Welding Solutions for Exhaust Systems

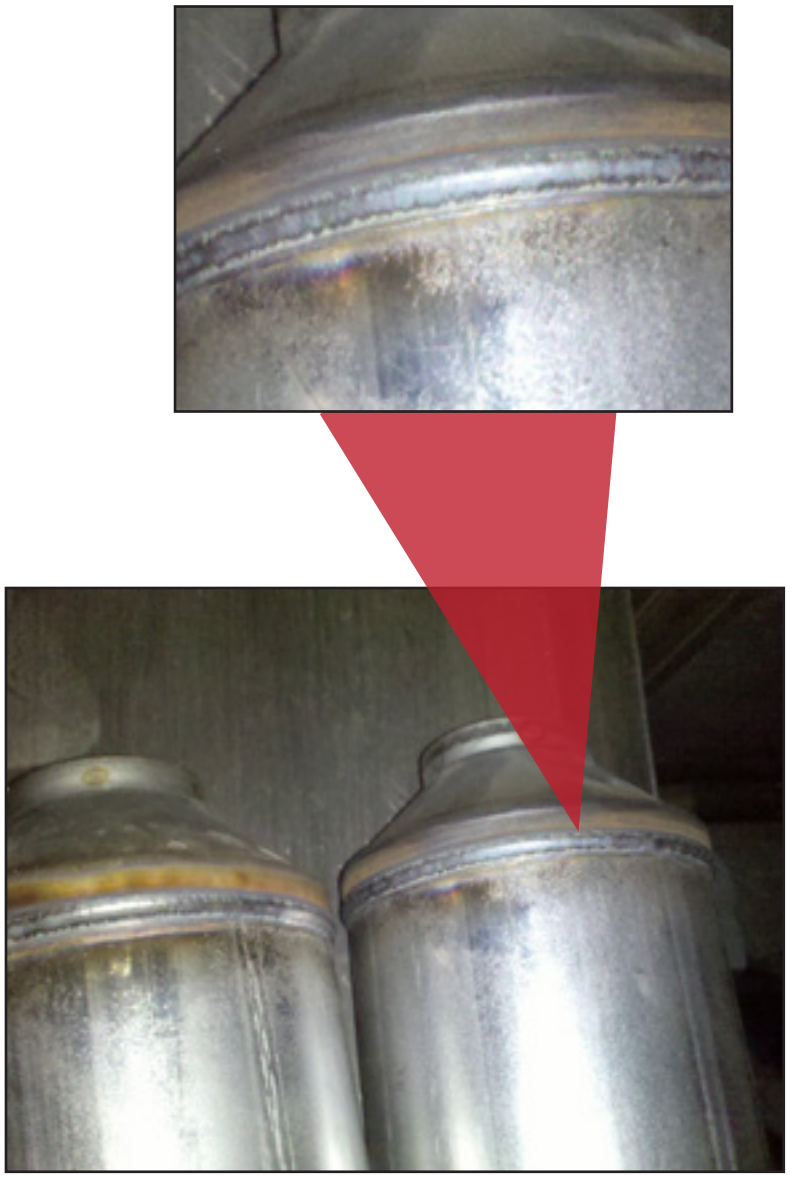
LINCOLN ELECTRIC

Tough Standards

meeting industry challenges maintaining productivity

Increasingly stringent CAFÉ standards are pushing design changes in exhaust systems. Higher temperatures are influencing material selection to include better corrosion and thermal cycle performance. Technologies like start/stop have increased thermal fatigue risks. Effective, gas-tight welding of exhaust systems without leaks and spatter is getting tougher.

Lincoln can help, with cost-effective solutions for today and high-tech innovations to help you get a jump on tomorrow. We have a broad portfolio of precision engineered solid and metal-cored welding wires that will improve weld integrity and boost productivity. We're at the forefront of precision welding that can compensate for poor fit-up, variable edge welds, and other difficult-to-weld parts. And we're not just The Welding Experts®, we're the cutting experts, too – we offer laser cutting solutions that will improve joint location precision. Here at Lincoln, we live up to tough standards too.



Precision Welding

More sophisticated emission control systems require more specialized welding products to reach top performance. Custom manufactured welding consumables can improve weld strength, corrosion performance and productivity.

Consumables

Exhaust components like the tail pipe, muffler and intermediate pipe are now thinner and lighter. Lincoln offers welding wire that is specifically designed to join exhaust system parts. Primalloy™ T-409Ti wire enables higher travel speeds on thin stainless steel. Single pass welding is possible, with good deposition rates and corrosion resistance and minimal spatter and slag.

