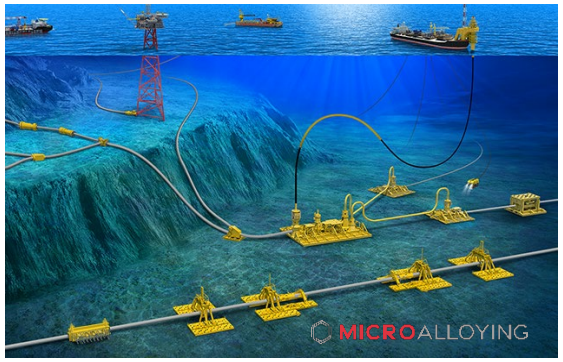
Advancements in Automatic Welding

The Pipeliner’s Association of Houston

January 12th, 2026

CRC Evans – About Us

CRC-Evans is the world leader in mechanized pipeline welding and has been in the pipeline construction industry for over 90 years. We've constructed over 50,000 miles (80,000 km) of pipelines around the world, stretching across the swamps and wetlands, dense tropical jungles, through the frozen arctic, scorching deserts, and everywhere in between. There are currently 2 facilities in the greater Houston area, (Katy and North Houston), which support North and Latin America, Gulf of Mexico and Australia.



PRE-ENGINEERING

- FEED engineering support
- Materials consultancy
- ECA analysis
- Mill Inspection

WELDING

- Boost operational speed, maintain high quality productivity
- Largest inventory of mechanized welding systems

FIELD JOINT COATING

- Globally recognized specialist coating contractor
- Best in class pipeline field joint coating and services

What is “Automatic” welding?

Many of you have probably heard the term, but what does it truly mean? How do the codes classify them, and what differentiates “automatic” and “mechanized” welding.

API Standard 1104 – Welding of Pipelines and related facilities – 21st Ed.

- **Automatic:** Arc welding with equipment that performs the entire welding operation without manual manipulation of the arc or electrode other than guiding or tracking and without a manual welding skill requirement of the operator
- **Mechanized:** Process where parameters and torch guidance are controlled mechanically or electronically but may be manually varied during welding to maintain the specified weld conditions.

DNV-ST-F101 Ed. 2021 – Submarine Pipeline Systems

- **Automatic:** Welding where the welding parameters and torch guidance are fully controlled mechanically or electronically and where manual adjustments of welding variables during welding is not possible and where the task of welding operator is limited to preset, start and stopping the welding operation
- **Mechanized:** Welding where the welding parameters and torch guidance are fully controlled mechanically or electronically but where minor manual adjustments can be performed during welding to maintain the required welding conditions.

Great, do we care and why?

What is Mechanization in Pipeline Construction

Mechanized welding replaces a traditional manual electrode (SMAW) or semi-automatic FCAW torch with a mechanized systems that travel along the pipe to weld joints with extreme precision. These applications typically come in two variants, a fully mechanized “mainline” and a “hybrid” weld solution. A mechanized mainline is typically a narrow groove J or K-prep design where the “hybrid” system replace the manual fill and cap passes of a V-prep joint design.

Fully Mechanized Mainline

Stages	What Happens
Preparation	Pipes ends are beveled to a specified bevel design to mainline welds
Alignment	Pipes are aligned using an **internal clamp** that holds them still from the inside. This could be an internal welding machine,
The Root Pass	Often, an internal welding machine or a specialized external bug performs the first "pass" to seal the bottom of the groove. This is the most critical weld for preventing leaks.
Fill & Cap	Multiple "bugs" follow behind in a specialized tent (to block wind/dust). They layer metal into the groove until it is full (the Fill) and then add a final decorative and protective layer (the Cap).

Hybrid / Tie-In

Why use Mechanization in Pipeline Construction

- **Consistency:** Mechanized welding systems focus on repeatability. A machine doesn't get tired, meaning you should expect the exact same weld at shift start to shift end… In any climate.

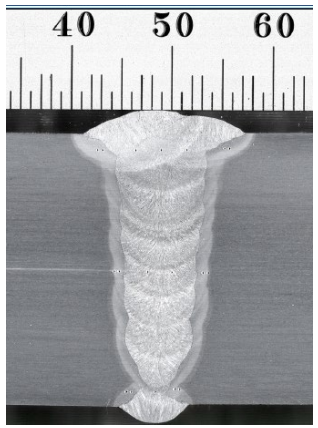
- **Speed:** Mechanized systems can weld much faster than a traditional manual welder. This is especially true as diameter and thicknesses increase.

