Production achievements on ZOHR project Welding deployment on offshore fast track project with multiple laying vessels





MILAN MARRIOTT HOTEL • MILAN, ITALY • 9-11 APRIL 2018

MCE Deepwater Development 2018

Production achievements on ZOHR project

- Project figures and peculiarities
- Innovative Technical Solutions
- Procedures development
- Procedures offshore implementation
- Project organization
- Production achievements





Project figures and peculiarities

- Project figures
 - 440kms of Carbon Steel sour service lines (26"x38,8mm & 14"x23,8mm)
 - 220kms of Carbon Steel sweet service line 8"x20,6mm)
 - o 18kms of 625 Clad line 14"x20,4mm
 - Water depth ranging from few meters to 1500m
 - Up to 6 laying and installation vessel simultaneously on the field (Castorone, CastoroSei, Castoro 10, FDS, S7000, PMS12 local subcontractor)
- Project peculiarities
 - Copper shoes forbidden for sour service lines
 - Internal visual inspection and tight acceptance criteria for Clad lines
 - Fast track schedule
 - Engineering activities start : March 2016 5 Months
 - Start of WPQT : early July 2016
 - Start of first offshore campaign : **15th December 2016**



5 Months

Project figures and peculiarities



Deep water Clad FDS

Vessel	Scope	Multiple joint pre-fabrication
Castorone	Deep Water S-Lay	Triple joint
Castoro Sei	Shallow water S-Lay	Double joint
PMS12	Shallow water S-Lay	Single joint
FDS	Deep Water CLAD J-Lay	Quadruple joint
Castoro 10	AWTI 5G	N/A
S7000	PLET Tie-In 2G	N/A



PLET Tie-In with S7000





Shallow water CastoroSei

D

ATER DEVELOPMENT



Deep water Castorone

AWTI with Castoro10



Innovative technical solutions – Ceramic backing

- Ceramic coated steel shoes
 - Steel shoes with ceramic coating (SAIPEM patented solution)
 - Prevent any copper pick-up
 - Provide better fit-up tolerances / Mitigate pipe movement during welding
- Low heat input root process
 - Use of STT generators
 - Support of LINCOLN for overall welding procedure development
- Production feedbacks
 - Very robust welding procedure
 - Improved root pass quality, reliability and productivity compared to current competitors solution without backing







Innovative technical solutions – Internal plasma re-melting

- Philosophy
 - Internal re-melting system, directly connected to Internal clamp (SAIPEM patent)
 - Correction of surface / geometric indications detected by internal visual inspection
 - Integrated camera for visual inspection
 - Deployment on all SAIPEM fleet
- Benefits
 - **First class root quality**: flat and regular profile, guaranty a defect-free layer at internal surface (Ex : CRA materials)
 - Reliability, repetitiveness and productivity
 - Easily inspected by AUT, radiography or visual inspection
 - High fatigue performance due to the flatness of the profile
 - All welding positions





Innovative technical solutions – Welding sequence

- Welding sequence
 - Retractable torches
 - Anti-collision system
 - Maximization of the efficient welding time 0
- Production feedback
 - 26" pipe : 4 welding bugs with 2 torch
 - 6 arcs at the same time
 - Lot of activities in overlap / masked time



F6+F7

■ F10+F11

F12+F13



Procedures development – Saipem Ploiesti Technology Center

- Location :
 - Ploiesti (Romania)
 - Centralized position (Black Sea, Caspian Sea, Persian Gulf, Mediterranean and North Seas)
 - Fast connection with the main Saipem Hubs in Europe-Middle East

• Activities :

- Focal point of all in-house technologies (115 persons)
- Projects Procedure Qualification Tests (Welding, NDT, FJC applications)
- R&D (Welding, NDT, FJC Technologies and Equipment)
- Training of personnel (Technologists and Operators)
- Full scale resonance fatigue machine
- 96 engineers in various offshore hubs





Procedures development – Saipem Ploiesti Technology Center

- Welding Equipment :
 - Offshore representative technologies
 - Up to 12 welding stations, from manual applications to fully automatic equipment (external and internal systems, single and multi-torch)







- Conventional NDT (RT bunker)
- In house AUT system for weld inspection and AUT validations
- Plan for 2018
 - Equipment for reeling qualification (full scale bend test)
 - In-house mechanical test laboratory





Procedures development – Saipem Ploiesti Technology Center

- Field Joint Coating technologies :
 - Saipem has invested since 2008 on FJC Technology.
 - full range of anti-corrosion, insulation and profile infill solutions for various pipeline FJC applications (Subsea, flowlines and SCRs)



• R&D:

- Welding Technology and equipment
- NDT Technology and equipment
- FJC Technology and equipment
- Pipeline equipment
- Testing of new prototypes



Procedures Offshore implementation

• Constraints :

- More than 220 welders to be qualified to cover the different vessels
- Multiple welding procedures (automatic and manual)
- Training school :
 - Organized onboard CastoroSei
 - Refresh and qualify the welders
 - Set-up the welding sequence
 - Reduce the learning curve during production
- Future improvement
 - Pre-selection with 3D simulation software









Project organization



ATER DEVELOPMENT







12

Production achievements

- Carbon Steel 8"x20,6mm Sweet service
 - Welding on copper backing
 - Production peak above 8kms / day
 - Very low repair rate
- Carbon Steel 26"x38,8mm Sour service
 - Welding on ceramic backing
 - Production peak above 4kms / day
 - Low repair rate
- Clad 14"x17,4 + 3mm Inconel 625
 - Internal plasma re-melting
 - Production peak :
 - above 40 welds/day in 5G
 - above 20 welds/day in 2G







Conclusion

- ZOHR was a challenging project, technologically and schedule wise
- Many resources and skilled staff were mobilized in parallel (Engineering, R&D, Assets, laying vessels, equipment, etc.)
- New procedures and technologies have been specifically developed and successfully implemented
- Company's milestones were reached in advance compared with Project deadlines
- Throughout the entire project, SAIPEM has demonstrated its ability to conduct fast track project, with high technical constraints
- This is again confirmed on the ongoing extension campaign



Thank you for your attention Do you have any questions ?

