

EuALF 2018 EUROPEAN ARTIFICIAL LIFT FORUM

13th & 14th June 2018, AECC, Aberdeen "Maximising Economic Lift"

Active Monitoring of Gas Lift Wells with Distributed Temperature Sensing

Iko Oguche, Tendeka



RESULTS ACROSS YOUR RESERVOIR



- Fiber-optic system components
- DTS operating principles
- System performance
- Gas-lift principles
- Event identification with DTS (case study)
- Data automation and management





- **Higher Power**
 - Higher • signal/noise ratio

Lower Power •





- Pulsed Laser travels through fiber
- Back-scattered light returns to fiber optic box
- Back-scattered light is processed to get useful information (Temperature, Strain, Sound)
- Raman (DTS) Temperature Measurement (0.01°C)
- Brillouin (DTSS) Strain and Temperature (0.5 °C)
- Rayleigh (DAS) Acoustic measurement

Zrelli Amira, Mohamed Bouyahi, Tahar Ezzedine 'Measurement of Temperature Through Raman Scattering' AWICT 2015



Performance Curves





- Distributed measurement
- Core components
 - Surface acquisition unit
 - Optical fiber
- Depth resolution
 - As low as 0.5m
- Temperature resolution
 - Better than 0.01°C (no post processing)
- Temperature Range
 - Up to 700 °C
- Range
 - Up to 100km
- No electronics or moving parts in monitoring zones
- Deployment
 - Permanent (Attached to production tubing)
 - Intervention





DTS Temperature Profile





Gas-Lift Principles





- DTS Cable clamped to the production string at every joint
- Gas injected through the annulus
- Annular space with flowing gas will have lower temperature compared to region with no flow
- Temperature reading at clamped point will be more reflective of warmer tubing temperature
- Temperature reading of free hanging fiber will be more reflective of cooler annular temperature





3 day worth of data

28/09/2006 10:13:33 to 01/10/2006 23:05:40 (78 traces)





2D Plots – Selected Traces











Slugging



Pressure (psi)







Data Identify Opportunities Validate

opportunities

Build Models / Algorithms

Implementation

Validate Results







Processed Data





Processed Data









Mandrel Closed Mandrel Open 200 400 600 -800 1000 -1200 Fibre Length (m RKB) 1400 1600 1800 -2000 -2200 -2400 2600 -2800 _ 20 40 60 80 100 Sep 28, 2006 Sep 29, 2006 Sep 30, 2006 Oct 1, 2006 Oct 2, 2006 Temperature (°C) 00:00:00 00:00:00 00:00:00 00:00:00 00:00:00

Sep 28, 2006 10:13:33 to Oct 1, 2006 23:05:40 (78 traces)



Sep 28, 2006 18:20:42 (1 trace)





- Temperature along the length of the well can be measured using DTS
- Measured temperature can be used to monitor gas-lift system integrity and identify event like active mandrels and slugging valves
- This information can be used to plan intervention or optimise gas-lift design
- DTS data size can grow quickly making manual data analysis tedious or difficult
- Automating the monitoring and analysis process can significantly reduce the amount of man hours needed and also deliver more timely information.
- This is made possible with effective data management systems



Thank You

TENDEKA

RESULTS ACROSS YOUR RESERVOIR