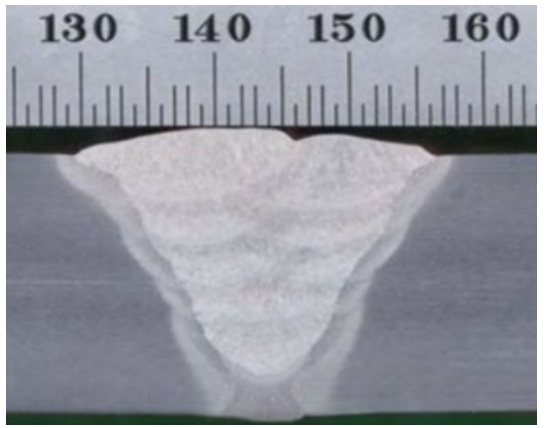
- **Quality:** Its common practice to expect sub 1% repair rates utilizing the full extent of API 1104 Annex A and mechanized welding.

- **Data:** Modern machines log every second of the weld. This data has a wide range of uses which we'll speak about later

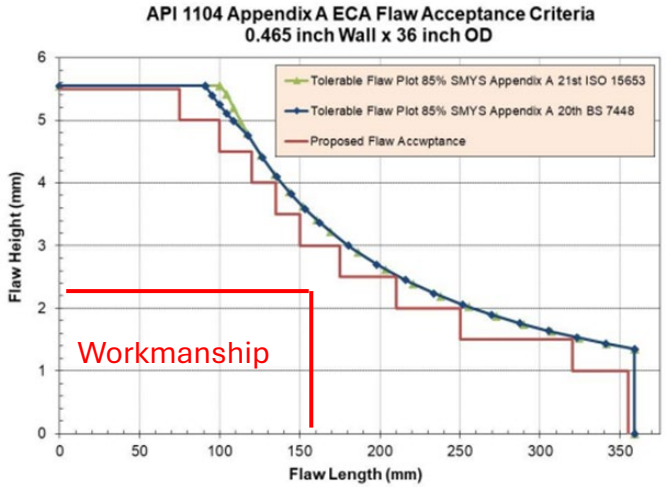
Mechanized Narrow Gap vs. Standard V-Prep

- **Reduced Weld Volume**
- **Increased "Arc On"**
- **Multiple Arc Capabilities**
- **Higher Travel Speeds**





ECA Acceptance Criteria



What is new in mechanized welding and where are we going?

- Advancements in Equipment & Welding Methods
- Non-Tradition Opportunities
- Advanced waveform processes
- Increases specification requirements
- Internally coated systems
- Data Collection and Utilization
- Honorable mentions

Advancements in Equipment & Welding Methods

- **Automatic Head Tilt Angle Control**
  - Introduced the means of controlling a welding torch's head angle
  - No longer do we have to compromise on a fixed head angle
  - Promotes higher quality and introduces new methods of welding
    - Cold Metal Transfer (CMT)
    - Surface Tension Transfer (STT)
    - Low Spatter Control (LSC)
    - Regulated Metal Deposition(RMD)
- **Ambidextrous Welding System**
  - Single system for CW and CCW
  - Opens doors for smaller diameter pipe
- **High Speed Drive Motors**
  - Removes the safety hazard of free wheel welding bug
  - Welder friendly

Non-Traditional Cases for Mechanized Welding

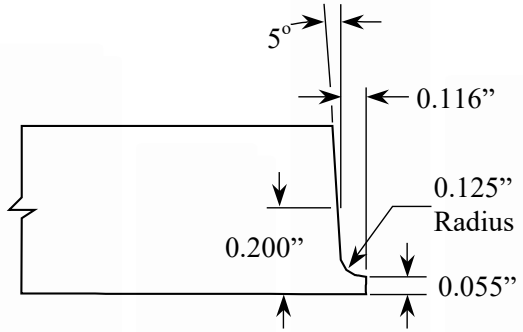
- Historically we've always been focused on long, large diameter pipelines
- Increase in automation on projects:
  - **Shorter Length / Smaller Diameter**
  - **Heavier Wall Thicknesses**
- Self-Shielded Flux Core
- Bore sections / casing pipe
- Internally Coated Pipes
- Specialty or High Grade Steels
  - (X-80, 100 or 120s, Inconel, Invar)
- Heavy Wall Storage Systems / Fatigue sensitive
- Push Stations / Barge Lay / Beach Pulls
- Water lines
- 2G piles
- Stations or facilities