Lincoln has also developed welding wire to improve travel speed and meet the high temperature needs of the hot end of an automotive exhaust system. Our Primalloy T-439Ti welding wire reduces cycle time, has improved high temperature corrosion resistance and is cost-effective. Coupling Primalloy T-439Ti with Lincoln's advanced waveforms additionally enhance welding speed.

Wire feedability

All welding wire is not created equal. Wire that is both lot-selected and precision manufactured feeds and welds better. Lincoln offers a wide array of welding wire and consumables engineered to fit your specific exhaust system applications.

Robotic Welding Power Source

Lincoln's Power Wave® welders are the industry standard. Our units are built for the long haul, with a sterling record of dependability.

They flex to your unique welding environment while consistently maintaining superior arc performance. Choose from over 60 standard welding waveform programs that offer a broad range of electrode size, type and shielding gas combinations to give you optimal appearance, penetration, bead shape and travel speed for each application. For exhaust applications, the Rapid-Arc® waveform delivers a 20% or greater improvement in travel speed. Power Mode™ enables stable arc welding on thin materials, with precise heat input throughout the welding process, even with out-of-position welds.

What further sets our equipment apart is the ability to provide a revolutionary level of networked communication.

Laser Tube Cutting

The effectiveness of upstream automation becomes more critical in a demanding welding environment like exhaust system manufacture. Precision upstream equipment can be key to improved productivity.

Lincoln provides a wide range of custom, flexible tube cutting solutions. Laser cutting can add production capabilities at a reasonable capital cost. The method can improve joint location precision; there is no loss of a cutting edge over time as there is with saw cutting.

When the upstream equipment and welding line equipment are supplied by the same manufacturer, start-up, fit-up and ongoing operation run more smoothly. Lincoln Electric is the only supplier of both upstream and welding automation.

LINCOLN ELECTRIC: WELDING SOLUTIONS FOR EXHAUST SYSTEMS

WELDING

CHALLENGE: With the extreme duty and strict standards of exhaust assemblies, can you afford to trust generic welding wire?

T-409Ti Metal-Cored Wire	**T-439Ti Metal-Cored Wire**
Cold end: tail pipe, muffler, intermediate pipe	Hot end: manifold, catalytic converter, flange
Excellent deposition rate Wider penetration than MIG wire Significantly lower cycle time than MIG wire More cost-effective than austenitic SS MIG wire	
No slag/minimal spatter Strength at high temperatures Corrosion resistance at high temperatures	No slag/no spatter Thermal fatigue resistance due to lower expansion coefficient Corrosion resistance at ultra-high temperatures (up to 1100°C)

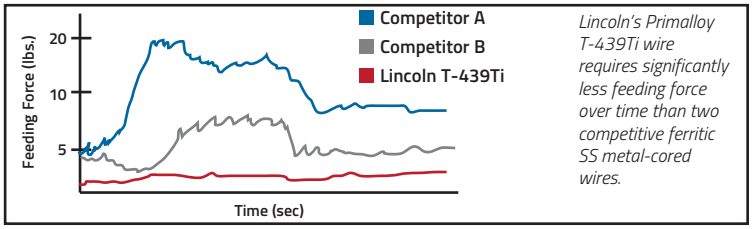
SOLUTION: Lincoln metal-cored welding wire is the recognized standard for achieving faster travel speeds on the new high performance exhaust systems. In documented studies in exhaust system plants, T-439Ti has been able to run up to 50% faster than solid ferritic or austenitic wire.

Primalloy T-409Ti and Primalloy T-439Ti are ferritic, stainless steel, metal-cored wires specially designed for high travel speed welding on exhaust sytems. They deliver corrosion resistance and a good deposition rate, with minimal spatter and slag.

Lincoln Primalloy wire, stabilized by titanium, produces strong welds that remain strong over time. Welds made with competitive welding wire alloyed with niobium can be subject to accelerated knife line corrosion. Niobium carbide does not precipitate uniformly, leaving some areas of the weld unprotected. Welds with Lincoln titanium alloy wire remain uniformly strong.

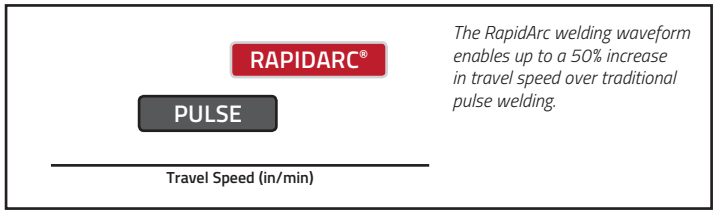
CHALLENGE: Mechanical fixes to guides, drive rolls and contact tips can only go so far in improving wire feedability. Wire quality accounts for the rest of the solution.

