SPE Workshop: Fiber-Optic Sensing Applications for Well, Reservoir, and Asset Management

28 - 30 Aug 2018 | Brown Palace Hotel | Denver, Colorado, USA

This SPE workshop will discuss technologies that are used to optimize reservoir and field development and operations.

Multiple fiber-optic monitoring systems are currently used, offering reliable temperature, pressure, flow, strain, acoustic and seismic measurements. Sessions will focus on distributed and multi-point sensing systems, such as DTS and DAS, deployed to provide reservoir and well diagnostics, and surveillance.

Attendees will hear extensive case studies and field deployment examples of the technical and economic benefits of these systems, receive guidance for developing work flows, and identify best practices.

HALLIBURTON

CORPORATE SPONSOR

AP SENSING advanced photonic — **Breakfast**

NKT Photonics — **Charging Station**

OptaSense a QinetiQ company — **Receptions**

SAGE RIDER Subsurface Surveillance Systems — **Internet**

Schlumberger — **Lunches**

SILIXA — **Coffee Breaks**

Committee Members

CHAIRPERSON
Dennis Dria
Myden Energy Consulting

Jeff App
Chevron

Chris Baldwin
Weatherford

Wolfgang Deeg
Devon

Roger Duncan
Baker Hughes, a GE company

Barry Freifeld
Lawrence Berkeley National Lab

Kyle Friehauf
ConocoPhillips

Steve Hirshblond
Shell

Eric Holley
Pinnacle

Paul Huckabee
Shell

Kelly Hughes
Chevron

Tommy Langnes
BP

John Lovell
MicroSilicon

Doug Norton
Fiber Optic Pipeline Solutions

Pierre Ramondenc
Schlumberger

Bill Shroyer
SageRider

Who We Are

SPE is the largest individual member organization serving managers, engineers, scientists and other professionals worldwide in the upstream segment of the oil and gas industry.

SPE International
Society of Petroleum Engineers

General Information

Accessibility
Our events and functions are accessible to all attendees with wheelchairs. If you require special arrangements, please contact our staff at the registration desk.

Alcohol Policy
SPE recognizes the legitimate serving of alcoholic beverages in the process of conducting business and social activities. We also recognize that the use and consumption of alcohol carries with it the requirement for all attendees to consume those beverages responsibly.

Commercialism
In remaining consistent with workshop objectives and SPE guidelines, commercialism in presentations will not be permitted. Company logos should be used only to indicate the affiliation of the presenter(s).

Continuing Education Units
Attendees will receive 2.0 CEUs. One CEU equals 10 contact hours of participation. CEUs will be awarded through SPE Professional Development for participation and completion of an SPE workshop. A permanent record of a participant's involvement and awarding of CEUs will be maintained by SPE.

Documentation
Following the workshop, a URL containing released copies of the workshop presentations will be available to all attendees.

Electronic Devices
As a courtesy to the speakers and your fellow registrants, please turn off all electronic devices during presentations.

Name Badges
Please wear your badge at all times. It is a courtesy to your fellow registrants, speakers, and sponsors.

Photography and Recording Policy
SPE reserves the exclusive rights to all video/audio recording or reproductions of the workshop.

Unauthorized video/audio recording is expressly prohibited in the session room(s) or poster area, whether by video, still or digital camera, mobile phone, or any other means or form of reproduction.

Any person attending may be photographed or videotaped, and by your attendance, you give permission to use your image in possible future marketing publications including print, online, and video.

Workshop Format
Workshops maximize the exchange of ideas among attendees and presenters through brief technical presentations followed by extended Q&A periods. Focused topics attract an informed audience eager to discuss issues critical to advancing both technology and best practices.

Many of the presentations are in the form of case studies, highlighting engineering achievements and lessons learned. In order to stimulate frank discussion, no proceedings are published and members of the press are not invited to attend.