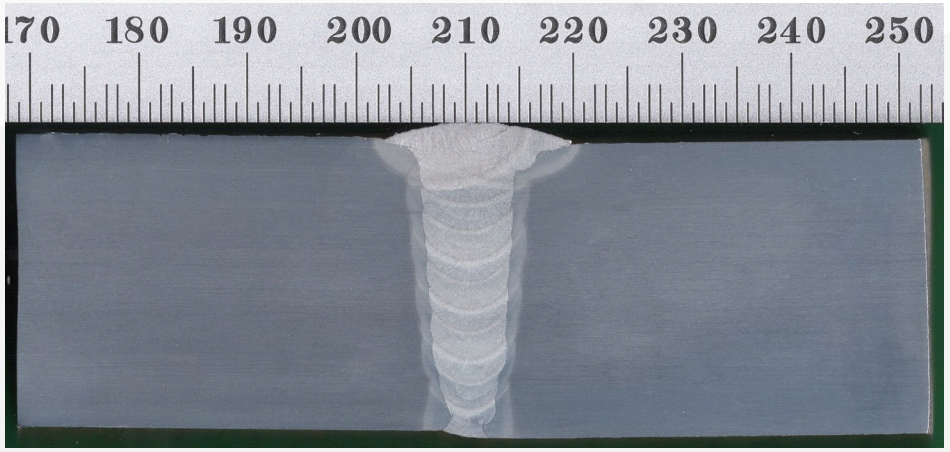
Self-Shielded Flux Cored

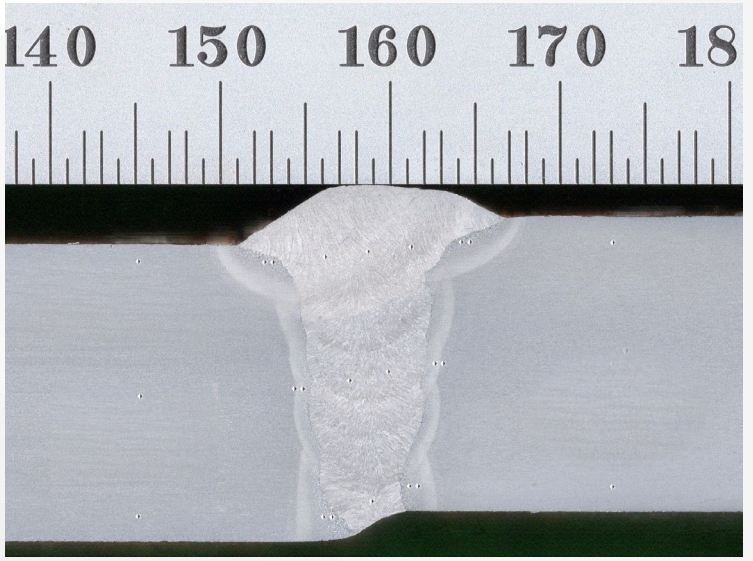
Advanced Waveforms / New Processes

- **Advanced Waveform Controls**
  - Cold Metal Transfer (CMT)
  - Surface Tension Transfer (STT)
  - Low Spatter Control (LSC)
  - Regulated Metal Deposition(RMD)
- **Increased Specification Requirements**
  - Low Hydrogen roots
  - No or limited ID spatter
  - High CTOD requirements

