



Metallurgy, Welding and Coating



Specialist Support to Project Engineering:

CESCOR has specialist competences in metallurgy, welding and coating supported by the in-house expertise in corrosion and materials engineering.

Our background is primary Oil & Gas, but it includes also renewables (Fig. 1), plus other industrial and civil sectors.

CESCOR can support engineering at different project stages; tasks include:

- Preparation and review of project documents for materials, welding and coating
- Technical bid evaluations
- Review of contractor/supplier technical documentation
- Technical support at qualification and production test stages.



Fig. 1 - Wind turbine

CESCOR has the in-house expertise to support engineering tasks related to metallurgical aspects for Oil & Gas onshore and offshore piping and pipeline components (tubular products, line pipes, induction bends, fittings, valves, isolation joints, flanges, heavy wall forgings, etc. see Fig. 2 and 3), equipment and structures in different services. Our expertise and services are transferable to renewables, civil, industrial and other infrastructure facilities.



Fig. 2 - Onshore piping section and associated components

Typical tasks consist of:

- Preparation and review of technical specifications and data sheets in accordance with international standards such as ISO 3183, API 5L/5LC/5LD, DNV-GL-ST-F101, ISO 15590, ASTM's, API 6A/17D, NORSOK M-650, DNVGL-RP-F119, etc. for different metallic materials (e.g. carbon/manganese steels, low alloy steels, corrosion resistant alloys used as solid material or clad / lining) and non-metallic materials (e.g. thermoplastic composite pipes), for offshore and onshore applications
- Support to preparation and review of material requisitions / material take off
- Review and acceptance of manufacturing procedure specifications and inspection test plans for qualification or production purposes, including heat treatment procedures and testing schedule for qualification of forged items (e.g. as per DNVGL-RP-0034)
- Review and acceptance of mechanical, chemical and corrosion test procedures and test reports in accordance with international standards such as ISO, NACE, ASTM's, etc.
- Review and acceptance of MPQT data and manufacturing record books (MRB)
- Specialist support for technical bid evaluations
- Compliance of equipment with ISO 15156 / NACE MR 0175 for sour service at different project stages
- Represent the client in Quality audits, Kick-off Meeting, Pre-production Meeting or clarification meetings prior to qualification / production
- Fabrication site management / supervision and QA/QC
- Laboratory and full-scale test witnessing
- Site support through Non-Destructive Testing (NDT) specialists qualified to ISO 9712 and ASNT TC-1A.



Fig. 3 - Fittings and valves

Welding

CESCOR personnel are qualified in accordance with the International and European Institute of Welding (IWE/EWE) for welding engineering. In addition, CESCOR personnel hold welding inspection qualifications such as PCN Level 2, CSWIP 3.1 or equivalent.

CESCOR can provide engineering support related to welding for Oil & Gas onshore / offshore piping and pipeline systems (Fig. 4), equipment and structures in different services (Fig. 5).