Carina® Sensing System
breakthrough performance enabled by Constellation™ fibers

SILIXA
sense the difference

» Seismic acquisition
Data quality beyond that of geophones

» Microseismic monitoring
High sensitivity for lower microseismic event detection

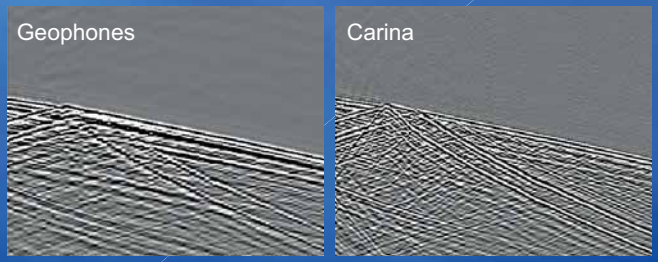
» Strain monitoring
Early crosswell strain monitoring

» Proppant allocation
Fine resolution, wide dynamic range for treatment monitoring

» Production allocation
High sensitivity for dynamic production monitoring

» Flow metering
Non-intrusive wellhead production monitoring

» Subsea well monitoring
Operating over long tie-back installations



www.silixa.com
sales@silixa.com
T: +44 (0) 20 8327 4210 / +1 832 772 3333

Monday, August 27, 2018

1730–1900
Welcome Reception
Onyx Room

Tuesday, August 28, 2018

0700–0800
Registration Check-in and Breakfast
Grand Ballroom Foyer

0800–0810
Chairperson's Welcome

0810–0845
Keynote Presentation: Future Directions in Fiber-Optic Sensing - From Quantum-Based Data Acquisition to Advanced Machine Learning
Alan Cohen, U.S. Department of Energy

0845–1015
Session 1: Seismic Imaging
Session Chairs: Barry Freifeld, Lawrence Berkeley National Lab
Steve Hirshblond, Shell

- Presentation 1: Distributed Acoustic Sensing Measurements for Reservoir Characterization in the Anadarko Basin
  Dan Kahn, Devon Energy
- Presentation 2: DAS VSP from the Containment and Monitoring Institute Field Research Station in Newell County, Alberta, Canada
  Heather Hardeman, Fotech Solutions
- Presentation 3: Permanent Reservoir Monitoring using DAS VSP and Surface Orbital Vibrators: Field Trials from the CO2CRC Otway Project
  Barry Freifeld, Lawrence Berkeley National Lab

1015–1045
Coffee Break
Grand Ballroom Foyer

1045–1215
Session 2: Emerging and Enabling Technologies
Session Chairs: John Lovell, MicroSilicon
Wolfgang Deeg, Devon

- Presentation 1: Point Heating and Optical Fiber Monitoring for Flow Movement Investigation
  Frank Selker, SelkerMetrics
- Presentation 2: Evaluation of Distributed and Engineered Acoustic Sensors for Multiphase Flow Measurements including Phase Allocation Using a Machine Learning Technique
  Garth Naldrett, Silixa
- Presentation 3: Enhancing the Temperature Performance of DTS Measurements when using a Combined DTS/DAS Configuration
  Gareth Lees, AP Sensing

SAGE RIDER

Real-time
All the Time

Fiber Optic Services

DAS & DTS
Acquisition and Interpretation

sageriderinc.com

1215–1315
Lunch
5280 Suite

1315-1445
Session 3: Completion and Stimulation Design Optimization
Session Chairs: Chris Baldwin, Weatherford
Eric Holley, Halliburton

- Presentation 1: Combination of Distributed Sensing and Point Flow Measurements: What is the Value?
  Pierre Ramondenc, Schlumberger
- Presentation 2: Development of a Completion Model for the Monitoring of EOR in Wells with Heavy and Extra Heavy Crude in the Largest Deposit in Latin America
  Gerardo Peña, Rosneft
- Presentation 3: Successful Applications using Real-Time Fiber Optic Technology in Kuwait
  Sam Gorgi, Pinnacle, a Halliburton Company

1445-1500
Coffee Break
Grand Ballroom Foyer

1500–1700
Session 4: Stimulation Diagnostics
Session Chairs: Paul Huckabee, Shell
Pierre Ramondenc, Schlumberger