Joint Design

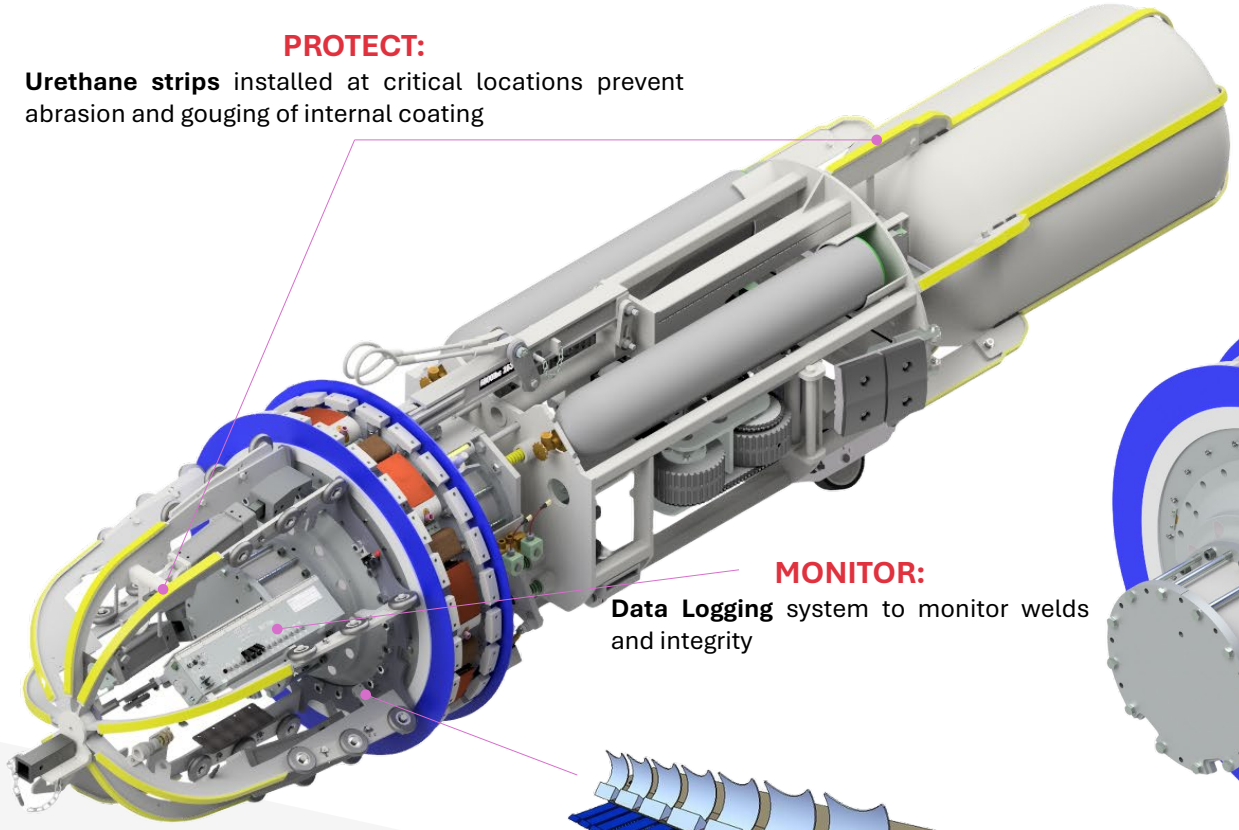




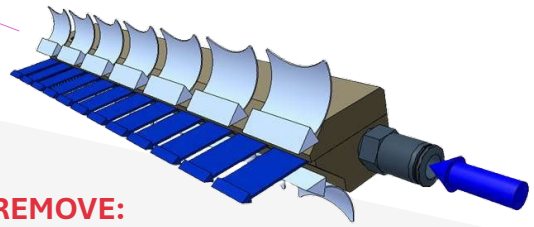


IWM Enhancements | Internally Coated Pipes

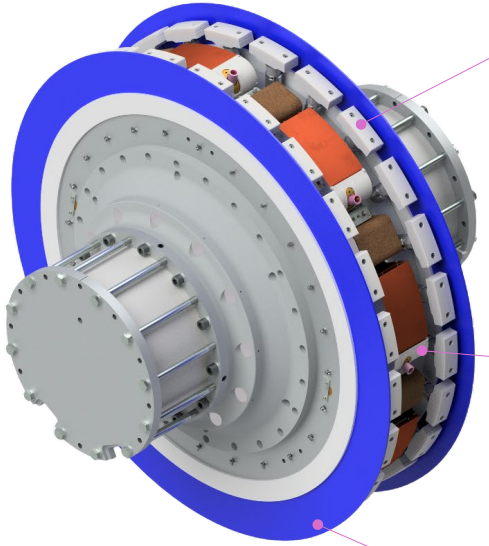
PROTECT:
Urethane strips installed at critical locations prevent abrasion and gouging of internal coating



