



Subsea Engineering Competency Profile

INTERNAL CORROSION AND CONTROL ELECTIVE

MC-002

The competency demonstrates the subsea engineer has acquired and applied knowledge to critically review or perform (under supervision) the engineering and management of factors affecting internal erosion and corrosion and their control in a subsea hydrocarbon production system.

ELEMENT OF COMPETENCE	WHAT THIS COMPETENCE MEANS IN PRACTICE	INDICATORS OF ATTAINMENT
<p>Working knowledge of internal corrosion mechanisms applicable to carbon steel, stainless steels, corrosion resistant alloys and non-metallic materials including:</p> <ul style="list-style-type: none"> ● CO₂ / H₂S corrosion ● Microbial corrosion ● Galvanic corrosion ● Oxygen corrosion (MEG circulation) ● Erosion and erosion-corrosion mechanisms ● Ferrous contamination of stainless steels ● Mercury corrosion ● Pitting corrosion ● Preferential weld corrosion 	<p>Can:</p> <ul style="list-style-type: none"> ● identify items and areas at risk of these mechanisms ● describe the impacts of trace contaminants on such as H₂S, organic acids, elemental sulphur, oxygen, wax, solids on corrosion rates ● perform a corrosion risk assessment for the mechanisms listed ● identify and understand the internal corrosion mechanisms in subsea equipment 	<p>Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence</p> <p>Has reviewed or contributed to corrosion risk assessments or management plans on several projects</p>
<p>Working knowledge of internal cracking mechanisms, including:</p> <ul style="list-style-type: none"> ● Sulphide stress cracking ● Hydrogen induced cracking ● Stress corrosion cracking (chloride, amine) ● Liquid metal embrittlement (mercury) 		



Subsea Engineering Competency Profile



ELEMENT OF COMPETENCE	WHAT THIS COMPETENCE MEANS IN PRACTICE	INDICATORS OF ATTAINMENT
<p>Working knowledge of</p> <ul style="list-style-type: none"> flow assurance and production processes and their impact on internal corrosion. process control, corrosion monitoring, inspection) necessary to manage CO₂ / H₂S corrosion risks the likely range of upset conditions over the life of the asset <p>Working knowledge of corrosion risks associated with non-production fluids including MEG, methanol, chemicals and other risks which may be introduced over the life cycle.</p>	<p>Can critically review a functional specification for:</p> <ul style="list-style-type: none"> A high-level design (type, location, base equipment, capacity) for a corrosion inhibitor injection system An inhibitor or pH stabilisation chemical and understand the qualification and selection processes The design features (corrosion allowance, material selection), integrity limits and operating practices. 	<p>Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence</p> <p>Has critically reviewed corrosion management plans and functional specifications in several projects across several applicable materials and operating environments.</p>
<p>Working knowledge of internal corrosion control measures including:</p> <ul style="list-style-type: none"> water removal and/or dew-pointing coatings, cladding, linings or non-metallic materials Control of operating temperature (cooling) Continuous / batch inhibitor dosing pH stabilisation 	<p>Can:</p> <ul style="list-style-type: none"> select and specify effective internal corrosion control measures on a greenfield project review the appropriateness and performance of existing and alternate corrosion control measures on brownfield sites 	
<p>Working knowledge of monitoring and inspection methods including interpretation of results for:</p> <ul style="list-style-type: none"> inline inspection pigging external inspection methods corrosion monitoring spools / sand detectors erosion / corrosion probes or coupons permanently mounted wall thickness sensors 	<p>Can:</p> <ul style="list-style-type: none"> Select and specify appropriate corrosion monitoring facilities and monitoring programme for a project Specify and supervise a qualification programme for subsea corrosion monitoring equipment 	<p>Has developed corrosion monitoring and inspection plans and functional specifications in several projects involving several monitoring and inspection methods.</p>



Subsea Engineering Competency Profile

ELEMENT OF COMPETENCE	WHAT THIS COMPETENCE MEANS IN PRACTICE	INDICATORS OF ATTAINMENT
<ul style="list-style-type: none"> production fluid analysis 	<ul style="list-style-type: none"> Review and understand chemical performance data, inspection data, and corrosion monitoring data and react accordingly. 	<p>Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence</p>
<p>Working knowledge of internal corrosion management during:</p> <ul style="list-style-type: none"> fabrication, storage and transportation installation flooding, hydrotesting or wet parking hook-up and pre-commissioning start-up and commissioning <p>Working knowledge of the risks of internal corrosion during start-up and commissioning including:</p> <ul style="list-style-type: none"> Well clean-up fluids Completion fluids Unexpected early life corrosion 	<p>Can understand the technical basis for preservation specifications and procedures to ensure equipment does not suffer internal corrosion prior to start-up.</p> <p>Can write or review post hook-up corrosion mitigation programmes to remove corrosion risks from seawater ingress (e.g. flushing, chemical treatment etc.)</p>	<p>Has developed corrosion mitigation plans and procedures across several projects.</p>
<p>Awareness of prominent industry corrosion models and commercial corrosion prediction software and their limitations on accuracy and sensitivity of results to source data.</p> <p>Awareness of failure analysis and investigation procedures as a result of internal corrosion</p>	<p>Can commission the relevant expertise to determine the cause(s) of corrosion-related subsea equipment damage and failure from inspection reports, process data, mechanical design and operations data.</p>	<p>Has participated in failure analyses / investigations as a result of internal corrosion.</p>