SOLUTION: Lincoln Electric's wire product is recognized in the industry for its best-in-class feedability. Superior wire feedability is achieved with consistent surface finish, chemistry and diameter. Our welding wires are manufactured with lot-selected metals and engineered with proprietary technology to consistent specifications for uniform feeding.



Lincoln's Primalloy T-439Ti wire requires significantly less feeding force over time than two competitive ferritic SS metal-cored wires.

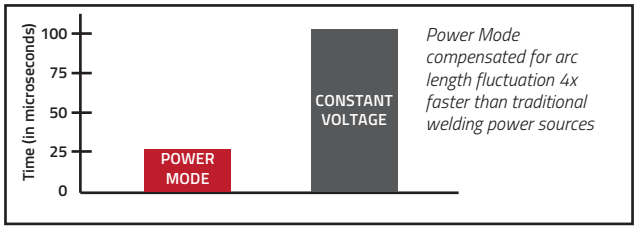
CHALLENGE: The out-of-position welding that occurs on exhaust assemblies requires a robust, adaptive solution where speed is maintained to keep up productivity.



The RapidArc welding waveform enables up to a 50% increase in travel speed over traditional pulse welding.

SOLUTION: Compared to traditional pulse welding, Lincoln Electric's RapidArc waveform can increase travel speed up to 50% and reduce spatter up to 15%. Reliable Power Wave welders with RapidArc enable high travel speeds even while managing poor fit-up joints.

CHALLENGE: Joining materials as thin as 0.7 mm can be tricky, especially where fit-up varies. Your welding process has to be more precise to avoid burn-through, spatter and inconsistent joints.



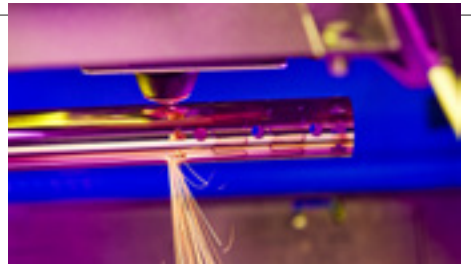
Power Mode compensated for arc length fluctuation 4x faster than traditional welding power sources

SOLUTION: Power Mode, standard process technology on Power Wave welders, enables consistent bonding and penetration throughout the welding process. It is particularly effective for exhaust systems because it delivers controlled heat input, stabilizing the arc during the welding of thin materials. Power Mode is one of many Lincoln innovations for precision welding equipment.

LASER TUBE CUTTING

CHALLENGE: The solution to exhaust system parts fit-up may be more than better welding. Upgrading your upstream process with precision tube cutting may be the answer.

SOLUTION: Lincoln has a full portfolio of automated cutting systems to fit any production line. A laser tube cutting machine can provide the highest quality, most consistent edges that can cure fit-up issues. Our equipment is engineered for many years of reliable production. Systems utilize CNC or Windows-based cutting software and can include custom automated loading and conveyor systems. Edges never vary like those on mechanically cut parts when the blade wears or chips.



Lincoln's laser tube cutting is the state-of-the-art method for pre-weld parts prep.

Automation Solutions

Lincoln Electric's expertise goes beyond the weld process to all aspects of automated metal fabricating for exhaust system manufacture.

- Flexible, automated systems for metal forming, fabricating and joining, including fixturing, laser and plasma cutting systems, press automation, tube bending and fabricating systems, tubular hydroform/structural frame automation and build-to-print manufacturing services
- Turntables, positioners, robot transport units, tool shuttles, transfer fixtures, conveyors and lifters
- High quality toggle, tube and wire clamps and retract pin devices

Environmental Solutions

Lincoln Electric supports safety and regulatory responsibility around the welding process with a full suite of audit services and safety equipment, including:

- Portable, stationary and engineered weld fume control systems
- Systems for fire detection and suppression

Robotic Welding Solutions

Lincoln Electric knows welding, and we also know automation. We have the depth and breadth of experience in exhaust system assembly to deliver the fastest, highest quality, most repeatable results for your robotic line. Our advanced technologies include:

- Workhorse welders
- Wire feeders for heavy-duty applications
- Innovative waveform technologies for strong, clean welds
- Unique welding consumables to optimize your results
- Laser welding systems

Lincoln Electric is the world leader in arc welding equipment, consumables and automation. We have been at the forefront of welding technology for more than one hundred years. Our product line now spans the breadth of the assembly floor, from plasma and oxyfuel cutting systems to arc welding products, weld fume removal products and robotic welding systems.

We offer a complete line of welding automation equipment and solutions for automotive assembly plants. We can customize your system with flexibility to meet the rapid changes in the industry. And with Lincoln, you receive full support, including modeling, procedure development, on-site programming, and training.

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