

The image features a close-up of a silver industrial robotic arm with a black corrugated hose. The arm has 'NOVARC TECHNOLOGIES' printed on its side and a yellow warning label. To the right, a control panel with a screen and a red 'GIVENS ENGINEERING' button is visible. The background is dark and out of focus.

NovAI™

Adaptive Welding Computer Vision AI

NOVARC
TECHNOLOGIES

Overview of Innovation at Novarc Technologies

To lead the innovation of AI and Automation in welding.

NOVARC TECHNOLOGIES NAMED ONE OF THE AMERICAS' FASTEST GROWING COMPANIES 2024 ON FINANCIAL TIMES ANNUAL RANKING

Our Global HQ: Vancouver, BC

- Other offices and Reps: TX, Aus, EU, ME

Innovation Team: Welding, AI, Vision, and Robotic experts

Novarc Products:

- **SWR** - Collaborative welding robot
- **NovSync** - Analytics dashboard
- **NovEye** - Autonomous SWR
- **NovAI** - Adaptive Welding Computer Vision AI (Control & Autonomy)



Adaptive Welding

Tack Adaptation

Seam Tracking

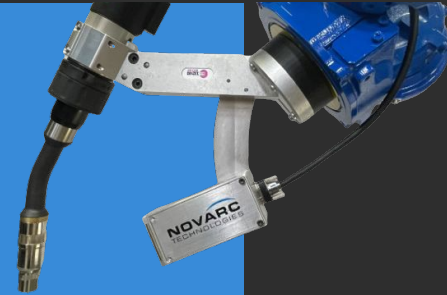
Fit-up Adaptation



NovAI Addresses **welding problems** through Adaptive Welding using AI and vision.

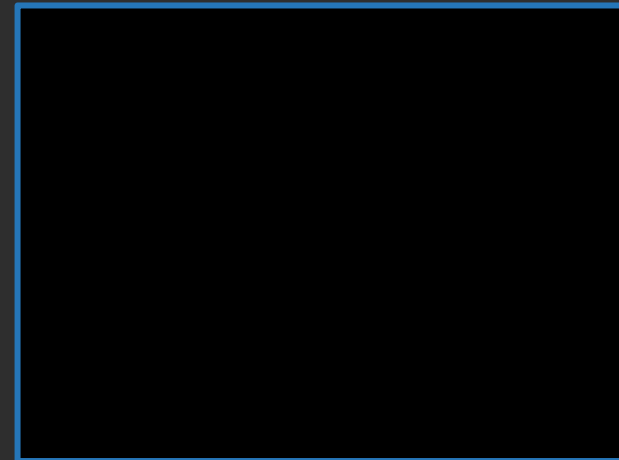
NovAI™

Brings Perception and Cognition to Robots

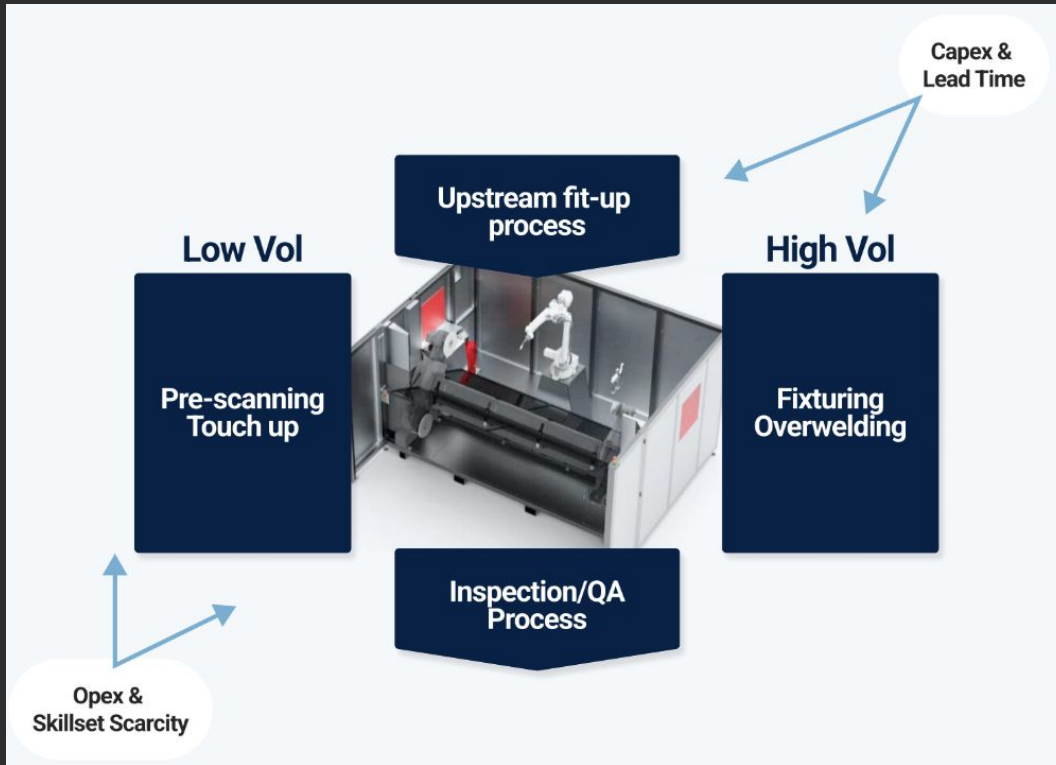
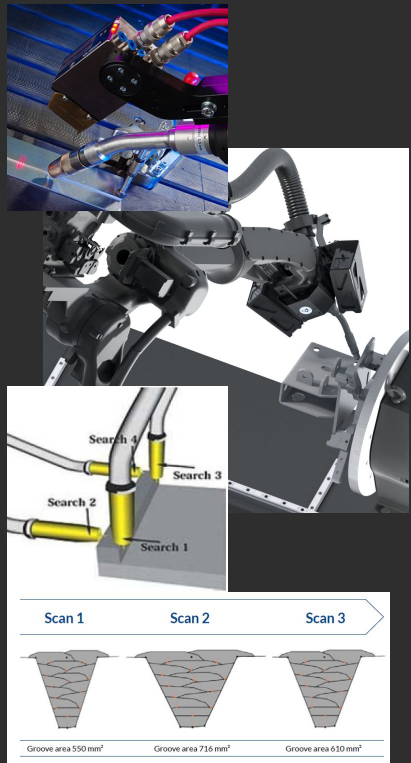


