Sensa Fiber Optics

Distributed Temperature Monitoring for Gas Lift Optimization

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Is Your Gas Lift System Performing as Designed?

**Problems**

- Gas Lift System efficiency
- Operating costs
- Non-productive time
- Conformance

**Sensa DTS Solutions**

- Real-time picture of all GLVs
- Problem detection & immediate rectification
- GLS continuous performance optimization
Agenda

- What will you get from using a Sensa DTS system?
- How does it work?
- How do you run it: Permanent or Intervention?
- Case studies
- Review & Questions
Sensa DTS: What do you get?
GLOW™: DTS Analysis software
Gas Lift Optimization and Leak detection at Wellsite

Valve search intervals

DTS temperature curve

w1: Valve identified open

w2: Valve identified open
GLOW™: Gas Lift Optimization and Leak detection at Wellsite
The Distributed Temperature Sensing Measurement
Agenda

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Permanent installation: WellWatcher NEON
Combines fiber optic with downhole gauge cable

- Provides a system to optimize gas lift and assist with flow assurance
- System has no negative impact to existing completion design
  - No modifications to existing equipment
  - No additional control lines
  - No pre or post job well intervention
- Maintains existing reliability of permanent downhole gauge
WW Neon Components

Hybrid Wellhead outlet:
Tested to API 6A
Hazardous Area Cert:
EEXd II C
<0.5 dB attenuation

NEON Hybrid Cable:
Multiple H2 barriers customized for application
10 or 15Kpsi versions
SM and / or MM fibers
Min. incremental cable cost
Intervention using SensaLine™ (FO SlickLine)

- Slickline Equipment
- Standard Pressure Control Equipment
- OD: 1/8” slickline
- SensaLine™: 0.125”
- Gas Lift Mandrels
- Memory or Realtime FO Pressure gauge
t 1 = 14:16 h - kick-off started
t 2 = 17:16 h - top GLV open
$t_3 = 18:01\ h - 2^{nd+3^{rd}}\ GLV\ pass\ gas$
t 5 = 21:46 h - GLVs re-open at higher gas rate
Gas Lift Monitoring with DTS

Activity at GL #3
Gas Lift Monitoring with DTS

Temperature [Deg F]
Depth [ft]
Operating GLV
GLV's
Gas Lift Monitoring with DTS – slugging

- Geothermal
- Joule Thomson cooling through GLV
- Unstable Flow
- GLV

15/05/2005 13:17
15/05/2005 12:51
15/05/2005 12:25
15/05/2005 11:59
15/05/2005 11:33
Gas Lift Monitoring – well start-up
Gas Lift Monitoring – well start-up

- Slug Flow
- Stable Flow
- Gas front moving down the annulus
- Lowest Valve operating

Gas Lift Valves
Case Study 3
GL System with over-injection of gas

- 10 GLVs
- Events happened at only 3 GLVs
- GLS not functioning as designed
- 900k m³ gas over-injection
- No completion integrity issues detected
WellWatcher Neon –DTS- Applications

- Ability to identify Gas Lift Valve Operation Real Time!
- Identify cycling valves
- Identify tubing integrity issues
- Identify Hydrate Formation
- Monitor Reservoir + GLV’s
- Monitor mudline to riser temperature transfer
- Monitor vacuum insulated tubing
Review / Questions

Sensa Fiber Optic Distributed Temperature Monitoring for Gas Lift systems Optimization

- Gas Lift System functionality
- Completion integrity
- Zonal flow contribution