- Presentation 1: New Near-Wellbore Hydraulic Fracture Geometry Insights from the Integration of Fiber Optics and Downhole Pressure Gauge Data
  Gustavo Uguesto, Shell
- Presentation 2: Fiber Optics in Completions: Real Time Stage Optimization
  Price Stark, Pinnacle, a Halliburton Company
- Presentation 3: A Frac Monitoring Case Study in the Montney
  Carson Laing, OptaSense
- Presentation 4: Completions Optimization Utilizing Multiple Wells Fiber Optics Data with Intervention Type Fiber
  Jennifer Charbonneau, Oasis Petroleum

1700–1830
Networking Reception
Brown Palace Club

WELL & RESERVOIR MONITORING

AP SENSING
advanced photonic

Distributed
Temperature Sensing (DTS)

- Superior reliability and ruggedness
- Outdoor, rack mount & portable
- Outstanding worldwide support
- Singlemode and multimode

Distributed
Acoustic Sensing (DAS)

- Upstream, midstream and downstream
- Leading performance
- Hydraulic fracture monitoring
- In-well flow profiling of production and injection wells

Leading the Way with Passion.

www.apsensing.com

America's Sales Office: 214 471-3460

Wednesday, August 29, 2018

0700–0800
Breakfast
Grand Ballroom Foyer

0800–0930
Session 5: New Technologies
Session Chairs: Tommy Langnes, BP
Bill Shroyer, SageRider

- Presentation 1: Real-time Cement Displacement and Long-term Zonal Isolation Monitoring using Distributed Fiber Optic Sensors
  Qian Wu, The University of Texas at Austin
- Presentation 2: Fiber Optic Resistivity Sensing
  Glenn Wilson, Halliburton
- Presentation 3: Downhole Distributed Fiber Optic Production Logging Tool
  Garth Naldrett, Silixa

0930–1000
Coffee Break
Grand Ballroom Foyer

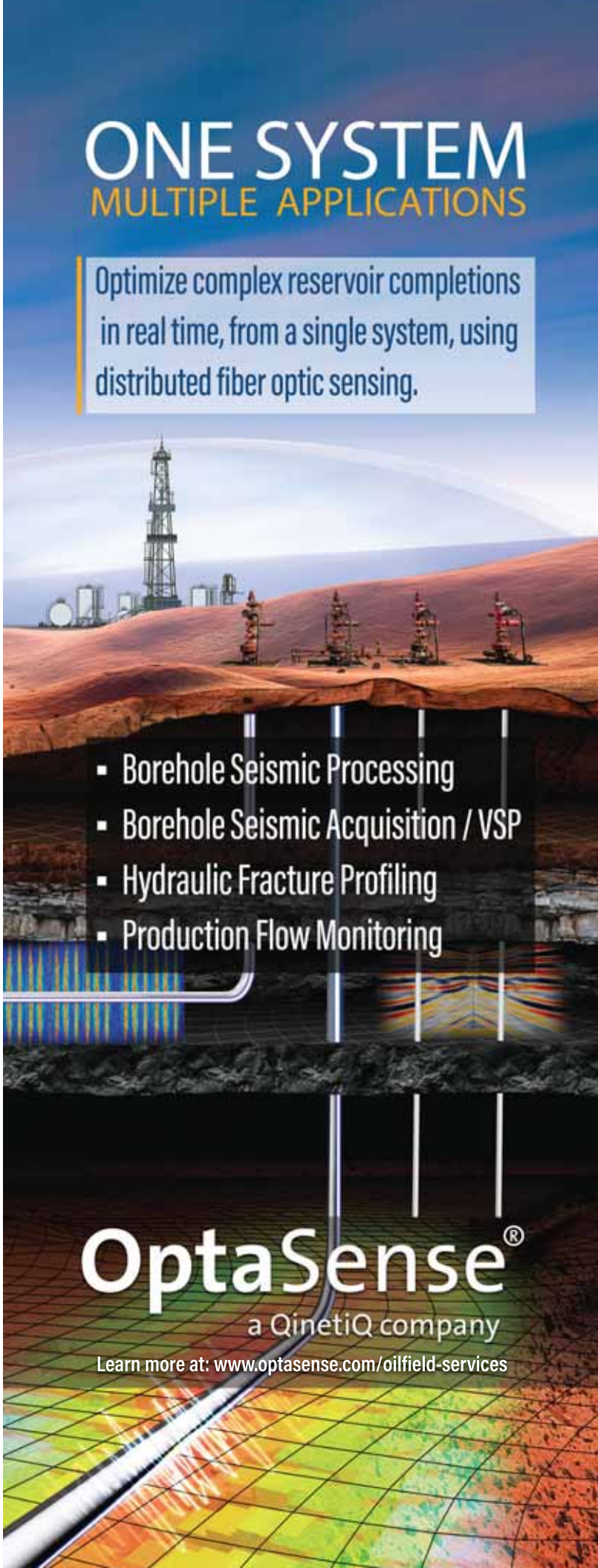
1000–1200
Session 6: Fiber Deployment
Session Chairs: Bill Shroyer, SageRider
Doug Norton, Fiber Optic Pipeline Solutions