Technical solution

- Live adaptation, no prescanning
- Adapt to tacks, no grinding for tacks
- Adapt to seam and welding distortion, no change to path planning
- Adapt to the fit up variation, no time-consuming reprogramming



Problem & Value Proposition



| SPECIFIED | | ACTUAL | | VOLUME INCREASE |
|-----------------|----------------|-----------------|----------------|-----------------|
| FILLET SIZE IN" | VOLUME CU.IN." | FILLET SIZE IN" | VOLUME CU.IN." | |
| 1/8 | .0078 | 3/16 | .0176 | 125% |
| 3/16 | .0175 | 1/4 | .031 | 78% |
| 1/4 | .031 | 5/16 | .049 | 57% |
| 5/16 | .049 | 3/8 | .070 | 43% |

Bigger is not always better!

Problem & Value Proposition

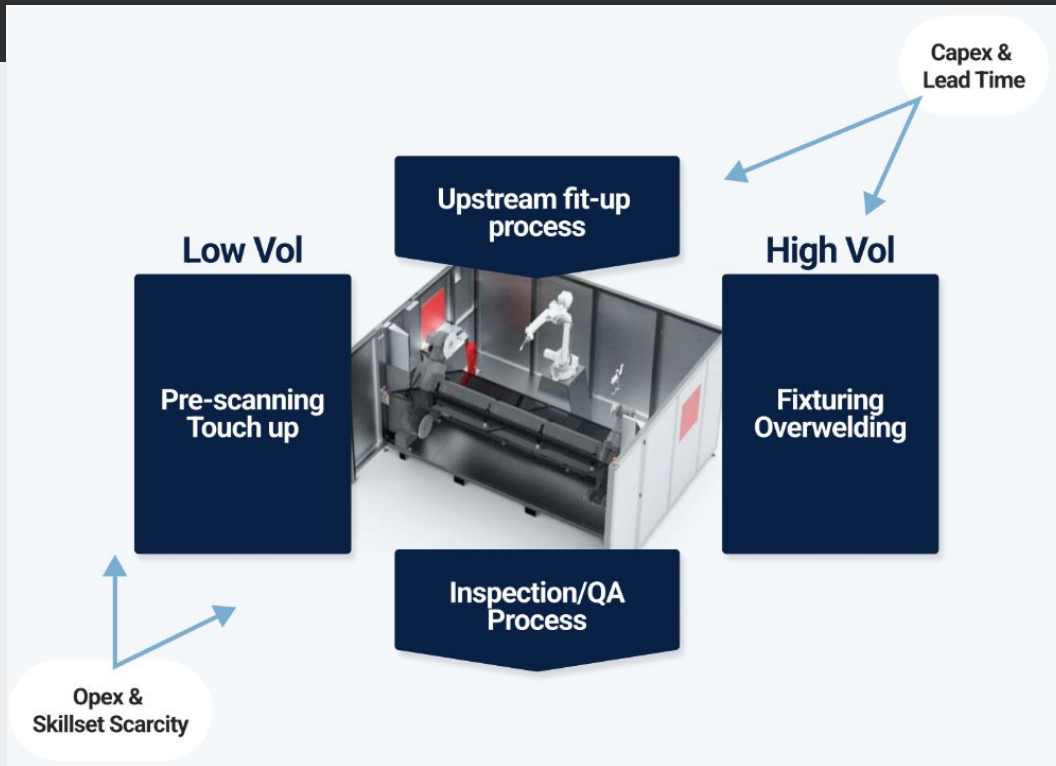
Low volume/high mix

- Shop floor programming challenging
- Fixturing expensive & long lead time
- Scarce certified welders
- Too many touch up points
- Impacts quality



Low Programming /No Touch ups

- Lean adaptation to mix
- Reduce skilled
- Increase quality
- Increase throughput



High volume/low mix

- Consumables
- Prescanning time
- Variations in production process
- Forensic of weld failures
- Uptime of line



No OverWelding/No Touch ups

- Conservative over cost mitigation
- Traceability and monitoring
- Increase quality
- Increase uptime

AI Learning Strategies for Welding:

Supervised Learning

Humans Oracle

Human builds the perception in robot

Create new models from welds and videos data

Unsupervised Learning

Data collection platform

Scale up the perception

Diversify new models from large welds and videos data

Transfer Learning

Foundation models

Robot learns from Robot

Sharing foundation models with each other to create a new one for applications

