BOND™ TECHNOLOGIES

THE FUTURE OF MANUFACTURING WITH RFSSW

CLEANER, STRONGER ALTERNATIVE TO RESISTANCE SPOT WELDING (RSW) AND SELF-PIERCING RIVETS (SPR)



Refill Friction Stir Spot Welding (RFSSW) is transforming how manufacturers join thin-gauge aluminum. Unlike resistance spot welding or self-piercing rivets, RFSSW delivers a flush, solid-state joint with no consumables, no through-holes, and just 1/40th of the energy use of traditional spot welding. Robot-friendly and production-ready, it's ideal for body-in-white and other lightweight structures in automotive, aerospace, rail, and electronics.

RFSSW has moved beyond the lab and onto the production floor, now standing as a serious contender to RSW and self-piercing rivets.

CYCLE TIME (LOWER BOUND):	ENERGY PER SPOT:	HERMETIC POTENTIAL:
~0.5 seconds (thin Al stacks, application-dependent)	≈40x lower vs. RSW	Watertight, refilled, keyhole-free joint

Why Choose RFSSW?

In direct comparisons, RFSSW consistently outperforms RSW and SPR. The advantages are clear:

- **Solid-state joint:** No melting, porosity, or spatter; minimal distortion.
- **Flush finish:** Keyhole-free refill leaves a smooth, paint-ready surface.
- **Stronger and more durable:** Higher strength, elongation, and fatigue life than RSW.
- **Faster and efficient:** Cycle times can be as low as 0.5 seconds (vs. RSW's 0.75s minimum), while consuming just 1/40th of the energy.
- **Lower cost at scale:** ~$91K vs. ~$3.64M (for RSW) in energy use per 100,000 vehicles.
- **Hermetic seal:** Watertight joints without extra sealant (stack-dependent).
- **Surface/adhesive tolerance:** Less sensitive to oxide, can weld through sealants/adhesives **with possible strength reduction.*

Why Work with Bond Technologies?

- **Purpose-built RFSSW platforms:** Gantry and C-frame machines Automotive/Aerospace duty.
- **Advanced control:** Closed-loop force, position, and spindle control with recipe management.
- **In-process monitoring:** Force, position, torque signature and traceability for every spot.
- **Application engineering:** Feasibility, Coupon development, parameter optimization.
- **Turnkey integration:** Cells/lines, fixturing, tooling and PLC/MES connectivity **(Robot or Hard-Tooled).**
- **Service Training and Global support:** Spare tooling, operator/maintenance training, worldwide service.

LEARN MORE

Side by Side: RFSSW vs. RSW vs. SPR

	RFSSW (Refill Friction Stir Spot Welding)	RSW (Resistance Spot Welding)	SPR (Self-Piercing Rivets)
WELD QUALITY	✓ High, solid-state joint	! Fusion weld, porosity risk	✗ Mechanical joint, loosens
MATERIAL COMPATIBILITY	✓ Joins dissimilar alloys (Al–Cu, etc.)	✗ Limited to similar materials	! Limited, ductility-dependent
SURFACE SENSITIVITY	✓ Tolerant to oxide/adhesive	✗ Requires clean surfaces	! Affected by coatings
ENERGY CONSUMPTION	✓ Low (1/40th of RSW)	✗ High (current + cooling)	! Moderate
COSMETIC APPEARANCE	✓ Flush, keyhole-free	! Indentation, HAZ	✗ Visible rivet head/bulge
FASTENER ELIMINATION	✓ Yes	✓ Yes (variable quality)	✗ No – requires rivets
WEIGHT REDUCTION POTENTIAL	✓ Moderate – no added parts	✓ Moderate	✗ Low – rivets add weight
ROBOT INTEGRATION	✓ Compact, robot-friendly	! Needs power/cooling systems	! Complex, rivet feeders
TOOL WEAR/MAINTENANCE	✓ Minimal, long tool life	✗ Electrode wear	✗ Dies/punches wear fast
CYCLE TIME	✓ Fast (0.5s+)	✓ Fast (0.75s+)	✗ Slower (mechanical placement)
ENVIRONMENTAL IMPACT	✓ Clean, no fumes	✗ Heat, fumes, cooling needed	✗ Waste from rivets
HERMETIC/WATERTIGHT	✓ Yes, sealed refill	✗ Not likely	✗ No, sealant required
ROI OUTLOOK	✓ Strong – payback in Al/mixed structures	! Moderate – best in steel use	✗ Low – costly, supply burden

Bond Technologies | The Premier Manufacturer of Friction Welding and Processing Machines

Bond Technologies is a global leader in Friction Welding Machinery and Processing that is revolutionizing manufacturing methods in the following industries: Automotive, Aerospace, Shipbuilding, Railcar, Electronic, and beyond. Our expertise in Friction Stir Welding, Friction Extrusion, and Refill Friction Stir Spot Welding allows us to deliver high-performance, solid-state metal joining and processing technologies to customers around the world.

Bring us your Stack Up

We'll validate joint performance and cycle times on Bond's RFSSW platforms and map a clear path in production. Let's Forge the Future, together.

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