- Presentation 1: Best Practices of 10 Years of Using Distributed Measurements as Part of Coiled Tubing Interventions
  Pierre Ramondenc, Schlumberger
- Presentation 2: A New and Cost-Effective Approach to Fiber-Optic Well Interventions
  Tad Bostick, Well-SENSE
- Presentation 3: Mapping the Orientation of Downhole Sensing Cables and Control Lines Using a Hybrid Distributed and Engineered Acoustic Sensing System
  Mahmoud Farhadiroushan, Silixa
- Presentation 4: Conveyance-Agnostic DAS Seismic Tomography
  Glenn Wilson, Halliburton

1200–1300
Lunch
5280 Suite

1300–1430
Session 7: Data Management, Visualization, Big Data, and Data Fusion
Session Chairs: Steve Hirshblond, Shell
Kelly Hughes, Chevron

- Presentation 1: Fiber Optics Data and Cloud Technologies
  Kanwal Gupta, Chevron
- Presentation 2: Sparse Representation of Distributed Acoustic Sensor
  Matt McDonald, Fotech Solutions
- Presentation 3: Digital Transformation of Wells and Reservoir Surveillance Using Distributed Fibre Optics
  Tommy Langnes, BP



1430–1500
Coffee Break
Grand Ballroom Foyer

1500–1700
Session 8: Production and Injection Profiling/ Flow Monitoring
Session Chairs: Jeff App, Chevron
Kyle Friehauf, ConocoPhillips

- Presentation 1: A Comparison of Different DAS Technologies for Production Flow Analysis
  Frode Hveding, Saudi Aramco
- Presentation 2: Downhole Sand Ingress Detection Using Fibre-Optic Distributed Acoustic Sensors
  Tommy Langnes, BP
- Presentation 3: Calibration of Double-Ended DTS System
  Ge Jin, ConocoPhillips
- Presentation 4: Distributed Fiber Optic Measurements Combined with Production Logging Tool Data Strengthens Fluid Flow Interpretation in Wells
  Yosmar Gonzalez, Schlumberger

Thursday, 30 August, 2018

0700–0800
Breakfast
Grand Ballroom Foyer

0800–0930
Session 9: Integrity, Flow Assurance, and Pipeline Monitoring
Session Chairs: Doug Norton, Fiber Optic Pipeline Solutions
Roger Duncan, Baker Hughes, a GE company

- Presentation 1: Value of Strain Sensing in the Belridge Field
  Matt Cannon, Shell
- Presentation 2: The Applicability of Distributed Acoustic Sensing for the Application of Pipeline Integrity Monitoring
  Stuart Large, Fotech Solutions
- Presentation 3: Tubing Leak Detection using Distributed Fibre Optic Acoustic Sensors
  Tommy Langnes, BP
- Presentation 4: Putting Theory Into Practice: Field Trial of DFOS on a Pipeline
  David Norman, ExxonMobil Upstream Research

0930–1000
Coffee Break
Grand Ballroom Foyer

WellWatcher BriteBlue
MULTIMODE DTS FIBER

BP optimizes drainage of more than 100 million barrels of secondary oil.

