Bureau of Safety and Environmental Enforcement

Wireline Operations Research

Booz | Allen | Hamilton RPS

"To promote safety, protect the environment and conserve resources offshore through vigorous regulatory oversight and enforcement."

Agenda

- Background
- Study Methodology
- Results
- Recommendations
- Final Report

BSEE Wireline Operations Research

Background

- Current wireline pressure testing regulations are found in 30 CFR §250.620

Wireline operations

The lessee shall comply with the following requirements during routine, as defined in §250.601 of this part, and nonroutine wireline workover operations:

(a) Wireline operations shall be conducted so as to minimize leakage of well fluids. Any leakage that does occur shall be contained to prevent pollution.

(b) All wireline perforating operations and all other wireline operations where communication exists between the completed hydrocarbon-bearing zone(s) and the well bore shall use a lubricator assembly containing at least one wireline valve.

(c) When the lubricator is initially installed on the well, it shall be successfully pressure tested to the expected shut-in surface pressure.

Background

- Project Objective
  - Investigate opportunities for updates and improvements of BSEE's wireline operations regulations in 30 CFR §250.620, especially with regard to pressure testing wireline pressure control equipment

Background

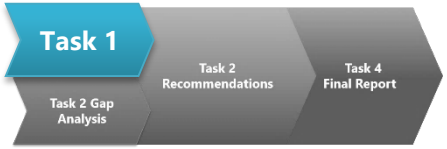
- Research Questions
  - How are wireline operators conducting lubricator and wireline ram pressure tests?
  - Are tests performed with well bore pressure?
  - What tests are being charted?
  - When are wireline rams used?
  - Why are operators asking for departures from testing at surface shut-in pressure?
  - Is granting a departure safe practice?
  - What wireline pressure testing regulations are implemented in U.S. states and countries of the International Regulators Forum (IRF)?

Background

- Wireline Operations Research Statement of Work (SOW)
  - **Task 1 Industry Survey**
    - Conduct survey with wireline companies to understand current industry practices and criteria
  - **Task 2 Recommendations**
    - Make recommendations for consistent wireline operations pressure testing criteria
  - **Task 3 Gap Analysis**
    - Research wireline pressure testing regulations of U.S. states and the countries of the IRF
  - **Task 4 Final Report**
    - Synthesize findings of Tasks 1, 2, and 3 into a final report, including recommendations for updating BSEE regulations in 30 CFR §250.620

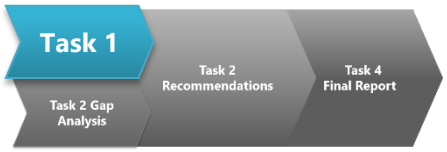
BSEE Wireline Operations Research

Study Methodology



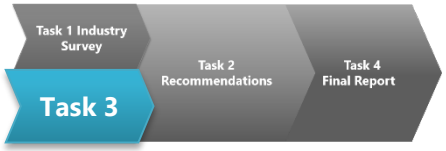
- Task 1 Industry Survey
  - Nine wireline companies were selected to solicit participation
    - Arena Energy
    - BP
    - Chevron
    - Hess
    - NOV/Elmar
    - Oil States
    - Schlumberger/Cameron
    - Shell
    - W&T Offshore

Study Methodology



- Task 1 Industry Survey
  - Five of the nine companies solicited for participation provided survey responses
  - Four companies declined to participate
    - **Participated**
      - Arena Energy
      - Hess
      - Oil States
      - Shell
      - Schlumberger/Cameron
    - **Declined to participate**
      - BP
      - Chevron
      - NOV/Elmar
      - W&T Offshore

Study Methodology



- Task 3 Gap Analysis of Wireline Regulations
  - Researched wireline regulations of
    - 13 U.S. states
    - 9 countries of the IRF
  - In some cases, these regulations incorporate voluntary standards by reference

