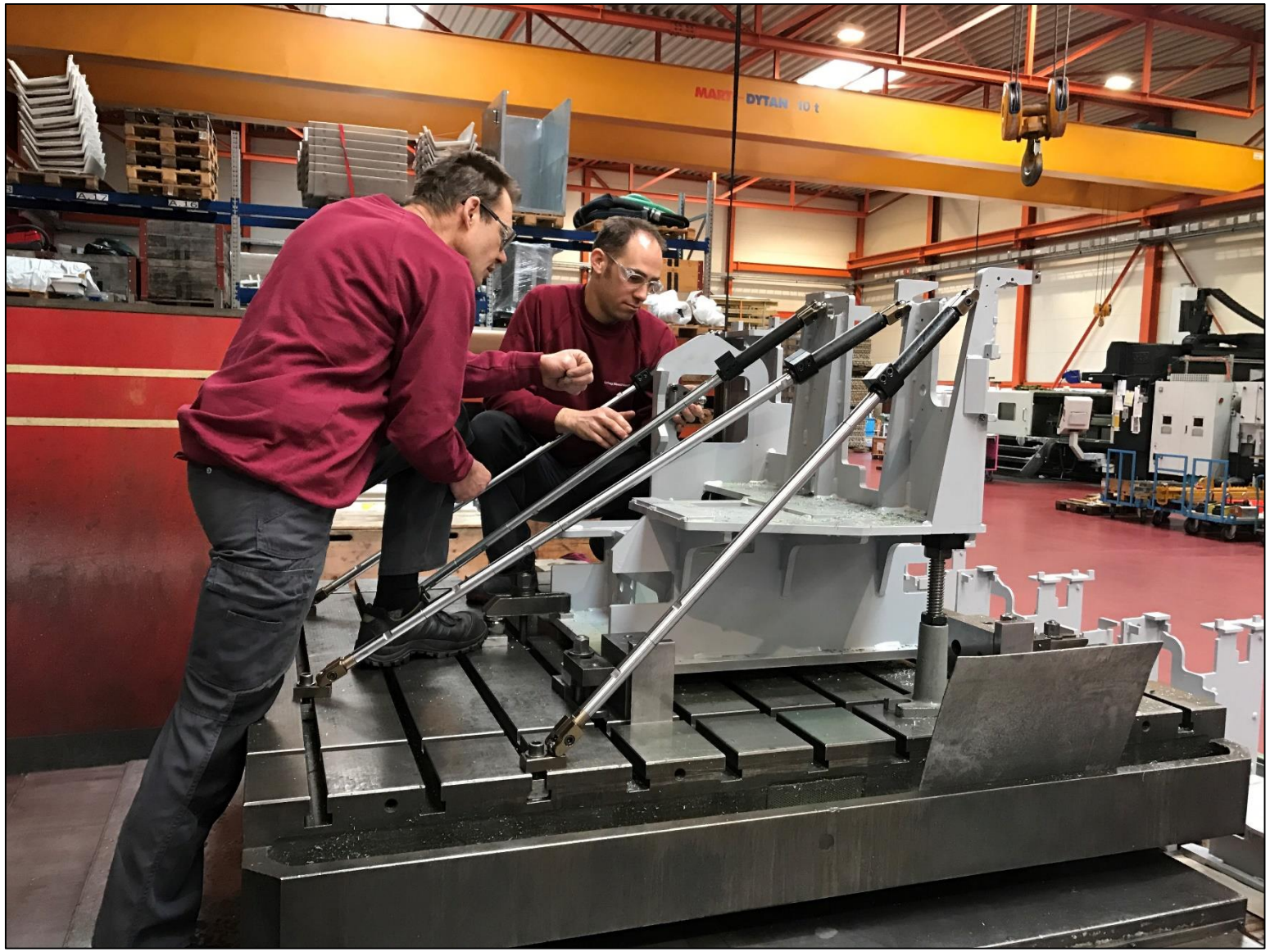


Image courtesy of: Innotool-Austria, Altach, Austria

Image courtesy of: Innotool-Austria, Altach, Austria

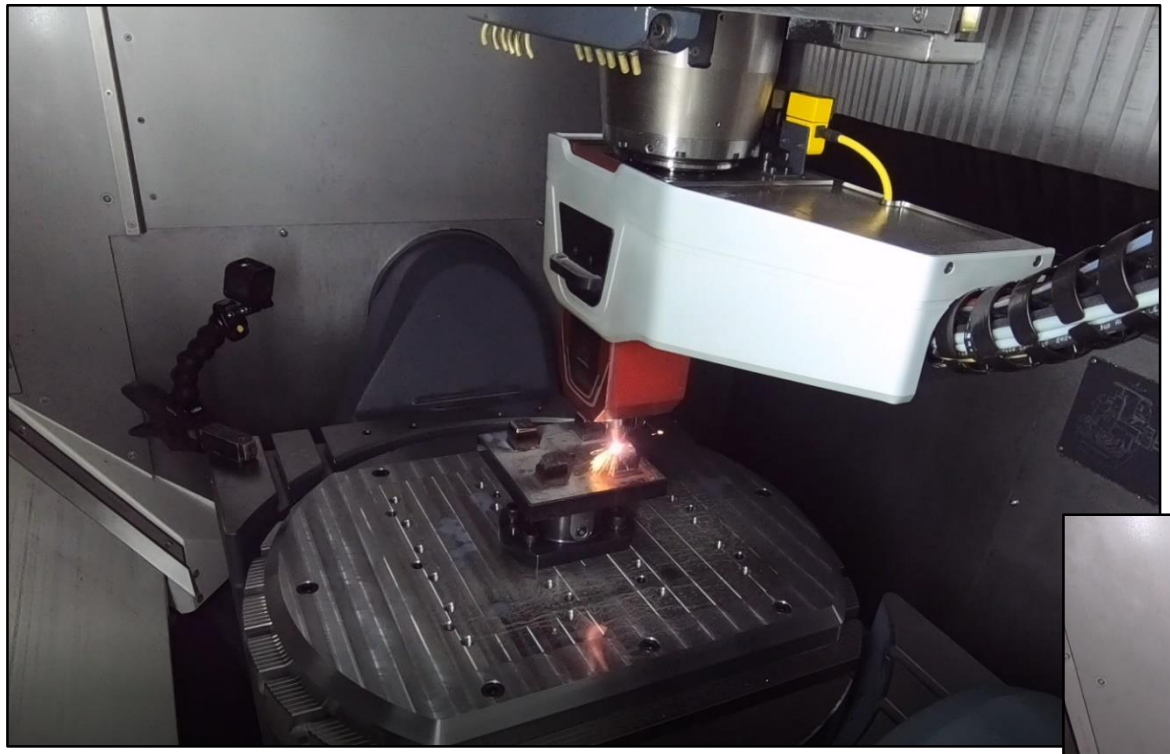
3) Laser deposition, machining and measuring application

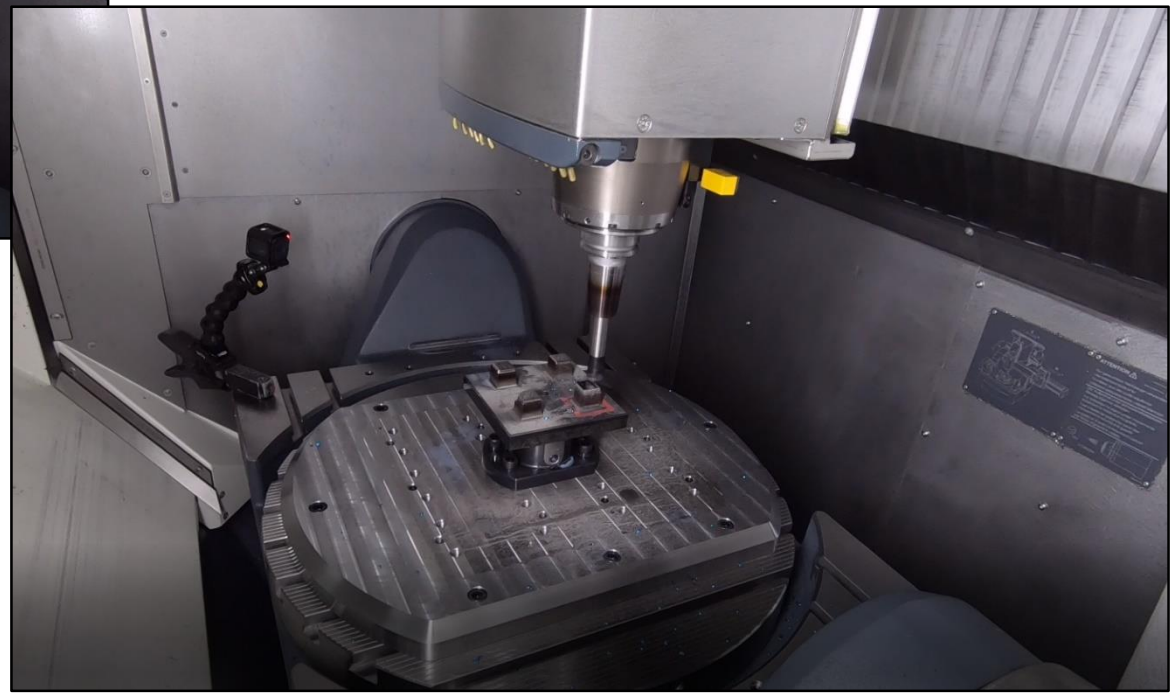
Customer: Automotive die shop

Problem: Wasting time resetting fixtures in the machining center and CMM

Cause: Fixtures in the machine where different than the ones at CMM

Solution: Use same fixture at all locations





Images curtesy of: Toyota Bodine Aluminum, Jackson, TN

Thank you!

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