WellWatcher BriteBlue* multimode DTS fiber provided continuous temperature profiles of individual reservoir zones, which enabled the effects of depletion to be monitored over time. As a result, BP adjusted its strategy for water injection and oil drainage—facilitating the drainage of more than 100 million barrels of secondary oil and also eliminating the need to run production logging tools.

Find out more at
slb.com/wellwatcher

Schlumberger

*Mark of Schlumberger. © 2018 Schlumberger. 18-DO-420463

1000–1130

Session 10: Consortia Review

Session Chairs: Eric Holley, Halliburton
Wolfgang Deeg, Devon

Brief overviews from the various organizations that are involved with formulating standards and protocols for the industry will be provided. A focus on current and planned activities for each organization will also be discussed.

- Presentation 1: Energistics – Energy Standards
  Ross Philo, Energistics
- Presentation 2: FOSA – Fiber Optic Sensing Association
  Mike Hines, OFS
- Presentation 3: SEAFOM
  Chris Baldwin, Weatherford

POSTER PRESENTATIONS

Displayed Wednesday and Thursday during coffee breaks

Novel Methods for Interpretation of In-Well Temperature Measurements
Khafiz Muradov, Heriot-Watt University

Subsurface Flow Profiling for Hydraulic Fracturing with Downhole Fiber Optic Distributed Temperature Sensing
Burton Mendonca, Pamban Energy Systems

Notes:

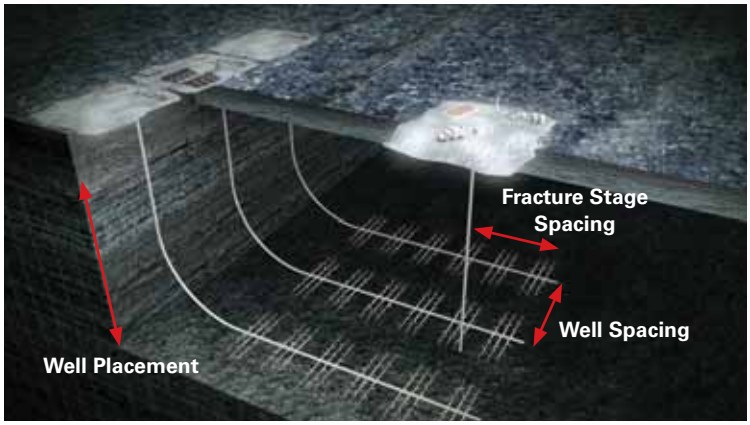
LIOS WELL.DONE
Reliable temperature and strain sensing

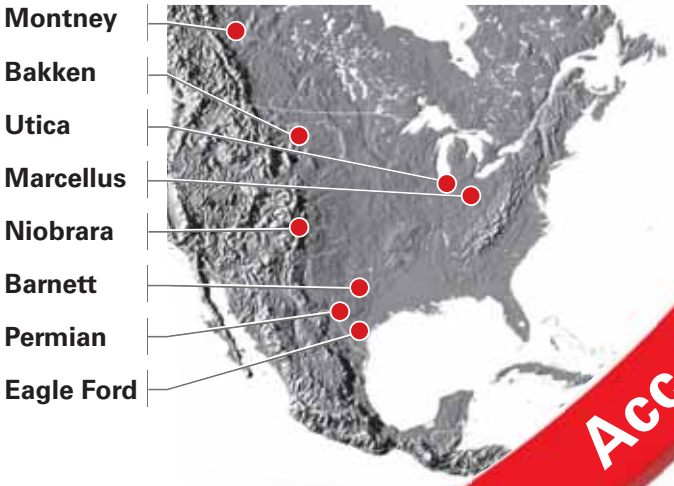
Distributed Temperature Sensing with real-time resolution better than 0.08°C and fast measurements over long distances up to 70 km.

