SAFETY ALERT

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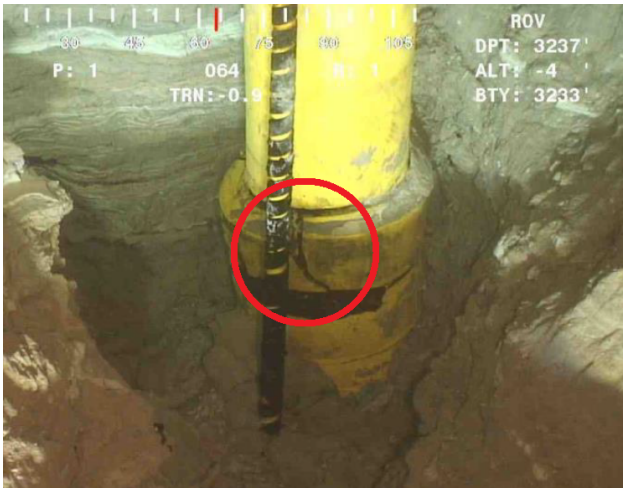
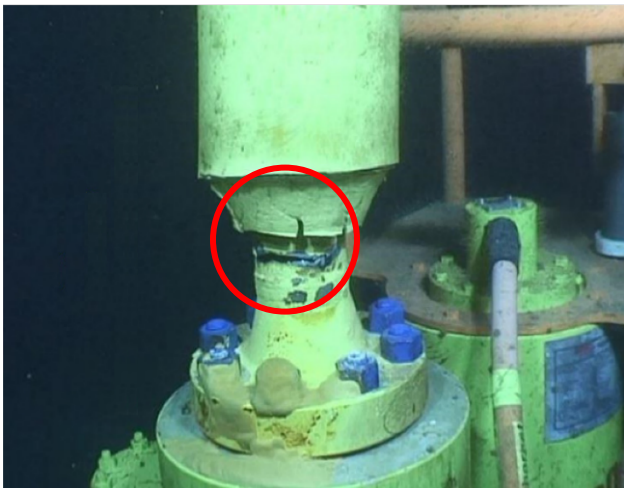
Risk-Based Inspections of Subsea Leak Detection Technology Reveals Gaps in System Processes



May 2016 - The load limiting joint cracked, but the leak was not identified until many hours later.



October 2017 - The operators noticed that the rates from the flow meter upstream of the leak did not match the LACT meter but did not initially suspect that a leak was the cause.

Recent leaks from subsea production equipment have demonstrated the need for improvements in subsea leak detection (SSLD) technology:

May 2016 – A crack in a subsea jumper just below the mudline leaked an estimated 1,926 bbls of oil. The abnormal flow behavior was initially suspected to be slugging. The field was shut in over 8 hours after the abnormal flow behavior was observed.

October 2017 – A fractured subsea wellhead jumper leaked an estimated 16,000 bbls of oil. The leak was not confirmed for over 24 hours and was initially suspected to be a malfunction of the multiphase flow meter upstream of the leak.

July 2020 – A damaged pipe elbow on the jumper caused a leak of an estimated 479 bbls of oil. The leak was not confirmed until an oil sheen was observed at the surface.

The investigations of the 2016 and 2017 leaks concluded that the SSLD capabilities were inadequate, delayed leak detection and increased the volumes of oil discharged. In response, BSEE requested information on the leak detection capabilities of all Gulf of Mexico operators' subsea wells and conducted risk-based inspections of five operators representing 34% of Gulf of Mexico oil production.

The overall finding of the evaluation was that while all operators had implemented SSLD technology, there were gaps and areas for improvement in the implementation of the personnel procedures and management system processes that are required for these systems to be effective.

Therefore, BSEE recommends that operators and contractors consider the following:

- **Assume that any observed abnormal subsea flow behavior may be a leak** and immediately investigate and identify the cause of the behavior to confirm or rule out the existence of a leak;
- Establish, document and communicate a clear chain of command and response procedure for SSLD alarms. At minimum, it should include:
    - Who has the initial responsibility to respond to an SSLD alarm (e.g. control room operator [CRO])?
    - If it cannot be quickly determined whether an alarm is valid, when and to whom will the response be escalated to (e.g. CRO escalates to Ultimate Work Authority/Offshore Installation Manager within one hour of the alarm)? The contact information for onshore personnel who can provide technical support should also be provided.
    - Who has the authority to override an SSLD alarm/shutdown timer (e.g. UWA/OIM) once it is confirmed to be a false alarm?
    - How long before a well automatically shuts in following an SSLD alarm? (e.g. four-hour timer before automatic well shut in)
- When an SSLD alarm/shutdown timer is overridden, operators should document the actions taken and why they concluded that the abnormal behavior was not a leak. Review these records periodically since frequent false alarms, or no alarms, may indicate that an SSLD system's configuration needs to be adjusted;
- Design SSLD drills and practice them regularly. Include scenarios for both valid and false SSLD alarms;
- Evaluate records of past failures of subsea leak detection systems (e.g. BSEE Panel Reports 2018-001 and 2019-002, which cover the 2016 and 2017 leaks mentioned previously) to determine if your system would have detected them and, if not, implement corrective actions to improve detection of future leaks;
- Train (and periodically re-train) personnel in the operation of your subsea leak detection system, the diagnosis and confirmation of potential leaks and the response to SSLD alarms. Use case studies (e.g. BSEE panel reports) to learn from prior events;
- Periodically test the SSLD system and the operation of the associated measurement devices. Check for inhibited or bypassed alarms;

- If possible, configure your control system to permit startup and shut-in of wells without manually bypassing SSLD alarms;
- Integrate the subsea leak detection into the pre-startup review process for new or modified wells (e.g. checking for personnel competency, verifying SEMS documentation, revising procedures, etc.);
- Alarm set points may need to be periodically re-evaluated and adjusted as the flow conditions of a well change over time. Use management of change when modifying a SSLD system's configuration;
- Use Remotely Operated Vehicles to conduct surveys of subsea equipment to check for excessive movement, subsidence or burial. Surveys can be conducted at regular intervals, at intervals determined by a risk-based analysis, and following major environmental events (e.g. subsea landslides), and before and after drilling campaigns;
- If your facility hosts third-party wells with third-party personnel on-site, coordinate with their management to ensure that personnel meet minimum competency requirements for subsea leak detection and response; and,
- Participate in Offshore Operators Committee and/or other industry workgroups to standardize best practices for existing subsea leak detection technologies, as well as research and apply new technologies that may improve industry's capabilities with respect to SSLD in the Gulf of Mexico.

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A **Safety Alert** is a tool used by BSEE to inform the offshore oil and gas industry of the circumstances surrounding a potential safety issue. It also contains recommendations that could assist avoiding potential incidents on the Outer Continental Shelf.

Category: Subsea, Production