Imitation Learning

Team Human-AI foundation model

Robot learns from interaction with Human

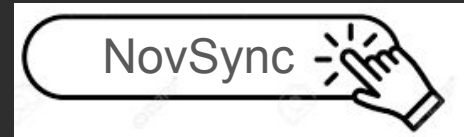
Copies robots and humans to perfect applications models

Conventional AI Training

1. Customer sends sample parts
2. Novarc extracts and collects data
3. Novarc trains the AI models
4. Models will be deployed to the system

AI Models Generated using Control

1. Data is collected at customer site during welding
2. Novarc finetune models on customer
3. Models will be deployed back to the system



How to collect welders input?

- Pendant + Vision
 - Dual control over power source and robot
 - Human in the loop
 - Applications: High mix, low volume

Control
(Human in the loop)

Data Collection

Seam Tracking (Motion Control)

Tack adaptation

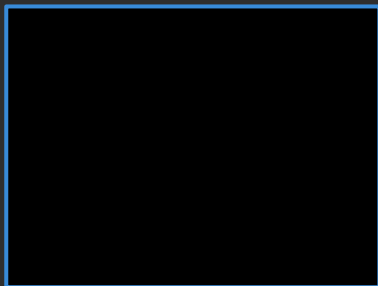
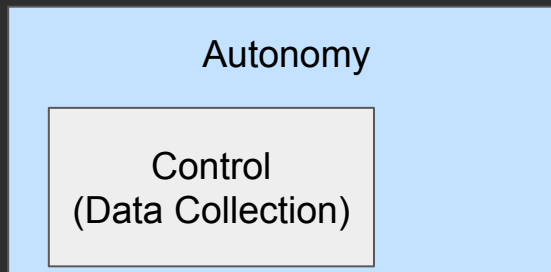
Fit-Up adaptation
(Root Opening, Gap)

Changes:
Process parameters
Motion parameters

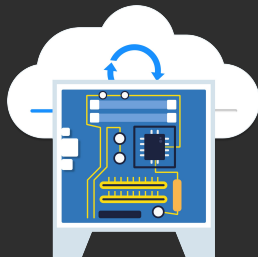
Robotic Welding

Fully autonomous

- Operator free
 - Needs learning and data
- Applications
 - High-Mix & high volume



Welding Image



AI Models
Trained on collected data

Changes:
Process parameters
Motion parameters



Robotic Welding

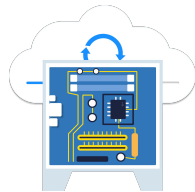
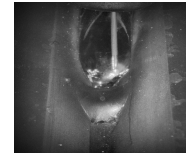
NovAI™ in Action





Advanced Sensory System

Capturing the welding scene.



Powerful Computing Hardware

Best-in-class computing powered by Intel® and Nvidia®



Adaptive Welding

Fitup variation, Seam tracking, tack detection and fusion



Weld Traceability and Tracking

All welds data and production statistics are recorded and backed up in the cloud for future referral and investigation

