



**Manufacturing
Technology, Inc.**

MTIwelding.com

DOUBLE ENDED AXLE MACHINE

Increase axle production quality, cycle time, and capacity with a single rotary friction welder built to meet drive and trailer axle requirements. Automate a manual or update an automated workcell with the latest in rotary friction technology. Whatever the axle demands, MTI can deliver.

IS INCREASING AXLE DEMAND...

Out-pacing your manually loaded, single-end, axle welder's capability?

Straining your scheduling because of long tooling change-overs?

Overloading current cycle times, resulting in low production numbers?

Forcing an upgrade to your workcell?

MTI incorporated its years of axle machine experience into our newest axle machine that meets drive and trailer axle industry standards for:

- Length
- Min-max diameter sizes
- Axle spindle length
- Axle tube wall thickness

Now, you can match your industry's demand on capability and capacity.

Because the axle machine is fully automated, you can eliminate slow, manual part load and unloading operations that impact your cycle time. Our twin spindle design improves capacity by welding a complete axle in one cycle, thus saving you time.

Your axle production capability will also improve because our new quick-change part contact tooling design, whether in drive or trailer axle production, runs on the same machine with a minimum

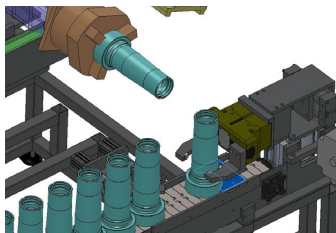
amount of tooling change-out downtime. Now, you can schedule different axle production runs on one machine, eliminating the need to juggle schedules across multiple, single-weld machines.

Plus, depending on the application, you'll now have the ability to produce finished axles, which is what your axle customer expects. These key machine features help deliver finished part accuracy:

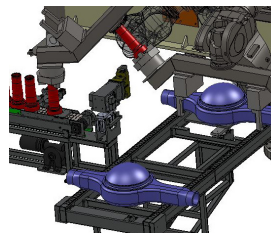
- Auto-length adjustment capability is achieved through a backstop position stored with each part number program.
- Independent mandrel clamping controls improve individual clamp functionality and pressures to minimize housing distortion and to meet or exceed industry standards.
- Improved spindle positional control of our industry leading orientation controls package increases spindle positioning accuracy across the dual spindles, which improves part to part orientation for improved finished part tolerances.

The sleek design of our manual, double ended axle machine is workcell-ready for the addition of a robot or overhead gantry, putting you in business to take on more orders.

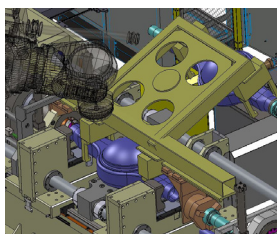
And as if all of that wasn't enough, you'll get the built-in dependability and longevity that comes with every friction welder we ship. Since 1926, MTI's experience in developing, building, and servicing in excess of 800 machines across six continents, means you can expect to see our know-how shine through at every turn of a wrench, press of a button, and maintenance check we perform.



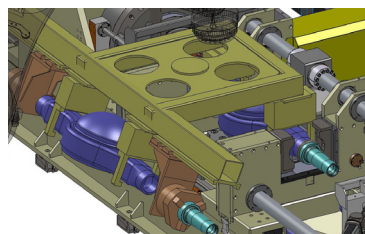
From robotic part pick-up...



to robotic input conveyor feed...



to robotic part load into welder...



through welded part robotic unload, there's...

AUTOMATION AT EVERY TURN

— AT A GLANCE —

YOUR AXLE MACHINE'S CAPABILITIES					
AXLE STYLE	MANUAL	AUTOMATED			NEED VARIABLE LENGTH?
	STANDARD	ROBOT	GANTRY	BOTH	
Drive	✓	✓	✓	✓	✓
Trailer	✓	✓	✓	✓	✓
You got it. Any way you want it.					

MTI's latest double ended direct drive rotary friction welding axle machine specifically targeted for today's modern, sophisticated automotive and trucking industry axle production facility helps you Bring It All Together through MTI Ingenuity.

Let us automate one for you today.



