



GOM Subsea Leak Detection (SSLD) Competency Management Process

GOM SSLD Competency Management Process

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1.1 Process Overview

- Competent Control Room Operators (CRO’s) are essential to ensure safe and efficient operations of Chevron’s deepwater facilities. In today’s deepwater offshore environment, with increasingly large production volumes, it becomes critical to integrate SSLD into the CRO training and competency management process.
- Training and competency on SSLD is critical since multiphase subsea systems present a challenge to quickly distinguishing a leak from normal conditions. Characteristics of subsea systems that make leak detection challenging is multiphase fluids, extreme elevation changes and often lack of instrumentation.
- To demonstrate competency, employees must be trained and assessed using this Standard to ensure requirements/expectations are met for managing SSLD. The Operator Training Simulator (OTS) is an excellent tool to use for providing training and delivering the ability to assess and verify CRO skill level.
- For facilities not employing an OTS, training and competency for SSLD can be accomplished using instructor-led and/or computer-based scenarios, the existing process control and alarm system screenshots and trending, checklists and process decision matrices/ trees.

1.1 Purpose and Objectives

Purpose

The purpose is to provide guidance for developing a CRO competency and verification procedure that utilizes training (OTS or other method) to ensure CRO’s have the skills and knowledge to rationalize subsea leak alarms and to manage the proper SSLD response.

All training, procedures, and communications for subsea leak detection shall support a ‘Think Leak First’ culture. If the CRO is in doubt, exercise stop work authority to shut-in affected wells/flowlines/drill center. When a subsea leak alarm is sounded, the CRO has full authority to shut-in the affected wells/flowlines/drill center.

Objective

Establish a GOM SSLD competency and verification procedure to develop CRO skills and competencies:

- to quickly detect subsea leaks and anomalies
- to understand asset-specific advanced monitoring solutions
- to rationalize leak alarms utilizing available tools and resources
- to respond properly to leak alarms, including escalation protocols.

1.2 Scope

All existing and future offshore operated subsea facilities, including 3rd party tiebacks

1.3 OE Expectations Met

A process is in place to enable the workforce to develop the skills and knowledge to perform their jobs competently, in a manner to prevent incidents, and in compliance with all applicable laws, regulations, company policies, and requirements. The process shall include:

- Identification of training needs for leaders, supervisors, and other members of the workforce.
- Initial, ongoing and regular refresher training.
- Worker awareness of their roles and responsibilities in achieving conformity with the requirements of OEMS and the potential consequences of departing from specific procedures.
- Documentation and assessment of training effectiveness

1.4 Regulatory

Operator training is regulated by 30 CFR 250 Subpart S – Safety and Environmental Management Systems (SEMS). SEMS states that training must address:

- Operating Procedures
- Safe Work Practices
- Emergency Response & Control Measures

Per SEMS, the training program must address:

- Initial training for the basic well-being of personnel and protection of the environment, and ensure that persons assigned to operate and maintain the facility possess the required knowledge and skills to carry out their duties and responsibilities, including startup and shutdown.
- Communication of any changes to procedures, safe work practices, or emergency response procedures, and training in those changes before personnel are expected to operate the facility.

1.5 Acronyms/Definitions

| Abbreviation | Description |
|--------------|--|
| BGF | Big Foot |
| BLF | Blind Faith |
| CBT | Computer Based Training |
| CFR | Code of Federal Regulations |
| CRO | Control Room Operator |
| CROC | Conditional Rate of Change |
| ERTC | Employee Resource Training Center |
| FMT | Flow Management Tool |
| GOM | Gulf of Mexico |
| I&C | Instrumentation & Controls |
| JSM | Jack & St. Malo |
| LMS | Learning Management System |
| MIMO | Mass In Mass Out (Mass Balance) |
| OTS | Operator Training Simulator |
| QC | Quality Control |
| SEMS | Safety and Environmental Management System |
| SSLD | Subsea Leak Detection |

Definitions

Steady State: Wells are flowing and conditions are relatively uniform throughout the production system.

Transient Operations: When Wells are in startup, shut down or slugging, pressure and temperatures are not stable, hold-up volumes are readily changing. It is difficult to discern loss of integrity.