MONITOR:
Data Logging system to monitor welds and integrity

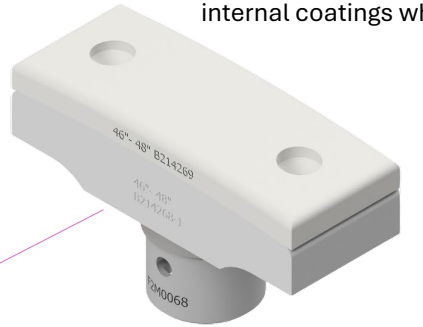


REMOVE:
Air amplification technology removes debris from sensitive areas

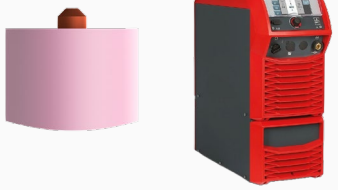


CONTAIN:
Engineered shielding and guarding solutions prevent widespread distribution of spatter

PROTECT:
Specialized shoe caps prevent damage to internal coatings when clamping



CONTROL:
Proper **torch tip spacing**, and **welding process** is critical to minimizing spatter



Control - Protect - Contain – Monitor - Remove

Data Collection and Utilization

Data Management platform to tag, collect, monitor, transform, visualize, and report the critical parameters of every joint welded for new pipeline construction – a virtual pipeline.

QC person Onsite

- Real-time View
- Custom Reporting
- Real-time Analysis
- Data Management & Sanctity
- Innovative Weld/Joint ID Management
- Post Weld Analysis & ADR