PUSHING THE BOUNDARIES OF METAL FORGING AND MACHINING TO MEET YOUR NEEDS.

LET'S GET TECHNICAL

Here are the basic facts on MTI's latest double ended axle rotary friction welding machine:

As the leaders in friction welding, we apply our knowledge of technologies to the right application. That's why we use Direct Drive Friction Welding (DDFW).

- Direct Drive technology is recognized as the axle industry standard over the years.
- Fully synchronized control, which ensures reactive forge forces during the weld.
- The low-profile, in-line High Torque Direct Drive Motor's compatibility with gantry-style automation was chosen, because the AC servo drive motor is directly coupled to the spindle. No pulleys, belts, or external brakes, which means reduced maintenance.
- Improved spindle positional control allows industry-leading orientation control for the positioning of the spindle.
- Direct attachment to the rear of the spindle also benefits you by:
 - No belt
 - 1:1 ratio
 - Low noise
 - Low maintenance
 - The low profile

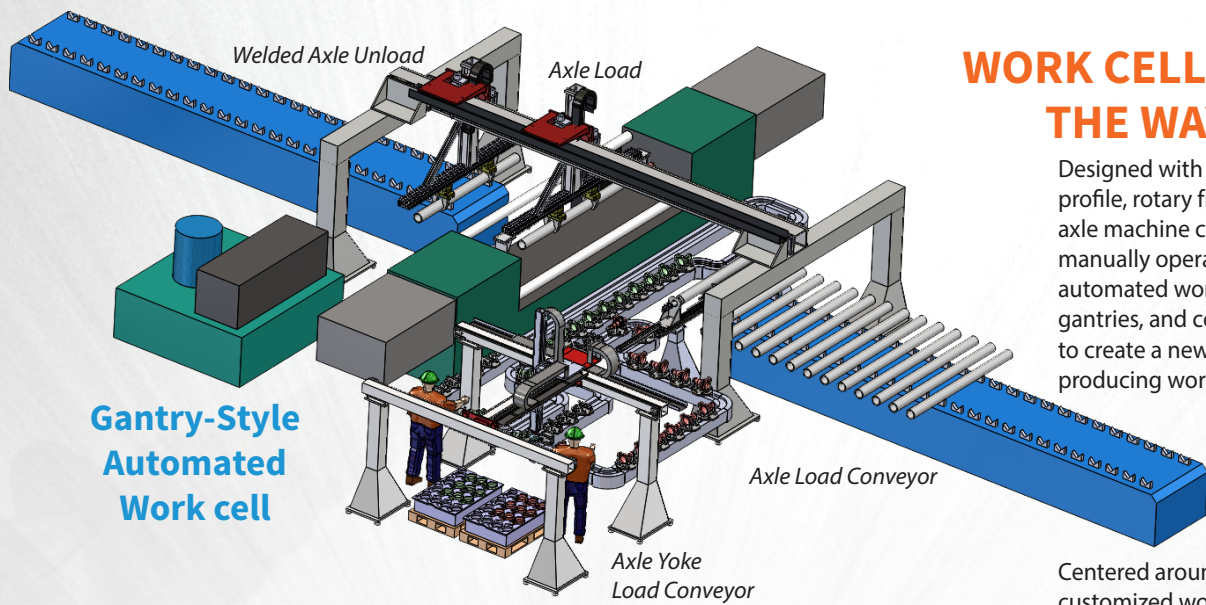
Our double ended direct drive rotary friction axle machines are capable of meeting the axle industry's dimensional specifications for drive and trailer axles, which means no retooling or major changes to existing production runs. With our 80 - 125 Ton designed axle machines, you'll expand your capability to cover the following range of component weld interface variations :

- 900mm - 3500mm axle lengths (1300mm - 3300mm finished)
- 90mm - 180mm axle diameter
- 6mm - 20mm wall thickness

Specifically designed for today's automated workcell looking to increase throughput, improve quality, reduce scrap, and boost their bottom line, MTI's axle machine offers the following features to help them get there:

- Two-piece shear dies and thrust plate separate the shear flash removal wear parts (shear dies and thrust plate) from the non-wearing clamp, resulting in reduced tooling costs and less downtime during part replacement.
- Flash removal system allows flash to move onto a conveyor to prevent marring of parts within the forge area, eliminating potential machine downtime, which keeps your production line running longer.
- Quick change tooling that reduces set-up times between differing part diameters means the machine is back in production mode quicker.
- Automated length adjustment through the software's part program accommodates the complete range of the axle industry's drive and trailer axles. This means software changes to adjust for different part lengths can be made without manual intervention.