Current BSEE Wireline Regulations

BSEE
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U.S. State Regulations

IRF Country Regulations

Evaluate Gap

Study Methodology

- Task 3 Gap Analysis of Wireline Regulations
  - 13 U.S. states
    - Alabama
    - Alaska
    - California
    - Colorado
    - Florida
    - Louisiana
    - Mississippi
    - North Dakota
    - New York
    - Oklahoma
    - Pennsylvania
    - Texas
    - West Virginia

Study Methodology

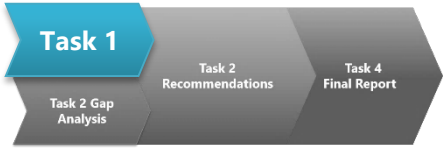
- Task 3 Gap Analysis of Wireline Regulations
  - 9 IRF Countries
    - Australia
    - Brazil
    - Canada
    - Denmark
    - Mexico
    - Netherlands
    - New Zealand
    - Norway
    - United Kingdom

Study Methodology

- Task 2 Recommendations
  - Evaluated results from Task 1 Industry Survey and Task 3 Gap Analysis
  - Considered what practices are already common
  - Considered what requirements would increase safety and consistency

BSEE Wireline Operations Research

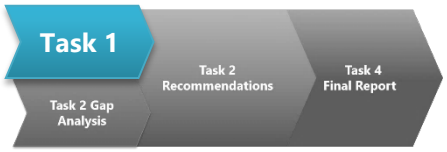
Results



- Task 1 Industry Survey
  - What criteria are used for a successful pressure test?

Question	Company				
	A	B	C	D	E
Low-Pressure Field Test (psi)	250 – 350 (wireline BOP and lubricator)	250 – 350	None	250 – 350	None
High-Pressure Field Test (psi)	MASP + 500 (wireline BOP and lubricator)	MASP + 500	Surface shut-in pressure + 500 – 1,000	20% above MASP	20% above MASP
Low-Pressure Shop Test (psi)	Equipment supplier performs shop tests, survey respondent did not know the shop test procedures	Equipment supplier performs shop tests, survey respondent did not know the shop test procedures	200	250 – 350	300
High-Pressure Shop Test (psi)			1.5 x RWP	RWP	RWP ≥5,000: 1.5 X RWP RWP <5,000: 2 X RWP
Well Bore Pressure Test	No	No	Initial test with pump, other tests with well bore pressure	No	Only when surface pressure <5,000

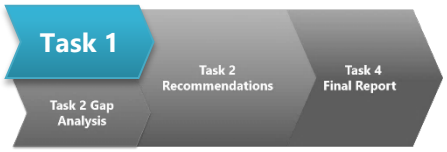
Results



- Task 1 Industry Survey
  - Are lubricator tests being charted?

Question	Company				
	A	B	C	D	E
Are Field Lubricator Tests Charted?	Yes	Yes	No	Yes	Yes, if required by customer
Type of Chart Used	Analog	Digital and analog	N/A	Digital and analog	Digital and analog

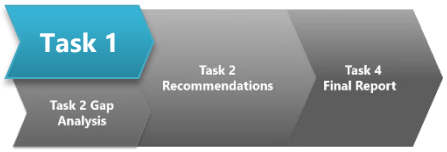
Results



- Task 1 Industry Survey
  - When are wireline rams used and are their tests being charted?

Question	Company				
	A	B	C	D	E
Are Wireline Rams Used?	Yes, for all operations	Yes, for all operations	Yes, for all operations	Any operation under pressure	Any operation under pressure
Are the Pressure Tests Charted?	Yes	Yes	No	Yes	Yes, if required by customer
Type of Chart Used	Circular, analog	Digital and circular, analog	N/A	Digital and circular, analog	Dependent on customer

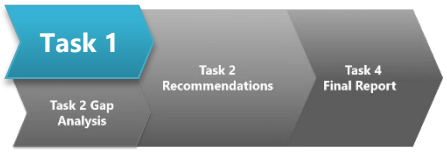
Results



- Task 1 Industry Survey
  - What criteria do operators currently use as a successful pressure test of the wireline rams and lubricator?

