

Sonibel Instruments

**In-Situ Acoustic Weld Monitoring for Improved
First-Pass Yield**
September 2026



Sonibel Instruments Background

**Shipyard
experienced
team**

**Pilot deployments
with the Royal
Canadian Navy
and two major US
fabricators**

**NSRP Welding
Technology
Panel Project
White Paper
submitted with
NNS**

Weld Rework is a Core Bottleneck

Welding

Volumetric
Inspection

Rework

Re-Inspection

3x Repair Time

10x Repair Cost

Metrics Affected

**Reduced First-
Pass Yield**

**Increased
consumption of
craft and
inspection labor**

**Constrained
Production
Throughput**



Solution: Pre-NDT Quality Gate

Alert welders of defects as they form, before NDT.
Especially valuable for multi-pass welds:

- Increase first-pass yield
- Reduce rework and re-inspection cycles
- Reduce schedule impacts and unplanned work
- **Improve production throughput**

System Strengths

**Unique
specialized
microphone:
only at Sonibel**

**System rated
to IP 65**

**Torch mounted
rated to IK 09**

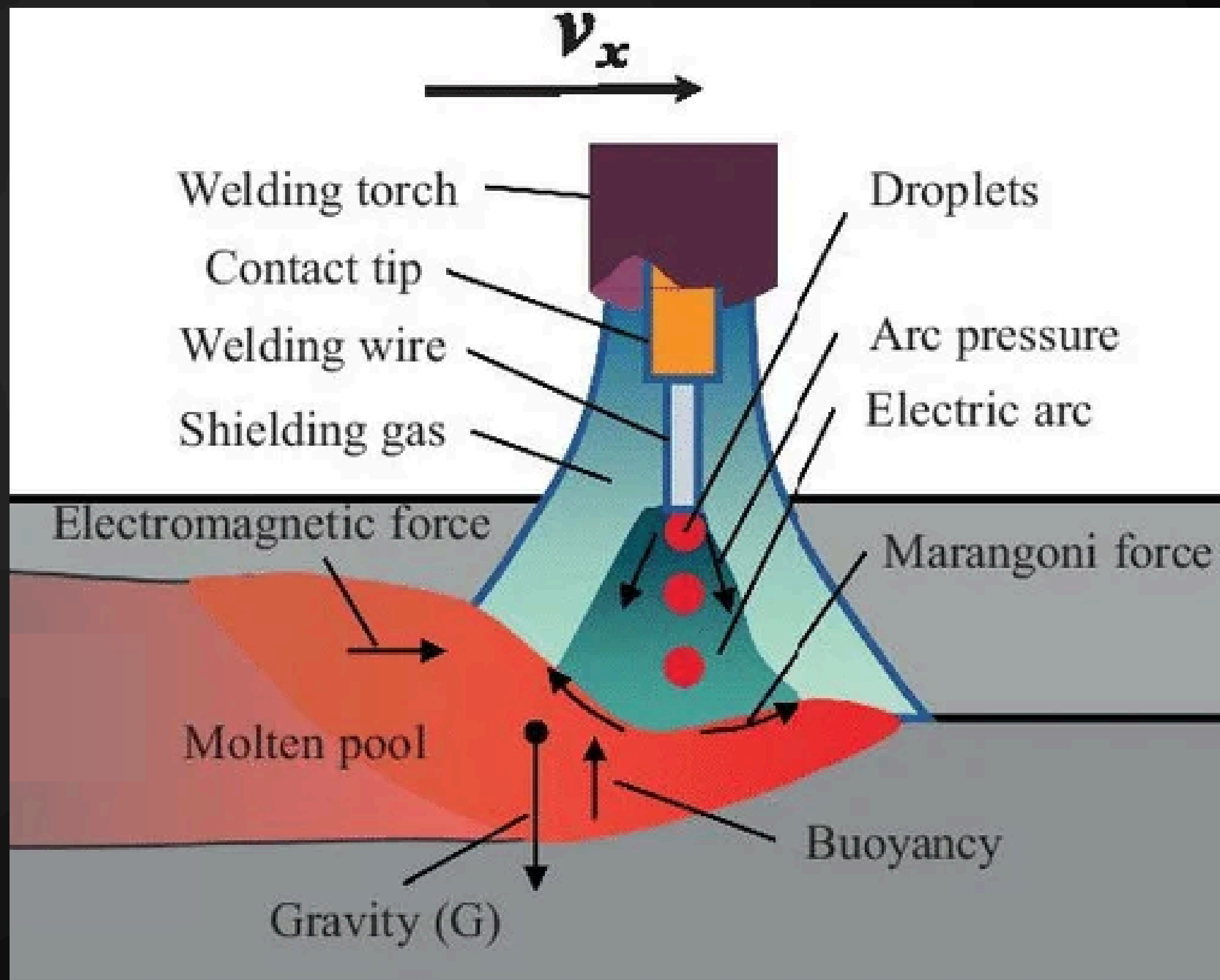
**Retrofits in 20
minutes**

**No change to
weld process**

Acoustic Signals

Defects are associated with changes in:

- Arc stability
- Ignition and extinction behavior
- Droplet detachment
- Droplet impact



AI (Machine Learning)

Sonibel analyzes the acoustic interaction between the arc and weld puddle during welding