Read "The DDFW Process" on the next page for more in-depth DDFW details.



Gantry-Style Automated Work cell

WORK CELL AUTOMATION, THE WAY YOU WANT IT

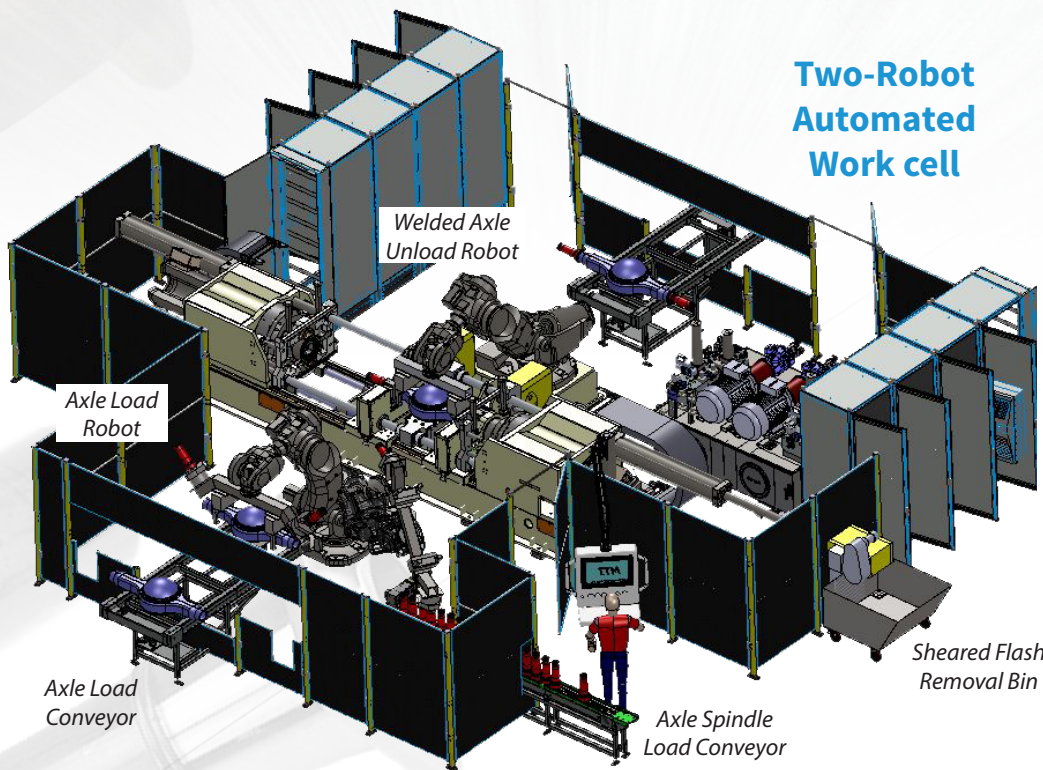
Designed with flexibility in mind, MTI's low-profile, rotary friction welding, double ended axle machine can be adapted as a standalone manually operated machine or as a fully automated work cell. Part handling robots, gantries, and conveyors can be combined to create a new, or enhance an existing, axle producing work cell.

Centered around our axle machine, your customized work cell will meet or exceed your expectations for speed, accuracy, quality, efficiency. You'll also benefit from:

- Cost savings
- Replacing flash shear dies instead of an entire flash shear clamping section
- Operating with fewer man-hours through automation and quick change tooling

Whether you decide to stand alone, refresh existing automation, or start afresh with a fully automated work cell, MTI has the answer to your axle production question.

