AUTOMATION IN FIELD JOINT COATING

Advances in FJC Application Technology
STANLEY OIL & GAS, CRC-EVANS, PIH

Automatic Welding

- World Leader For Onshore & Offshore Pipeline Construction
- Extensive Range Of Equipment For Variety Of Applications
- Boosts Operational Speed, Maintains High Quality

Inspection

- Provides Specialist Inspection, Quality Assurance And Testing
- Automated Ultrasonic Process For Various Pipeline Projects
- Full-Service Offering Inclusive Of Ultrasonic & Magnetic Tests

Field Joint Coating

- Protect Pipeline From Corrosion, Heat Loss, Damage
- Repeatable | High Coating Production Rates
- 30+ Years Of Experience In Onshore, Offshore Coating
GLOBAL OPERATIONS

Offices

PIH, Burnley

Johor Bahru

representative

Offices
OVERVIEW

• PIH – Field Joint Coating Contracting Company (Services)

• Leading player within global pipeline industry

• Services
  – Equipment design and manufacture
  – Materials
  – Skilled operators
  – Project management
PIPELINE INDUCTION HEAT

Pipeline coating

field services (field joint coating)
THE USE OF AUTOMATION FOR THE INSTALLATION OF FIELD JOINT COATING MATERIALS

• Following slides show some common types of FJC carried out:
  – Onshore
  – Offshore
  – Spool base*
  – Construction Yard
  – Custom Coating
• Automation Development*
APPLICATION OF FIELD JOINT COATING SYSTEMS
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Cross Section Illustrating the Application of ‘MCL’ to Pipeline Field Joints

Pipe wall
MCL Field Joint Coating
Extruded Polyethylene / Polypropylene Topcoat
FBE Primer Layer
Copolymer Adhesive Layer
Weld

50-75 mm
150 mm
20-35 deg
APPLICATION OF FIELD JOINT COATING SYSTEMS

As pipelines and flow lines became longer and longer – increased number of joints to be treated (in the field).

• 400 km pipeline = +30,000 joints

• Each joint protected, with a equal degree of quality (application)

A need to automate the installation process of the field joint coating system (eliminate human error factor, as much as possible)

automation ➔ repeatability ➔ quality ➔ long term integrity
ONSHORE

Systems include:
FBE, Fused 3LPE, PP Flame Spray, MCL, HSS
Offshore

Systems include:
FBE, Flame Spray, HSS, IMPU, IMPP,
PU Foam Infill
Systems include:
FBE, Fused 3LPP, Flame Spray, HSS, IMPU, IMPP
CONSTRUCTION YARD (OFFSHORE)

Systems include: FBE, Flame Spray, HSS, GSPU, IMPU, IMPP...
Subsea structures: PLEMS, PLETS, ....
CUSTOM COATING PLANT

Systems include:
FBE, Flame Spray, GSPU, IMPU, IMPP, ....
PIPELINE INDUCTION HEAT

AUTOMATED APPLICATION EQUIPMENT

SPOOL BASE ACTIVITIES and QUAD JOINTING
THE USE OF AUTOMATION FOR THE INSTALLATION OF FIELD JOINT COATING MATERIALS

- Automation Development*
- Quad Joint Facility Chosen
  - Equipment Development Suited Towards A Factory Type Environment.
  - Pipe Travels Through Equipment.
  - High Output Required.
QUAD JOINTING

Unique Opportunity with large Diameter Quad joints to have FBE layer below HSS.
AUTOMATED APPLICATION EQUIPMENT

Background

Key stages for the installation of FJC systems, as part of offshore pipeline construction are:

- Surface preparation
- Heating
- Application
- Cooling

Current technologies

- Traditional equipment requires multiple stations
- Traditional equipment requires a degree of human intervention
- Traditional equipment is diameter specific
- Traditional equipment can give rise to material contamination within the work station - HSE Noise, Dust from - blast media, FBE powder, water (quenching)
AUTOMATED APPLICATION EQUIPMENT

Need

• Fully contained units
• Fully automated units
• Minimise work stations – multifunctional units