Question	Company				
	A	B	C	D	E
Criteria for Successful Pressure Test	Pressure is held for 5 minutes with no allowable pressure drop	Low and high test; hold pressure for 5 minutes	API RP 54, para. 13.6.3: 2 pressure holding periods 3 minutes in length	Hold pressure for 15 minutes, pressure cannot decrease more than 1%	Pressure must not drop more than 5% of the test pressure or 500 psi, whichever is lower

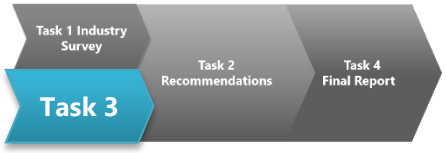
Results



- Task 1 Industry Survey
  - Should BSEE grant a departure from testing at surface shut in pressure when rigged on top of a BOP?

Question	Company				
	A	B	C	D	E
How to Test Above a Rig BOP	Close blind shear rams and test to 1,000 psi	-	Close blind shear rams and test to 1,000 psi	-	-
Potential Damage to BOP Shear Rams from Pressure Above	-	Pressure from above will cause rams to leak	-	-	Damage to sealing surfaces of rams, leaks
Can Shear Rams Sever Wireline Cable?	-	Yes	-	-	Yes
Potential Solution	Test plug	-	Kill-weight fluid in well bore	-	Inverted blind rams, test plug

Results

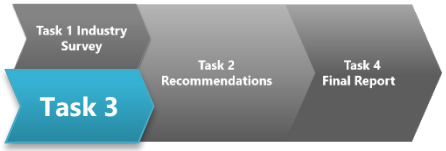


- Task 3 Gap Analysis of Regulations
  - Specify Consistent Testing and Performance Criteria for Successful Field Pressure Tests

State or Country	Field Low-Pressure Test	Field High-Pressure Test	Frequency
Alabama	None specified	Anticipated surface pressure or 70% of the minimum internal yield pressure casing, whichever is less	When installed, after the connection is broken, and at least once a week during operations
Alaska	None specified	Maximum potential wellhead pressure	Upon initial installation
Louisiana	None specified	Lubricator tested to expected surface shut-in pressure	Upon initial installation
Canada	200 psi to 300 psi	> MASP	Upon initial installation, after the connection is broken, and at least once every 14 operational days
NORSOK D-010	220 psi to 290 psi	≥ MASP	Upon initial installation
DNVGL-OS-E101	None specified	1.5 × RWP	Not specified

Note: This table only shows results from states, countries, and standards that specify performance-based or prescriptive field pressure tests. Other countries, states, and standards researched are not shown.

Results

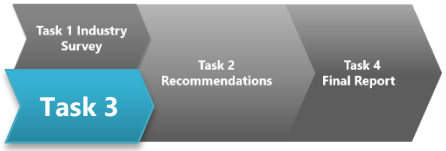


- Task 3 Gap Analysis of Regulations
  - Specify Consistent Testing and Performance Criteria for a Successful Shop Pressure Tests

State, Country, or Standard	Shop Low-Pressure Test	Shop High-Pressure Test	Frequency
Alaska	None specified	Wireline rams tested to permitted working pressure	Monthly
Mexico	None specified	Lubricator tested to RWP	Annual
Norway	Performance-based, no pressure specified		Recertification every 5 years
API RP 54	None specified	Lubricator and wireline rams tested to lubricator RWP, wireline rams tested in open and closed position	Annual
DNV-RP-E101	Conduct test, pressure not specified	RWP	Every 5 years

Note: This table only shows results from states, countries, and standards that specify performance-based or prescriptive shop pressure tests.

