Artificial Lift R&D Council

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Industry Pursuit of API 19G2 V0 Validation

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GUARDIAN™ FLOW CONTROL DEVICE

JMI™

Outline:

- API 19G2 Flow Control Devices (FCD) for Side-pocket Mandrels
  - Two types: hydraulically activated and normally closed
- V0 requirements were added in 2020
- The industry has yet to achieve a V0 validated FCD
- V0 is the most severe service grade test criteria for a validated FCD
- This paper reviews the steps necessary in both designing and testing a FCD to meet API 19G2 V0 with hydraulic activation

API 19G2 Validation Grade Designations:

- The four design validation grades are:
  - V3: Basic grade of design validation
  - V2: Intermediate grade of design validation
  - V1: High grade of design validation
  - V0: Severe service grade of design validation

API 19G2 V0 Test Progression:

- FCD design must meet V1 requirements before testing to V0
- For V0, a single FCD must pass all tests, in sequence, without redress or rebuild
- V0 validation tests :
  - Initial Function Test
  - Unloading Test
  - Gas Flow Test
  - Final Test (Repeat Initial Function Test)

Initial Function Test

1. Mechanical Function Test
2. Low pressure liquid backflow integrity test at ambient temp
3. High pressure liquid backflow integrity test at ambient temp
4. Low pressure liquid backflow integrity test at max temp
5. High pressure liquid backflow integrity test at max temp
6. Test 2-5 repeated with **gas** as the medium
7. Minimum liquid flow rate activation for **hydraulic** back-check or confirm minimum differential pressure to open **normally closed** back-check

Unloading Test

Objective: Demonstrate device can withstand erosion forces that occur during normal unloading and kick off

1. 1.5 bbl/min liquid flow rate for a total of 600 barrels (95.4 m3), approximately 6.7 flowing hours
2. Post erosion back-check testing and minimum liquid flow rate

Gas Flow Test

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Objective: Demonstrate device can withstand high flow gas rates that occur during normal operating conditions

1. Ramp gas flow: 176.5 MSCFD (5000 SCMD) in incremental steps to a minimum of 3.5 MMSCFD (100,000 SCMD)
2. Open-close: 100 gas flow cycles from 0.0 to at least 3.5 MMSCFD (100,000 SCMD)
3. Continuous gas flow: minimum 24-hours at 3.5 MMSCFD (100,000 SCMD)

Final Function Test

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1. Mechanical Function Test
2. LP liquid backflow integrity test at ambient temp **Acceptance: 3 psi (21 kPa) over 10 minutes (3x)**
3. HP liquid backflow integrity test at ambient temp **Acceptance: 1% over 10 minutes (3x)**
4. LP liquid backflow integrity test at max temp **Acceptance: 3 psi (21 kPa) over 10 minutes (3x)**
5. HP liquid backflow integrity test at max temp **Acceptance: 1% over 10 minutes (3x)**
6. LP gas backflow integrity test at ambient temp **Acceptance: 20 cm^3 (1.22 in^3) over 10 minutes (3x)**
7. HP gas backflow integrity test at ambient temp **Acceptance: 20 cm^3 (1.22 in^3) over 10 minutes (3x)**
8. LP gas backflow integrity test at max temp **Acceptance: 20 cm^3 (1.22 in^3) over 10 minutes (3x)**
9. HP gas backflow integrity test at max temp **Acceptance: 20 cm^3 (1.22 in^3) over 10 minutes (3x)**
10. Minimum liquid flow rate activation for hydraulic back-check **Acceptance: less than 25 psi (1.7 bar) pressure differential over 10 minutes (3x) or** confirm minimum differential pressure to open **normally closed** back-check **Acceptance: hold differential pressure and maintain**

Question to you…

- Who has validated an FCD to API 19G2 V0?

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Acknowledgements, Thank You & Questions

- JMI Manufacturing appreciates the opportunity to offer this presentation and values your input. The floor is now open for questions.

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