2.0 Procedures

2.1 Leak Detection, Diagnose and Response

All facilities in scope shall develop site-specific **Subsea Leak Operations Response Plans** to provide a detailed response for the CRO when a subsea leak alarm is sounded. **The following template shall be used to develop the facility-specific Operating Procedures (OP's):**

[Site-Specific Operations Response Plan RevH.docx](#)

The Subsea Leak Operations Response Plan shall include the following three (3) sections:

1. **Detect: Summary of Subsea Leak Alarms**

The purpose is to define the alarms currently active in the site-specific control system to alert a CRO of a potential subsea leak. The four (4) active alarms in the control system may include:

- Conditional Rate of Change (CROC) – Active alarms during steady state and transient operations, above and below hydrostatic conditions, utilizing physical process variables such as pressure and/or temperature
- Flow Management Tool Leak Detection System Alarms (FMT) – Active alarms during steady state and transient operations, which provide likelihood of a leak and approximate leak location
- Mass In Mass Out (MiMo) – Active alarms during steady state operations, above and below hydrostatic, utilizing multi-phase flow meters located subsea and topsides
- Alternate indications of potential subsea leak

See link above for more details on all required alarms

2. **Diagnose: Validate or invalidate the alarm**

The purpose is to validate or invalidate the subsea leak alarm. Once a subsea leak alarm is sounded, the **diagnostic** steps are as follows:

1. Immediately alert Operations Installation Manager (OIM).
2. Immediately consult **Flow Assurance Flow Chart for a Suspected Subsea Leak**. A **Flow Assurance Flow Chart** shall be developed. See link below with example flow assurance flow charts.

[Flow Assurance Flowchart Operating Modes.pptx](#)

3. Pull permits – limit Simultaneous operations.
4. Within **30 minutes**, operator must walk the deck to look for a sheen.

NOTE: If a leak test is required to validate or invalidate a potential subsea leak, see “**Leak Test: Below Hydrostatic Pressure**” found in the “**Diagnose**” section of the facility-specific Subsea OP.

[Site-Specific Operations Response Plan RevH.docx](#)

3. **Respond: Action Required**

The purpose is to detail the next steps once a subsea leak alarm has been validated or invalidated.

If a subsea leak alarm is validated or invalidated, please follow the site-specific requirements detailed in the “**Respond**” section of the Subsea Leak Operations Response Plan.

[Site-Specific Operations Response Plan RevH.docx](#)

2.2 Training Plans:

Initial training on Subsea leak detection for Control Room Operators will be provided as follows:

- Basic Awareness Training via HES Supersession and PSST
- Operator Training Simulator (OTS) scenario specific to subsea leak
- Flow Assurance Operator Training
- Procedural Automation via ExaPilot for proper shutdown of the flowline / drill center
- Operations Action Plan will provide protocol for diagnosis of and response to alerts / alarms indicative of subsea leaks:
 - Defines time requirements for specific actions
 - Provides detailed checklist and flowchart to validate suspected leak
 - Ensures proper notifications

Facilities shall use the following template to develop Subsea Leak Detection training plans (see link below):

Link: [SSLD Training Plan Template1.docx](#)

2.3 Competency Assessment and Verification:

- Competency Assessment administered every 3 years for Control Room Operators will verify individual fluency and validate effective training plan:
 - Utilize training and assessment software tool (e.g., Exercise Manager, pending Kongsberg updates)
 - For facilities not employing an OTS, competency assessments for SSLD can be accomplished using instructor-led or computer-based scenarios, the existing process control and alarm system screenshots and trending, checklists and process decision matrices/ trees.
- Competency assessment reports are generated by the Assessor/Instructor

LINK: [CRO SSLD Training and Competency Form](#)

- Competency assessments tracked in LMS or an appropriate company-specific competency management system
- Completed forms stored in ERTC SharePoint (company-specific)

3.0 Resources, Roles and Responsibilities

The following table outlines the roles and responsibilities associated with this process.

Table 1. Responsibilities and Competencies

| Role | Responsibilities |
|-------------------------|---|
| CRO | <ul style="list-style-type: none"> • Participate in all required OTS training sessions. • Demonstrate proficiency in all required OTS competency assessments • Demonstrate skill and knowledge to manage and execute the proper subsea leak detection response. • Mentor new/inexperienced CRO's |
| OTS Instructor/Assessor | <ul style="list-style-type: none"> • Provide OTS training for CRO's. • Administer OTS competency assessments • Develop and implement gap/deficiency mitigation for CRO's as required • Schedules OTS training room • Works with FC/OS to schedule training • Develops training material • Provides assessment results for tracking in LMS • Running, pausing and exiting the simulator • Viewing, zooming, tracing through graphics • Viewing equipment and stream process information • Viewing trends and profiles, customizing trends • Applying equipment malfunctions and remote actions • Applying field actions to equipment • Saving and loading operating conditions • Saving, loading, replaying snapshots • Changing Global Variables i.e., pressure, ambient temperature, seawater temperature, etc. • Detailed knowledge of the Asset's control narratives, Cause and Effect Charts, SAFE Charts, Packaged Equipment Control Systems. |
| Operations Supervisor | <ul style="list-style-type: none"> • Provide support for developing CRO competency • Ensure facility-specific OTS training plans are updated as per OTS Training Plan template • Monitors compliance with CRO OTS competency management requirements – receives compliance reports from LMS |