Results

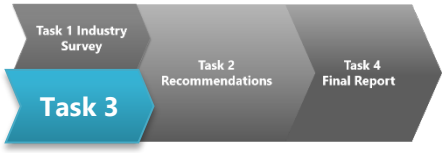


- Task 3 Gap Analysis of Regulations
  - Determine What Should be Charted and How Long the Pressure Test Must Be Held

State, Country, or Standard	What is Charted	Type of Chart	Test Pressure Hold Time
Canada	Charting not addressed		Low-Pressure Field Test: hold 90% of test pressure for 5 minutes High-Pressure Field Test: hold 90% of test pressure for 10 minutes
Mexico	Charting not addressed		Shop High-Pressure Test: hold test pressure for 3 minutes, lower pressure to 0, then increase to test pressure and hold for 3 minutes
API RP 54	Charting not addressed		Shop High-Pressure Test: hold test pressure for 3 minutes, lower pressure to 0, then increase to test pressure and hold for 3 minutes
DNV-RP-E101	Lubricator and wireline rams	Not specified	Not specified
NORSOK D-010	Lubricator and wireline rams	Not specified	Minimum 10-minute hold time for field low- and high-pressure tests
DNVGL-OS-E101	Lubricator and wireline rams	Not specified	15-minute hold time for field high-pressure test

Note: This table only shows results from states, countries, and standards that specify performance-based or prescriptive requirements for charting or pressure test criteria.

Results



- Task 3 Gap Analysis of Regulations
  - Determine When it is Appropriate to Test with Well bore Pressure and What Barriers Needs to Be in Place When Testing

State, Country, or Standard)	Field Test with Well Bore Pressure	Barriers Required or Used
Alaska	Not addressed	• Wireline rams • Lubricator
California	Not addressed	• Wireline rams • Lubricator
Louisiana	Not addressed	• Wireline rams • Lubricator
Canada	No, must test above MASP	No specific barriers addressed
DNVGL-OS-E101	No, field test is to 1.5 × RWP	No specific barriers addressed

Note: This table only shows results from states, countries, and standards that specify performance-based or prescriptive requirements for testing with well bore pressure.

BSEE Wireline Operations Research

Recommendations

Category	No.	Recommendation
Pressure Testing	1	**Field pressure tests for wireline rams and lubricators** Conduct field low- and high-pressure tests of the wireline rams and lubricator when installed and after each time a connection is broken. ▪ Low-pressure test at any pressure from 250 psi to 350 psi ▪ High-pressure test 20% above MASP Departures from this requirement should not be granted to allow for testing to only 1,000 psi when rigged above a drilling BOP. When lubricators are rigged above drilling BOPs, operators should either use a test plug or install inverted blind rams in the BOP to allow pressure testing to 20% above MASP.
	2	**Maintenance shop pressure test for wireline rams and lubricators** Conduct low- and high-pressure tests periodically at a pressure test facility. ▪ Low-pressure test at any pressure from 250 psi to 350 psi ▪ High-pressure test at RWP
	3	**Recertification shop pressure test for wireline rams and lubricators** Conduct low- and high-pressure tests annually at a pressure test facility. ▪ Low-pressure test at 250 psi to 350 psi ▪ High-pressure test at 50% above RWP

Recommendations

Category	No.	Recommendation
Charting	4	**Pressure-test charting** All wireline ram and lubricator field pressure tests must be charted, and records of the test results maintained for the life of the well, with the following exception: ▪ For wells with pressure below 1,000 psi, charting is not required ▪ Both analog and digital charts are acceptable records
	5	**Acceptance criteria for pressure tests** All field pressure tests must be held for a minimum of 5 minutes. ▪ Maximum allowable pressure drop: 5%
Testing with Well Bore Pressure and Required Barriers	6	**Testing with well bore pressure** Lubricators and wireline rams must be tested with a surface pump to a safety margin above surface shut-in pressure for wells with more than 1,000 psi pressure. ▪ Well bore pressure testing is allowable only for wells with surface shut-in pressure of 1,000 psi or less. For these low-pressure wells, the lubricator and wireline rams may be tested to surface shut-in pressure.
	7	**Barriers required for wireline operations** When pressure is present in the well bore, all wireline operations must feature at least one set of wireline rams and one device capable of cutting the wireline cable (e.g., a wireline cutter or a blind shear ram).

BSEE Wireline Operations Research

Final Report

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