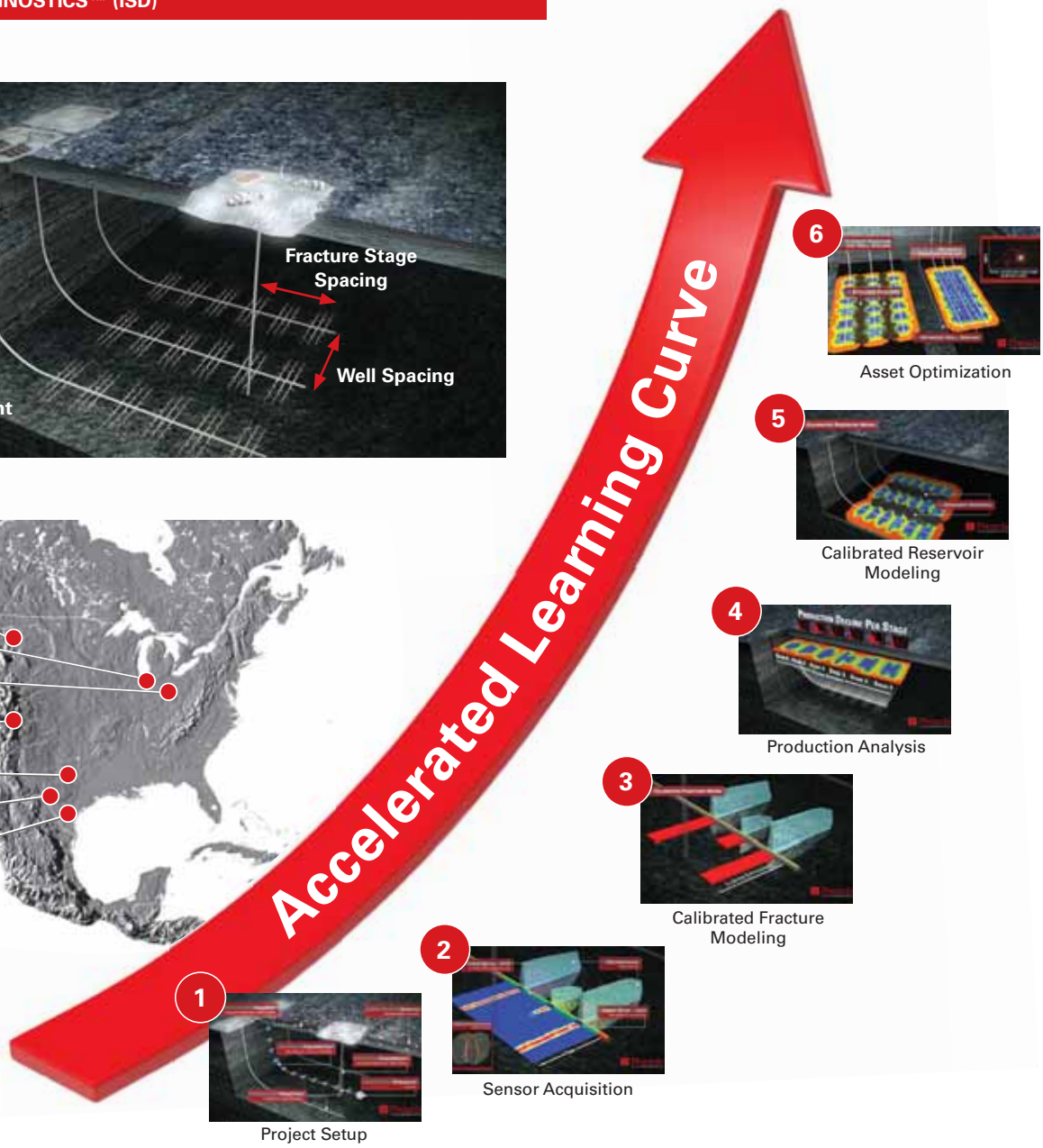
Distributed Strain Sensing for real-time shearing and deformation monitoring.

All in maintenance-free industrial units designed for harsh environments.

NKT Photonics







ISD Accelerates the Asset Learning Curve by Combining the World's Leading Frac Company with our Industry Leading Diagnostics

Solve the most fiscally critical challenges:

- Real-time decision making on the job site
- Solve your well and fracture spacing challenges
- Make intelligent data driven decisions guided by experts

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

H012523 6/18 © 2018 Halliburton. All Rights Reserved.