



Subsea Engineering Competency Profile

PROCESS ENGINEERING AND FLOW ASSURANCE ELECTIVE

FDP-004

This competency demonstrates the subsea engineer has sufficient knowledge and experience to effectively and successfully perform or supervise or approve fluid characterisation, process design and definition of subsea processing system elements, steady state hydraulic analyses and transient hydraulic analyses from the well completion through to the inlet separator of a topsides or onshore facility.

ELEMENT OF COMPETENCE	WHAT THIS COMPETENCE MEANS IN PRACTICE	INDICATORS OF ATTAINMENT
<p>Working knowledge of fluid sampling and characterisation including:</p> <ul style="list-style-type: none"> • Live and dead fluid sample collection methods and limitations • Definition of laboratory analyses including PVT testing, compositional analyses and testing related to various forms of solids. • Interpretation of laboratory reports • At least two industry-wide fluid characterisation software packages • Applicability and limitations of various equations of state and other characterisation methods (including black oil models). 	<p>Can define a fluid sampling, testing and storage programme appropriate for the reservoir's anticipated fluid types and reasonably foreseeable flow assurance issues which might be associated with developing that reservoir.</p> <p>Can develop characterised fluids ready for use in subsequent steady state or transient process software or flow assurance software, with sufficient accuracy in the temperature and pressure ranges of interest for the development.</p>	<p>Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence</p> <p>Has led or supervised the definition of a fluid sampling and testing programme on at least one development resulting in pre-FEED, FEED or detailed design.</p> <p>Has led or supervised the characterisation of process fluids in at least three projects in pre-FEED, FEED or detailed design.</p>
<p>Expert knowledge of common flow assurance fluid chemistry issues including:</p> <ul style="list-style-type: none"> • Hydrates – including typical structures and blockage formation tendency • Wax deposition and gel formation– including typical fluid analysis methods, wax appearance 	<p>Can describe conditions under which the solids are likely to appear, the structure of the solids and the tests required to identify if the solids will pose a problem to the operation of the system</p> <p>Can identify potential chemical treatment solutions and define the testing requirements associated with appropriate chemical management strategies.</p>	<p>Has successfully identified several of these issues and targeted subsequent fluid testing, and/or chemical testing, and/or flow assurance modelling to mitigate these issues on at least three projects in pre-FEED, FEED or detailed design.</p>



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<p>temperature test methods, wax melting test methods and gel strength testing methods.</p> <ul style="list-style-type: none"> Asphaltenes, including SARA testing Scale deposition <p>Working knowledge of production chemicals including inhibitors for corrosion, hydrates, waxes, gels, emulsions, asphaltene and scales.</p>	<p>Can prepare operating strategy and philosophy reports including the mitigation and management of flow assurance related issues such as hydrates, paraffins, asphaltenes, oil gelling, corrosion, erosion, solids deposition, scaling, emulsions, etc.;</p>	<p>Refer to only as many Indicators of Attainment as you need to demonstrate the Element of Competence</p> <p>Has participated in a team mitigating an upset condition arising from flow assurance hazards on an operating subsea production system.</p> <p>Has prepared or reviewed flow assurance design basis, project execution plan, specifications and tender documents</p>
<p>Expert knowledge of flow assurance management strategies for liquids and hydrates.</p>	<p>Can short-list the most appropriate strategy / strategies prior to commencing detailed analysis for a development</p>	<p>Has led or supervised a flow assurance team in at least three projects in concept or pre-FEED phases and short listed and/or selected the appropriate liquids and hydrate management strategies.</p>
<p>Expert knowledge of steady state hydraulic and thermal analysis including:</p> <ul style="list-style-type: none"> At least one industry-wide steady state flow assurance software packages All types of multiphase flow regimes and their relative locations on a typical flow regime map How the results of steady state analysis are used by other engineering disciplines in designing their respective elements of the development. How to use steady state modelling results to make preliminary estimates of transient behaviours and thus shortlist or select optimum line size in conjunction with economic input prior to commencing detailed transient analysis 	<p>Can define a case map of steady state parametric results suitable for both progressing flow assurance definition and as input data for other engineering disciplines.</p> <p>Can use steady state modelling results to make preliminary estimates of transient behaviours and thus shortlist or select optimum line size prior to commencing detailed transient analysis.</p> <p>Can perform steady state and dynamic simulations using industry standard software and prepare reports relating to pipe sizing, thermal performance, flow regime, slugging, chemical injection, start up, shut down, pigging</p>	<p>Has led or supervised a flow assurance team in at least three projects in pre-FEED, FEED or detailed design phases.</p>



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<p>Expert knowledge of transient hydraulic and thermal analysis including:</p> <ul style="list-style-type: none"> • At least one industry recognised transient flow assurance software packages • How to use the transient modelling results to simulate normal operation of the system (from start-up, ramp-up, steady state, turn down, shut in) and abnormal operations (depressurisation, well clean-up, pre-commissioning, commissioning, etc.). • How the results of transient analysis are used to ensure safe operation of the system. 	<p>Can define a case map of transient results suitable for both progressing flow assurance definition and as input data for other engineering disciplines.</p> <p>Can use transient modelling results to make estimates of operating behaviours of the system and help develop operating guidelines a/ procedures.</p> <p>Can prepare operating procedures and manuals to include production assurance issues, valve testing, well clean-up, pigging, etc. for use by operators.</p>	<p>Has led or supervised a flow assurance team in at least three projects in pre-FEED, FEED or detailed design phases.</p>
<p>Working knowledge of hydrate management strategies which do not rely on thermodynamic options.</p>	<p>Can define steady state and transient case maps suitable for non-thermodynamic hydrate management strategies.</p>	<p>Has participated in or analysed the results of at least two projects in pre-FEED, FEED or detailed design phases involving non-thermodynamic hydrate management strategies.</p>