Organization – [OE Process Name]

| | |
|--|--|
| <p>I&C Engineering Process Automation Engineering Process Control Tech Support</p> | <ul style="list-style-type: none"> • Supports the simulator during OTS development and for ongoing maintenance; performs OTS system backups; makes minor changes on the simulator interface/models; provides hardware support; • Technical interface between Chevron and simulator vendor • Ensure OTS is updated to reflect facility changes, at a minimum annually (if required). |
| <p>Flow Assurance Engineering</p> | <ul style="list-style-type: none"> • Develops site-specific Operations Response Operating Procedures and Flow Assurance Flow Charts • Delivers Flow Assurance Training to CROs |
| <p>LMS Training Administrator</p> | <ul style="list-style-type: none"> • Develop OTS competency curriculum in LMS • Track all completed OTS training (initial and refresher) • Track Competency Compliance and provide reports |
| <p>GOM ERTC Competency Coordinator</p> | <ul style="list-style-type: none"> • Support Operations on managing OTS competency process • Perform periodic review of completed assessments • Provide feedback to Ops and ERTC Manager based on reviews • Maintain standards for all GOMBU CRO competency requirements • Serves as liaison to new projects for OTS builds • |
| <p>ERTC SharePoint Administrator</p> | <ul style="list-style-type: none"> • QC completed CRO competency assessment submitted by Operations • Store completed competency assessments in ERTC SharePoint • Upload completed competency assessment to ERTC SharePoint site |

4.0 Measurement and Verification

4.1 Measurement

The following metrics shall be tracked **as a key consideration in confirming** to determine that the SSLD Competency Management process is effective in meeting its stated purpose.

4.1.1 Leading Measures

Number of CROs required to be assessed and verified as competent in a calendar year

4.1.2 Lagging Measures

*Number of CROs assessed and verified as competent in a calendar year and tracked in LMS.
Percentage of CROs assessed that pass verification requirements*

Summary of Requirements

The following requirements are part of this process and are outlined here as the set of requirements used for assessments and reviews to measure a facility's progress towards implementation and execution of this process but are not inclusive of all process details.

1. All facilities in scope shall develop site-specific **Subsea Leak Operations Response Plans** to provide a detailed response for the CRO when a subsea leak alarm is sounded - outlined in section 2.1.
2. Initial training on Subsea leak detection for Control Room Operators must be provided. Facilities shall use the template provided to develop Subsea Leak Detection training plans – outlined in section 2.2
3. A competency and assessment verification process must be implemented as outlined in section 2.3.
4. Metrics for this procedure shall be captured and tracked as outlined in section 4.0.

5.0 Continual Improvement

Process gaps, nonconformance and improvement opportunities identified from section 4.1.2 shall be summarized and used to assist in building a process-specific mitigation plan.

The site specific operating procedures outlining CRO response to subsea leak shall be reviewed and updated with all applicable Management of Change, and, at a minimum every three years.

Document Control Information

Document Change History

Changes to this document are listed in the table below in reverse order by change date.

Table 2. Document Change History

| Date (DD Month YYYY) | Revision Number | Description of Change |
|-------------------------|--------------------|-----------------------|
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Document List - Appendix

This is a complete list of the documents referenced in this process.

Table 3. Document List (links)

| Procedure/Attachment Title | File Name |
|---|--|
| SSLD Competency Management Process - Framework | GOM Subsea Leak Detection\SSLD Process Framework.vsd |
| Subsea Leak Operations Response Plan | Site-Specific Operations Response Plan RevH.docx |
| Flow Assurance Flow Chart for a Suspected Subsea Leak. | Flow Assurance Flowchart Operating Modes.pptx |
| Subsea Leak Detection Training and Competency Development Plans | SSLD Training Plan Template1.docx |
| Operator Training & Competency Assessment Form | CRO SSLD Training and Competency Form |
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