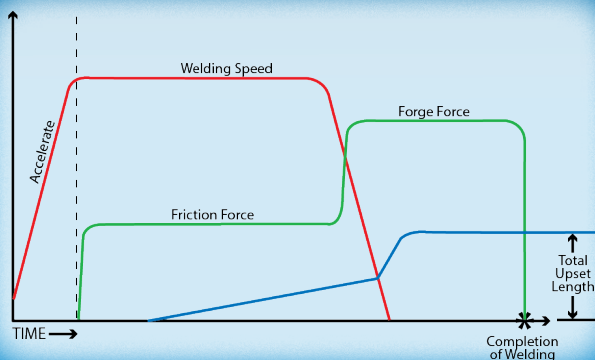
Meeting finished part specifications has just gotten easier.



Two-Robot Automated Work cell

THE DDFW PROCESS

Direct Drive Friction Welding (DDFW) is the oldest form of the rotary friction welding process. Here is MTI's process for direct drive welding:



- 1 One part is rotated while the other part stays stationary. The rotated part is accelerated to the desired weld speed. This speed is maintained throughout most of the process.
- 2 A low friction force is added to generate some heat at the weld interface to decrease the coefficient of friction and prevent motor-stall due to excessive torque.
- 3 After a predetermined amount of time, a second friction forge force greater than the initial forge force is applied to generate more heat at the weld interface to further soften the material and start creating upset.
- 4 Once the desired amount of upset is achieved, energy input is decreased by braking the spindle to zero weld speed. Full forge load to make the weld is applied, causing the soft material at the weld line to extrude as upset.
- 5 Forge force is maintained for a period of time to allow the part to cool, completing the weld process.

EXPERIENCED - TRUSTED - RESPECTED

You told us what you need in an axle manufacturing cell, and we listened:

- ✓ Post-weld finished axles that require no further machining
- ✓ One welder that can process drive and trailer axles
- ✓ Auto axle-length adjustable capability to eliminate manual changes to software

That's why MTI adds our latest, most innovative axle rotary friction welder to our existing line of axle machines to meet these industry demands.

Now, axle producers have the right tool from a trusted and respected industry leader in friction welding at the right time to expand capacity without loss of quality and to stay in-step with the axle industry's needs.

We can't wait to share our decades of experience in designing and building some of the most innovative and challenging friction welders with you.

Our know-how has produced friction welders:

- For every friction technology in use today
- For research centers and universities

- In every major industrial market
- As standalone, manually operated machines
- As a fully automated workcell integrated into a larger production line
- As small as a refrigerator and as big as a 2-1/2 story house

MTI's rotary friction welders have always been at the core of our business. We know the technology inside and out.

Whether its inertia, direct drive, or hybrid driven, we can integrate and automate to any level of production or capacity demand.

Known and respected industry-wide as the

leader in custom engineered solid state joining solutions, MTI will design and build the solution you want and need.

"Now, axle producers have the right tool ... at the right time..."



MTI INGENUITY

Brings it all together!

INNOVATIVE. GENUINE. CONTINUITY.

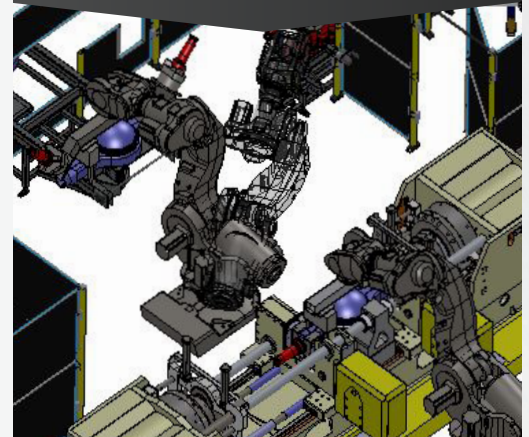
Industry-leading Orientation Capability



Direct Drive High Torque Motor - a New Technology for the Axle Industry



Recognized Industry Leader in Automated Turnkey Solutions for Welding and Joining



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DDFW DOUBLE ENDED AXLE MACHINE

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MTI's newest, most innovative double ended, direct drive, rotary friction welding machine can increase your throughput with little or no scrap, increase your revenue and decrease your operational costs. The opportunity to acquire Peace of Mind is now. Contact MTI today to begin reshaping your axle producing future.