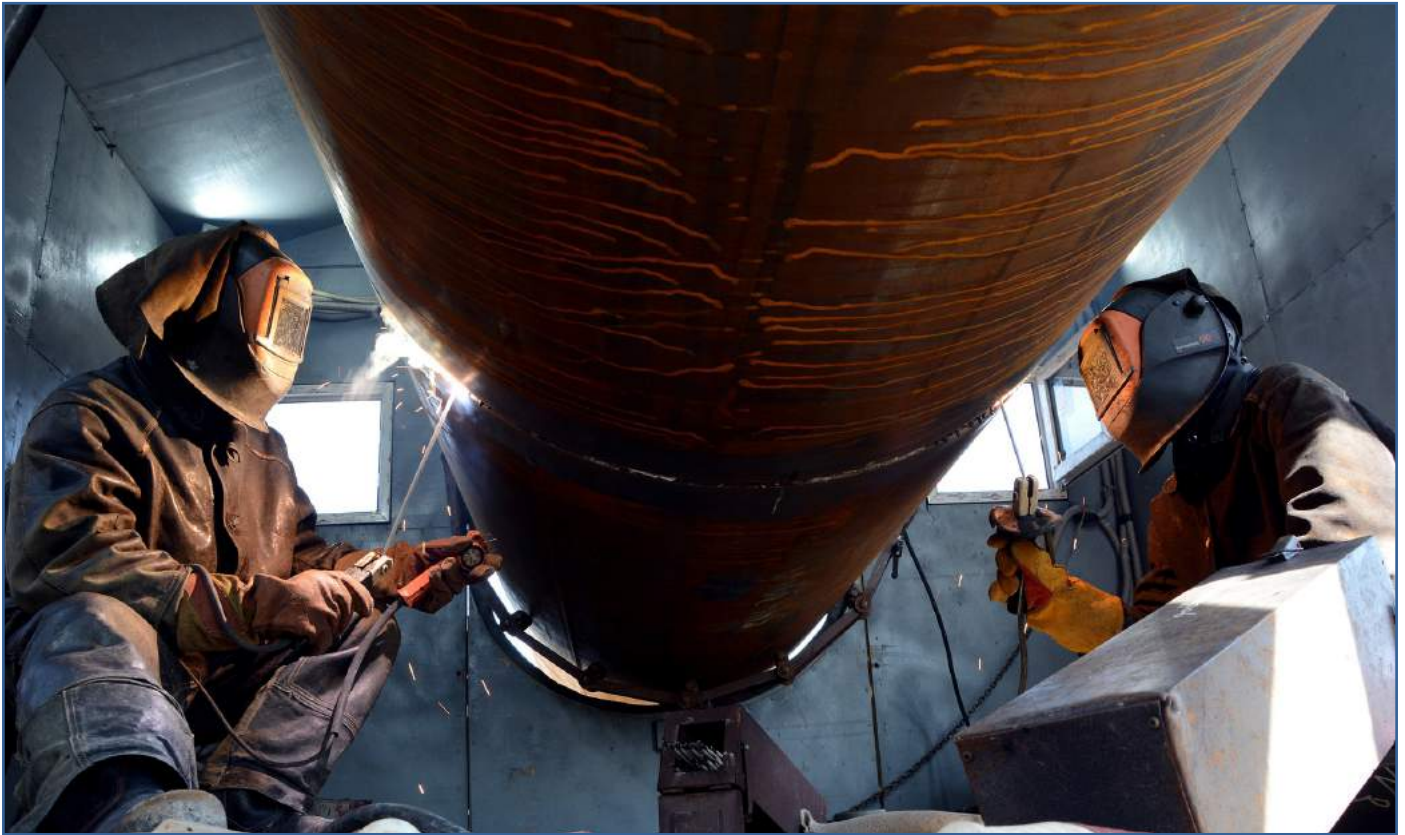


Fig. 4 - Pipeline welding

Typical tasks consist of:

- Preparation and review of welding specifications in accordance with international standards such as ASME BPV Code Section IX, ISO 15614, ISO 13847, Norsok M101, EEMUA 158, AWS D1.1, API 1104, DNVGL-ST-F101
- Review of Welding Procedure Specifications (WPS) and Welding Procedure Qualification Records (WPQR) for main-line as well as repair welds
- Witnessing of welding procedure and welder performance qualifications
- Full scale or laboratory testing and witnessing
- Review of inspection reports
- Review of welder qualification records and welding books
- Support the Client in developing the WPS/WPQR in line with project specifications and international standards for materials such as unalloyed, low alloy steels, clad carbon steel, austenitic, ferritic, duplex, martensitic stainless steels, nickel alloys, etc.
- Performance of quality audits in accordance with ISO 3834 series
- Fabrication site management / supervision and QA/QC
- Site support through Non-Destructive Testing specialists qualified to ISO 9712 and ASNT TC-1A.

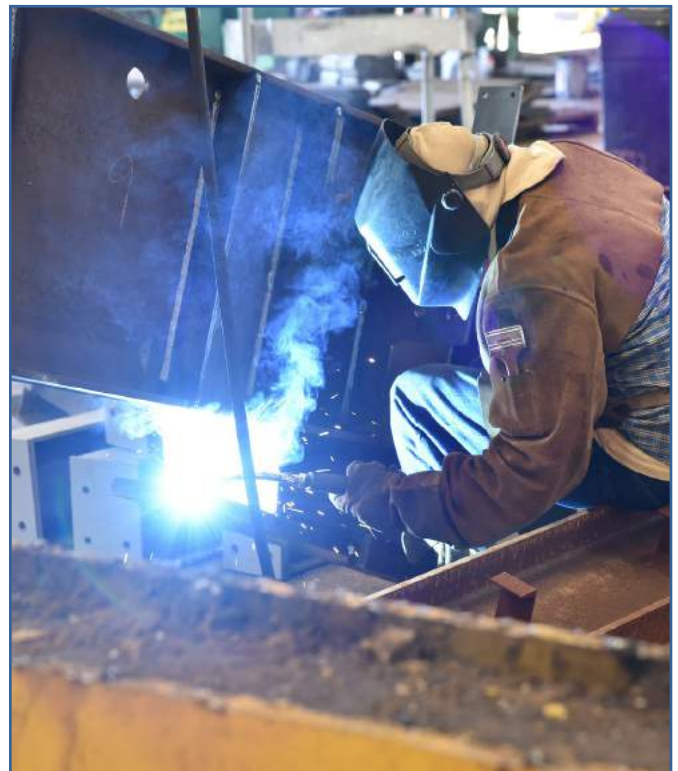


Fig. 5 - Welding of steel structures

Coatings

CESCOR also provides in-house expertise to support engineering activities related to coatings and insulation for Oil & Gas onshore and offshore piping and pipeline systems, equipment and structures in different services (Fig. 6).

CESCOR's personnel is qualified in accordance with NACE Level 2, Frosio, ICorr Level 2, BGAS/CSWIP Level 2 or equivalent for coating inspection.

Typical tasks consist of:

- Preparation and review of coating and insulation specifications in line with international standards such as DNV-GL-RP-F102, DNVGL-RP-F106, ISO 21809 series, NORSOK M-501 for factory applied or site applied systems
- Review and approve application procedure specifications datasheets and inspection test plans / coating schedules for new and maintenance / repair coating systems
- Technical consultation and support for coating and insulation systems such as solid and syntactic polyurethane, polypropylene (PP), polyethylene (PE), 3 layer / multi-layer polyolefin systems (3LPE, 3LPP), concrete weight coating systems and field joint coating applications
- Technical support during proof of concept, qualification and production stage (PQT's, PPT's) including simulated service testing
- Provide specialist support in technical bid evaluations for various coating contractors
- Full scale or laboratory testing and witnessing – Review of inspection reports
- Laboratory testing specifications
- Factory or fabrication site supervision and QA/QC.



Fig. 6 - Coated line pipes




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