aws

Smart Lync

API/CSV/ PDF

Customer QC System

Web dashboard to access Data

Wireless Access Point with internet connectivity

STARLINK

Station 1

Internal Welder

Station 2

CCW CW

P-600Z | P-625

Station 3

CCW CW

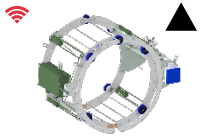
P-600Z | P-625

Station 4

CCW CW

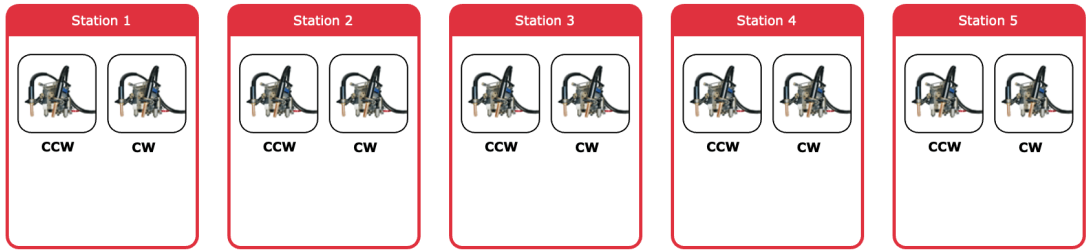
P-600Z | P-625

Station 5 *



MCL

Traditional DATA Collection

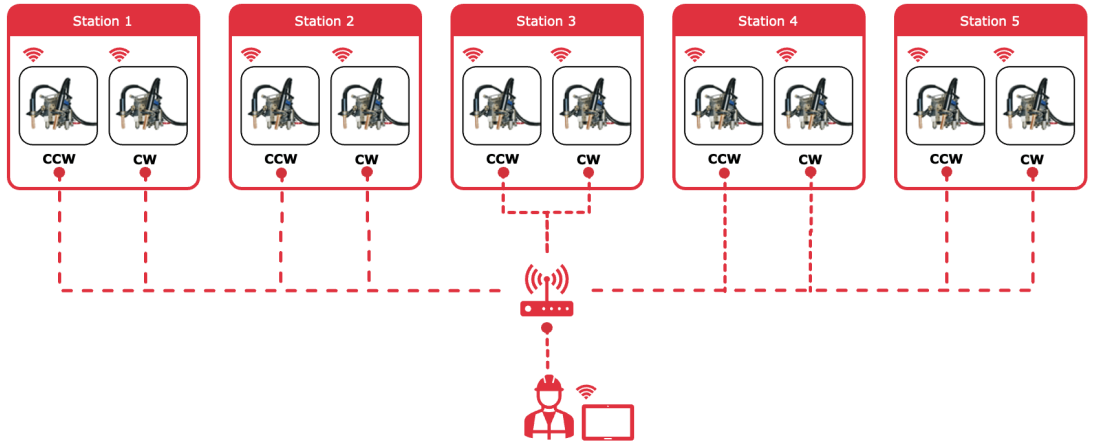


Step 1

Collect Data from each station

* 150 to 200 welds per day

DATA with Automatic Welding



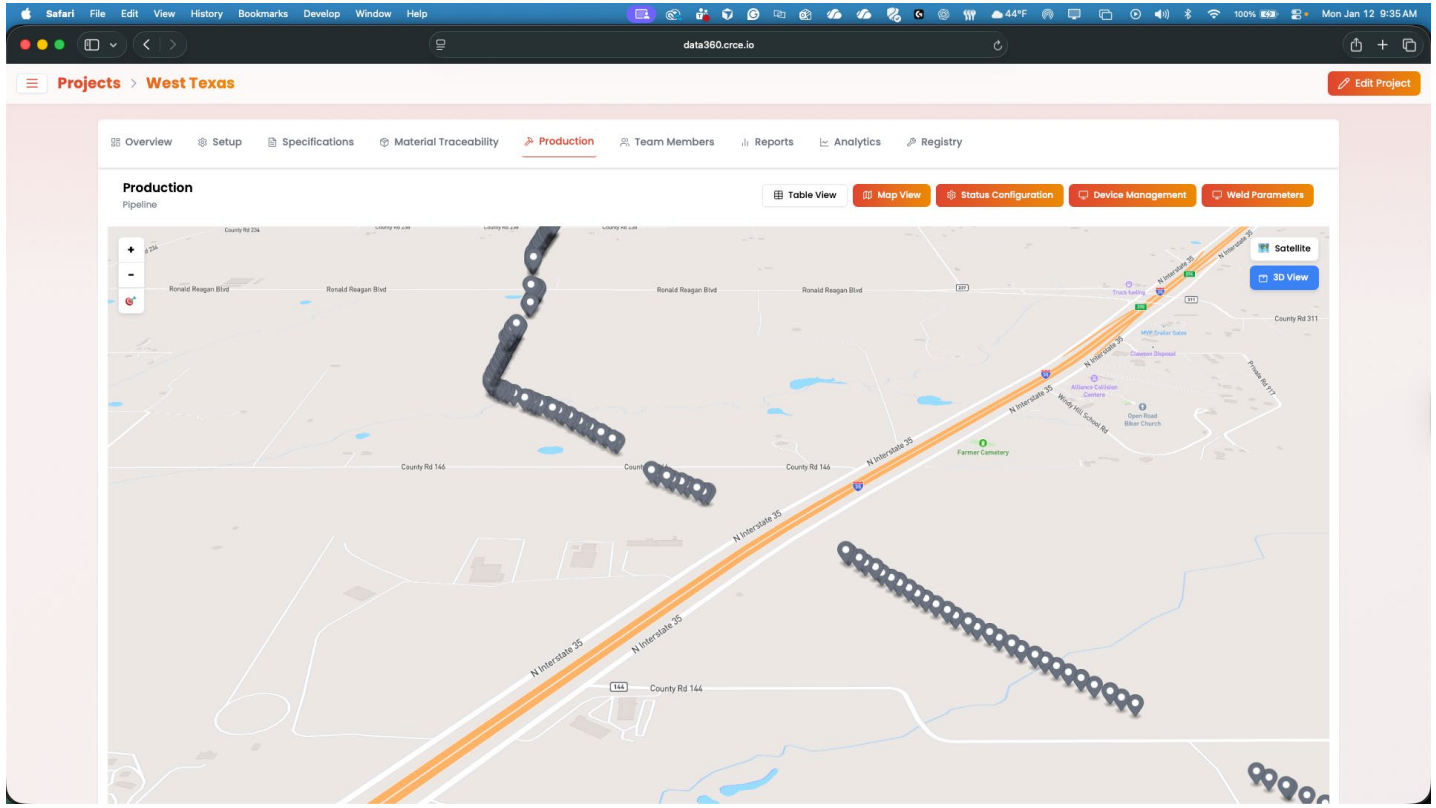
* 150 to 200 welds per day

Value Addition

- Extract and analyse data while welding (Real-time View)
- Quicker Data Analysis, in turn, reduced Downtime
- Accurate Weld ID Tagging
- Data Management and Sanctity (per project, per weld, per station, per pass)
- Faster and customized reporting (pass/zones)
- Reduces the number of personnel required on the firing line(from per station to per project)