Detects porosity, incomplete penetration, lack of fusion, and slag inclusions



Porosity sound byte

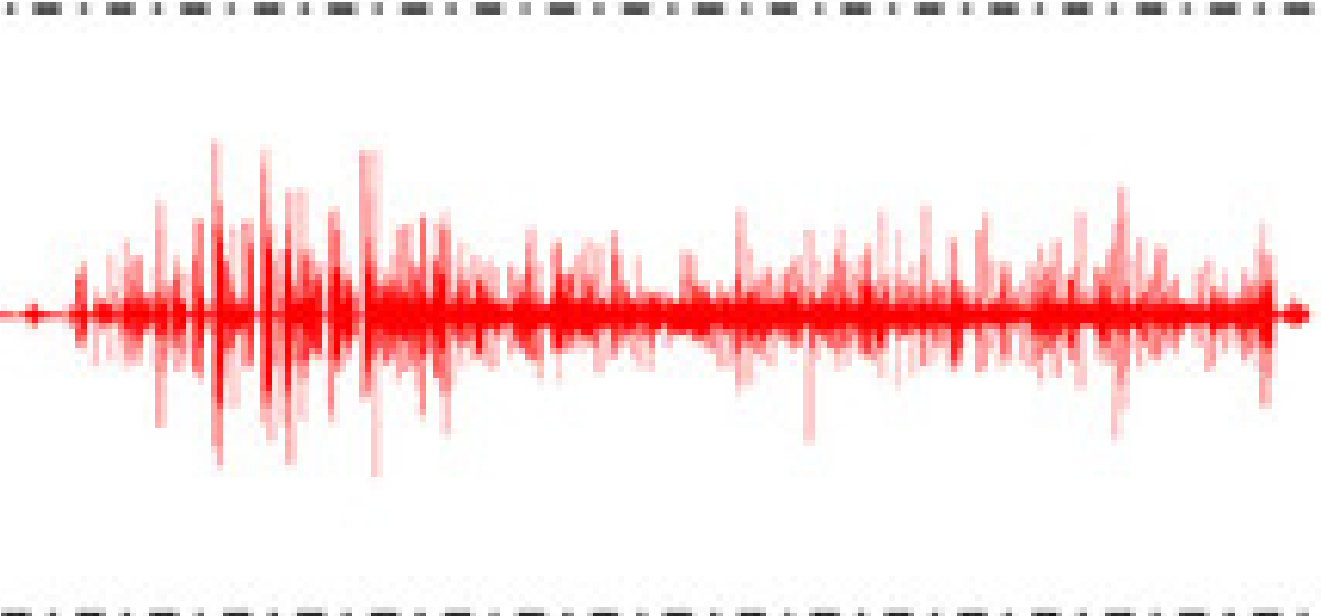
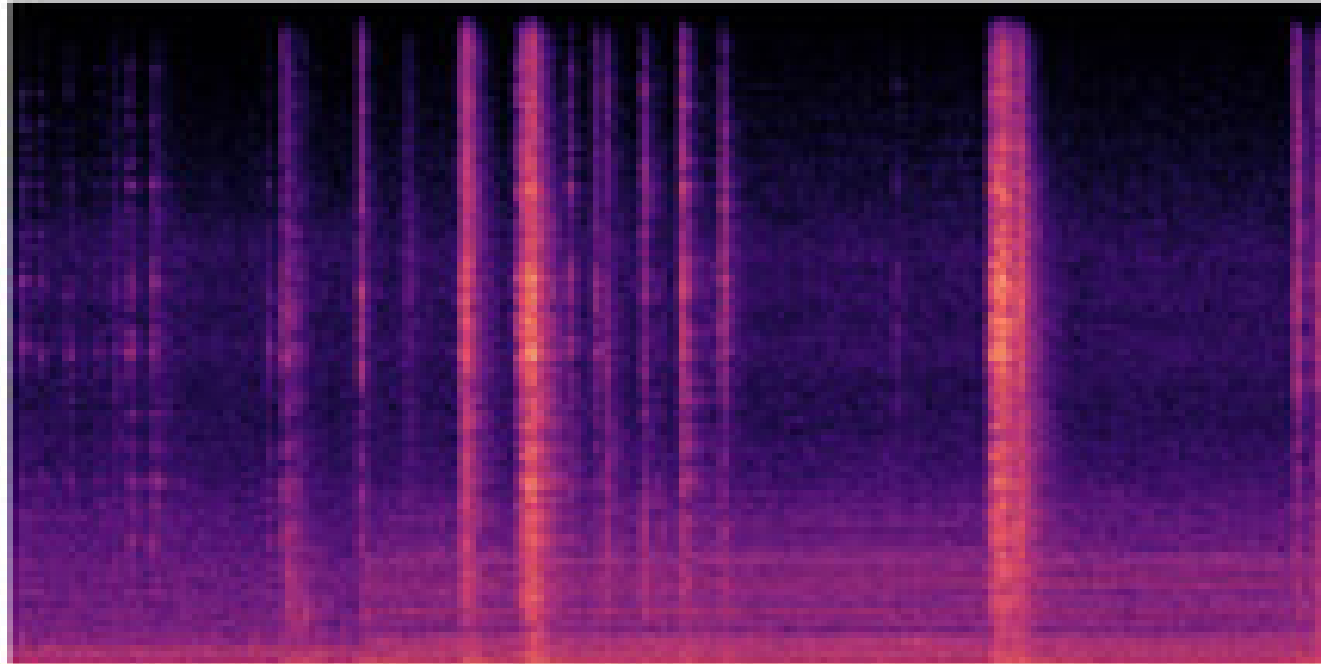
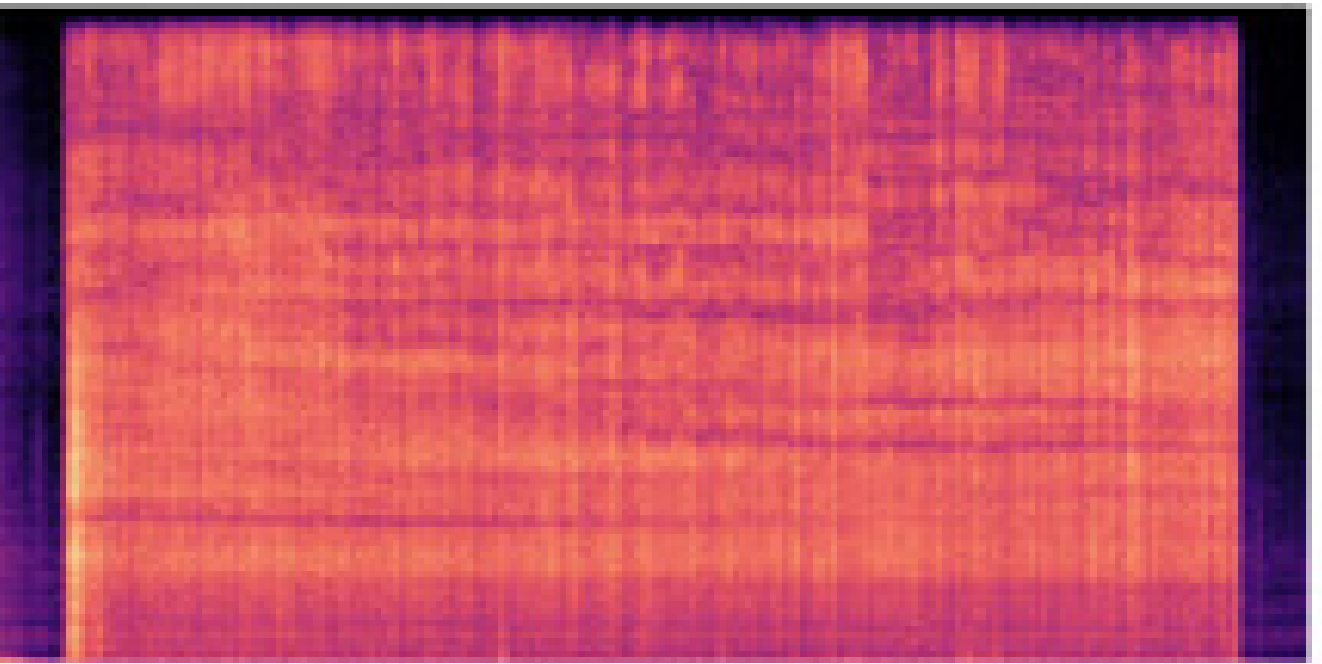