Solution

• Fully automated, closed cycle blast unit
• Fully automated, combined Heat and Coat unit for the application of FBE (one station)
  – automated heating throughout application of FBE
  – 3 D printer-modeling produced coating deposition heads – thickness control
• Fully automated, application of polyolefin and polymer insulation materials. *In this particular case study by Others*
• Fully automated quenching units
AUTOMATED APPLICATION EQUIPMENT

1. Automated water jet cleaning
2. Automated closed cycle blasting
3. Automated pre heat + FBE coating
4. CANUSA IntelliCOAT
5. Automated Quenching
6. Automated holiday detector
EQUIPMENT FUNCTIONS

1. HYDRA- Two Versions
   - High Pressure Water Wash
   - Low Pressure Water & Air Quench

2. SABRE- Closed Cycle Blast Unit
   - Lower Noise and Dust

3. RAPTOR- Heat & Coat Unit For FBE
   - Plus CMPP Or Dual Layer FBE
   - Lower Steel Temperature Due to One Unit and Controls.
SUMMARY

APPLICATION OF FIELD JOINT COATINGS
BY USE OF AUTOMATION:

• ELIMINATE HUMAN ERROR
• INCREASED PRODUCTIVITY – CYCLE TIMES
• REPEATABLE CYCLE TIMES
• REPEATABLE QUALITY
• INCREASED CONTROL OF APPLICATION PARAMETERS
SUMMARY – APPLICATION OF FIELD JOINT COATINGS BY USE OF AUTOMATION

Blast preparation

Semi automated closed cycle

Fully automated closed cycle
SUMMARY – APPLICATION OF FIELD JOINT COATINGS BY USE OF AUTOMATION

Fusion Bonded Epoxy

Pre heat

Powder application

Combined pre-heat and coating machine (1 station)
SUMMARY – APPLICATION OF FIELD JOINT COATINGS BY USE OF AUTOMATION

Quenching

Water quench

Fully automated closed cycle
SUMMARY

APPLICATION OF FIELD JOINT COATINGS

BY USE OF AUTOMATION:

• Progressing Well In Offshore Markets
  – IMPP
  – HSS
  – PP

• Transitioning Into Certain Onshore/Offshore Activities.
  – Added Complexity for Certain On Pipe Equipment
Offshore Automated Blast Unit
Application of Multi-Component Liquid (MCL)

Evolution:
2011 - “Fully Automated Spray Technology” (F.A.S.T)

- Temperature control and monitoring (viscosity, “fan”)
- Online monitoring and recording of mixing ratio
  “stall check” after every application (joint) - will not allow coating to continue if any irregularities detected (alarms / shut-off system)
- Correct flushing and “loading” of lines
- Recording of physical parameters; ambient temperature and humidity
- Logging of time, date
- Logging of batch numbers and coating material
- Can easily change settings for higher or lower thicknesses
Application of Multi-Component Liquid (MCL)

- automatic spray machines, “rotating, on-pipe equipment”
  - spray head is always perpendicular to pipe substrate
    - Environment
    - H&S

Manual spray – excessive overspray to ROW, hazards to operator and the environment (HSE)
Application of Field Joint Coating systems

**Application 3 layer PE or PP**

*Fused Field Joint (3LPP and 3LPE)*

- Predominantly used in offshore industry and HDD pipes
- Controlled, application, speed
  - Highly repeatable
- High performance (3 layer)
- Long term integrity

Manual, hand applied tape and HSS

Automated application equipment with heat-assisted, Fused Field Joint system (3LPE and 3LPP)
EQUIPMENT DEVELOPMENT
BESPOKE POC & DESIGN BUILDS - KAOMBO

IMPP Spools Design

IMPP Deck Station Design

IMPP Multi jointing Design

Offshore Raptor

Offshore Jlay Sabre

Offshore Jlay Raptor
SOUTH STREAM

PIPELINE INDUCTION HEAT
SOUTH STREAM
VIDEO / ANIMATION
Stanley Black & Decker