We Have The Data, What Do We Do With It

- **As required QC reporting**
- **Real time project tracking**
  - Watch your project remotely
- **Weld defect prediction**
  - Meshing the data with inspection provides opportunities at defect prediction, specific shack or station issues and even down to personnel performance.
- **Predictive equipment maintenance**
  - Notification to welding technicians before a complete failure occurs
- **End of project digital copy**
- **Service life extensions**



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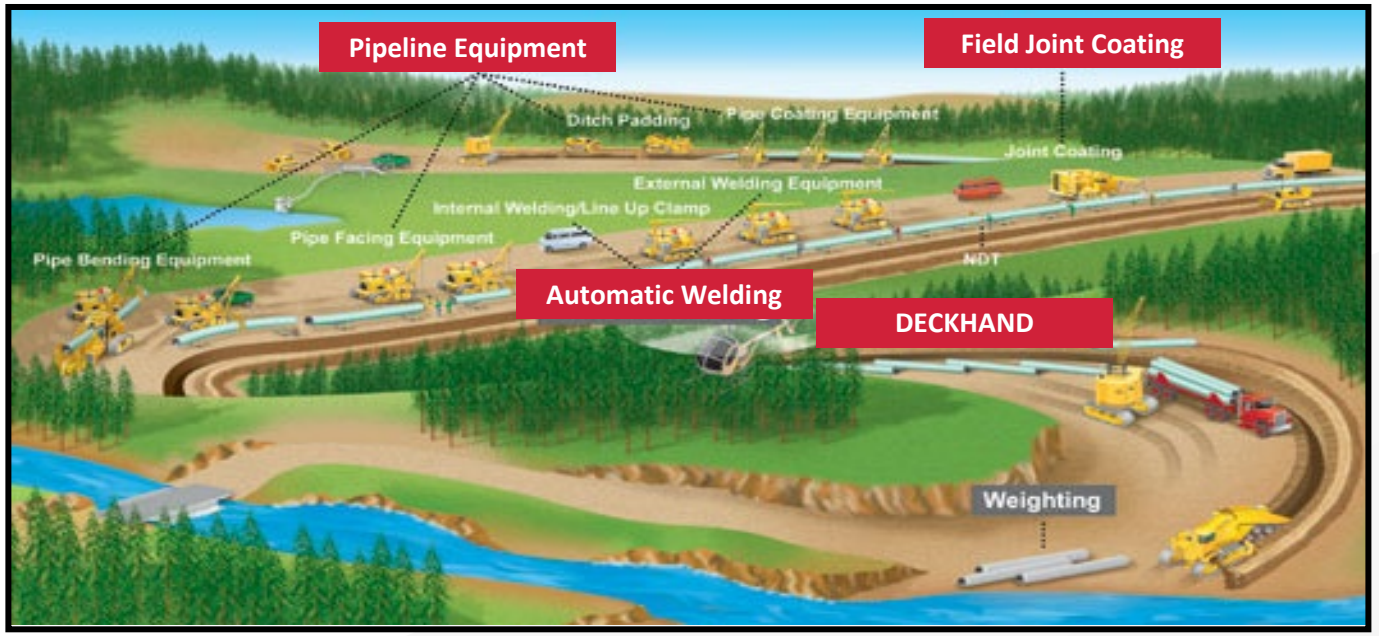
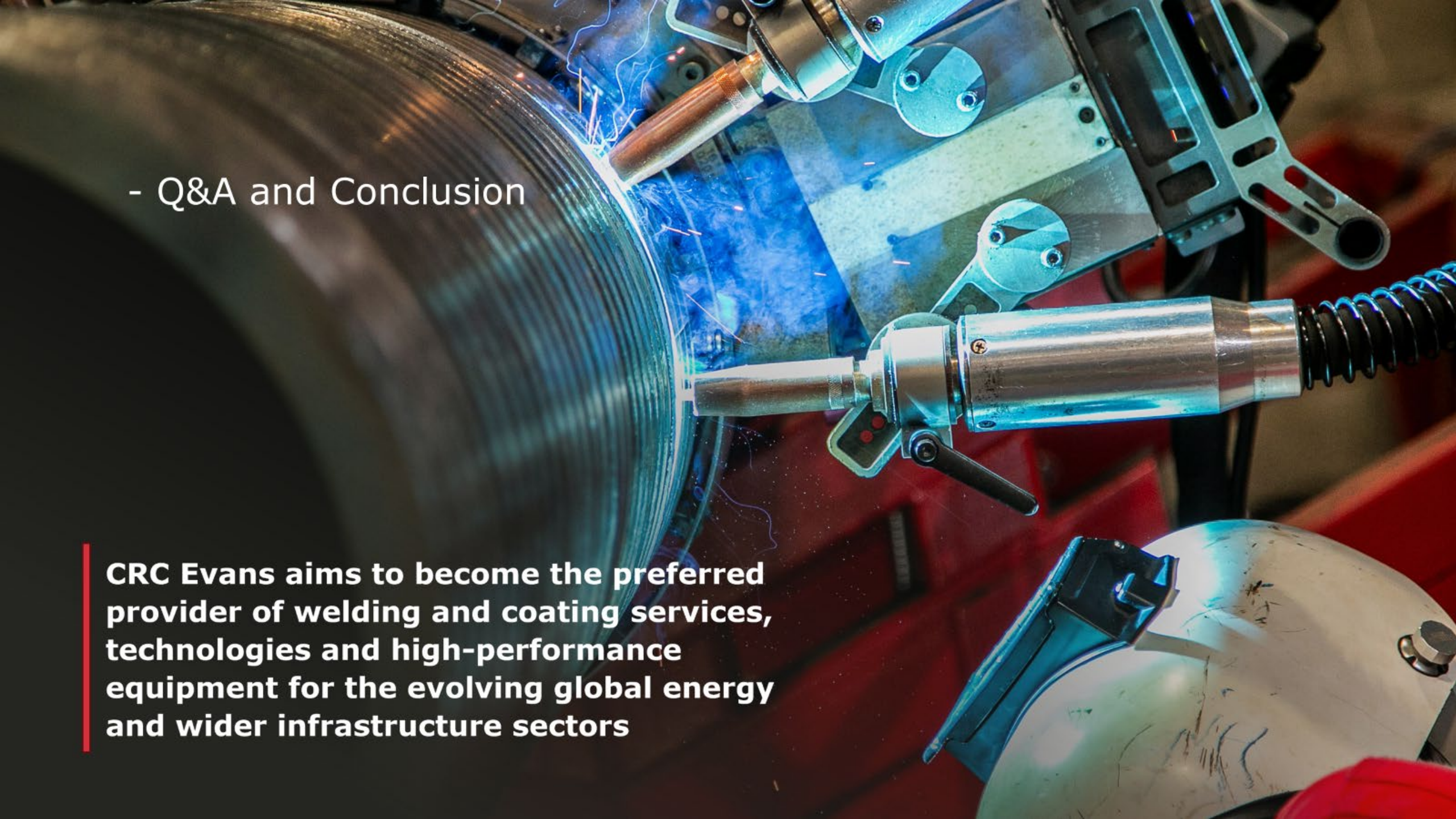


SELECT KEY OPERATIONAL SITES

Houston, TX, USA	Aberdeen, UK	Zeewolde, NL
		
Total Area – 63k sq. ft.	**Total Area – 59k sq. ft.**	**Total Area – 63k sq. ft.**
128 employees	127 employees	42 employees

SELECT KEY MANUFACTURING AND SERVICE LOCATIONS

Burnley, UK	Tulsa, OK, USA	Katy, TX, USA
		
Total Area – 44k sq. ft.	**Total Area – 146k sq. ft.**	**Total Area – 21k sq. ft.**
178 employees	255 employees	50 employees



- Q&A and Conclusion

CRC Evans aims to become the preferred provider of welding and coating services, technologies and high-performance equipment for the evolving global energy and wider infrastructure sectors