Good weld sound byte

AI Calibration Method

1. Choose a WPS (weld procedure specification)
2. Sonibel records ~60,000 inches of weld audio: good and defect simulated welds
3. Convert audio signals into STFT spectrograms
4. Train Sonibel's AI (machine learning) models on that WPS

Spectrogram-based inputs outperform raw audio-spectrum inputs

	Class 0 – Rejected welds	Class 1 – Approved welds
Weld coupon		
Audio Spectrum		
Spectrogram		

External Lab Validation

Detecting under
penetration and
burn-through in
robotic pulsed
GTAW:
96% accuracy

Zhang et al. 2018

Detecting lack of
fusion and
porosity in SMAW:
95% accuracy

García Rodríguez
et al. 2026

Detecting
penetration states
in CMT/GMAW:
98.8% accuracy

Zhang et al. 2018

Sonibel Field Validation

Pilot deployments include:

- Royal Canadian Navy: semi-automatic FCAW
- [Undisclosed] major US fabricator: semi-automatic FCAW
- [Undisclosed] US bridge fabricator: SAW

Sonibel's current models achieve <96% accuracy

Cost Savings Example

ROI and validity reports from ongoing pilots are in progress

**96% → 99.2%
first-pass yield**

**> \$300,000/year
value from one 20
unit deployment**

< 2 year payback

**94% ROI
over five years**

Proposed Next Steps with NNS

Thank you to Amanda D'Arcy, NNS Technical POC

1. Choose a WPS: 1 month
2. Calibrate Sonibel's AI for that WPS: <6 months
3. Evaluate in production and measure impact: <3 months
4. Document results for technology transfer: throughout

10 month total project duration

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