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

8–9 August 2023 | The Westin Westminster | Westminster, Colorado, USA

Program Chairpersons

Dennis Dria, Myden Energy Consulting Chairperson

Steven Mathias, Weatherford Co-Chairperson

Program Committee

Faraaz Adil, Halliburton

Jeff App, Chevron

Donald Craig, BP

Kyle Friehauf, ConocoPhillips

Jackson Haffener, Devon

Ge Jin, Colorado School of Mines

John Lovell, MicroSilicon

Doug Norton, AFL

Pierre Ramondenc, SLB

Pierre-Francois Roux, Baker Hughes

Baishali Roy, ConocoPhillips

Brian Seabrook, Exxon Mobil

Jyotsna Sharma, Louisiana State University

Bill Shroyer, SageRider

Richard Temple, Chevron

Richard Tøndel, Equinor

Gustavo Ugueto, Shell

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.

Society of Petroleum Engineers

The upstream energy industry is at an exciting stage in the use of optical sensing to measure, understand and optimize asset performance. The breakthroughs and enhancements in the last several years that have created this excitement include

- Extended sensing range, enhanced measurement sensitivity and greatly improved signal-to-noise performance through instrument and fiber engineering efforts
- Novel strain measurement and interpretation technologies that expand the value of fiber-optic sensing in conventional and unconventional oil & gas applications
- Broadened application space to accommodate the energy transition, a priori cases as well as exploiting reservoir analogs in such areas as carbon capture/utilization/storage and geothermal energy harvesting

In this SPE Workshop on Fiber-Optic Sensing we will highlight the results of these value-adding breakthroughs and enhancements through multiple sessions with case studies in the areas of hydraulic fracture stimulation, multiphase flow measurement, fiber-based seismic acquisition and imaging, CCUS monitoring and optimization and geothermal energy recovery. We anticipate significant participation from operators, service companies and the OEM sector (instrumentation, fiber, cables, etc.) with multiple networking opportunities on the schedule.

Thank You to Our Sponsors!

Corporate Sponsor

HALLIBURTON

Internet Sponsor

Weatherford®

Notepads Sponsor

SILIXA

Science based. Future proof.

Technical Agenda

As of 11 July 2023

Monday, 7 August, 2023

1730–1830 — Fountain Greens Courtyard
Welcome Reception

Tuesday, 8 August, 2023

All technical sessions will take place in Standley Ballroom.

0700–0800
Registration Check-In and Continental Breakfast

0800–0815
Chairman's Welcome and Introduction

0815–0930
Session 1: Keynote Presentation—Sensing the Energy Future
Chairs: **Kyle Haustveit,** Devon Energy Ventures

0930–1000
Coffee Break

1000–1130
Session 2: Seismic Applications—New Methods and Technology
Chairs: **Baishali Roy,** ConocoPhillips
Jackson Haffener, Devon Energy

- Some Chevron Deepwater DAS VSP Learnings 2021–2023
  Scott Baker, Chevron
- Conductive Fracture Imaging (CFI) of Microseismic Reflection Data Recorded by Multiple DAS Arrays
  Anton Reshetnikov, Reservoir Imaging Solutions (RIS)
- Deep Learning-Driven Waveform Inversion of Walkaway DAS VSP Data
  Vladimir Kazei, Saudi Aramco

1130–1300
Lunch — Cotton Creek/Meadowbrook

1300–1430
Session 3: Integrity, Flow Assurance, and Pipeline Monitoring
Chairs: **Jyotsna Sharma,** Louisiana State University
Doug Norton, AFL
Pierre Ramondenc, SLB

- Real-time Downhole Monitoring Using DAS: A promising Technology for Leak Detection and Well Integrity
  Aurélien Cherubini, Febus
- Annuli Liquid-Level Monitoring Using Distributed Fiber Optic Sensing Data
  Kjetil Haavik, Equinor
- Long-Term Well Integrity Monitoring in A Gas Hydrate Study Site with Distributed Temperature Sensing
  Ana Garcia-Ceballos, Colorado School of Mines

1430–1500
Coffee Break

1500–1630
Session 4: Lower Carbon Applications (CCUS and Geothermal)
Chairs: **Richard Temple,** Chevron
Pierre-Francois Roux, Baker Hughes

- Monitoring of Next-Generation Geothermal Systems with Distributed Fiber Optic Sensing
  Aleksei Titov, Fervo Energy
- Novel DAS Active and Passive Seismic Monitoring Concepts for CCUS
  Samantha Grandi, Shell
- A Comparison of Straight and Helically Wound Optical Fiber for DAS Monitoring of the Geological Storage of CO_2
  Brendan Kolkman-Quinn, Carbon Management Canada

1630–1730
Networking Reception — South Courtyard

Wednesday, 9 August, 2023

0700–0800
Continental Breakfast

0800–0930
Session 5: Emerging Applications and Technologies
Chairs: **Bill Shroyer,** SageRider
Ge Jin, Colorado School of Mines
Richard Tøndel, Equinor

- Towards Integrated Fiber Optic Distributed Acoustic and Magnetic Sensing: Theory, Simulation and Observation
  Eileen Martin, Colorado School of Mines
- Shape Sensing Application Based on High Precision RFS and Application for Surface Seismic
  Kinzo Kishida, Neubrex
- Hollow Core Optical Fibers for CO_2 Distributed Gas Sensing
  Allan Chang, Lawrence Livermore National Laboratory

0930–1000
Coffee Break

1000–1200
Session 6: Stimulation Diagnostics
Chairs: **Gustavo Ugueto,** Shell
Faraaz Adil, Halliburton

- Plug and Perf Treatment Design Optimization Using Fiber Optic Interpretation and Integration—Addressing the Stimulation Efficiency Effectiveness Balance
  Gustavo Ugueto, Shell
- Fracture Height Quantification from Fiber Measurements
  Kan Wu, Texas A&M University
- Hydraulic Fracture Fluid Distribution Uniformity: Why Do In-Well DAS and Perf Imaging Analysis Not Align?
  Kyle Friehauf, Conoco Phillips
- Rapid Characterization of Hydraulic Fracture Geometry Using Cross-Well Low-Frequency DAS
  Smith Leggett, Texas Tech University

Technical Agenda

As of 11 July 2023

1200–1330
Lunch — Cotton Creek/Meadowbrook

1330–1500
Session 7: Distributed Fiber Optic (DFO) Sensing Applications, Deployment Methods and Technology Advancements—Onshore and Offshore
Chairs: Don Craig, BP
Brian Seabrook, Exxon Mobil

- **Of the Value of Fiber-Optic Sensing: Some QaQc Considerations**
  Joel Le Calvez, SLB
- **A Numerical Model for Analyzing Mechanical Slippage Effect on Cross-Well Distributed Fiber Optic Strain Measurements During Fracturing**
  Ge Jin, Colorado School of Mines
- **Fiber Optic Surveys to Locate Reservoir Containment Breaches**
  Annabel Green, Well-SENSE

1500–1530
Coffee Break

1530–1700
Session 8: Production and Injection Profiling/Flow Monitoring
Chairs: John Lovell, MicroSilicon
Jeff App, Chevron
Kyle Friehauf, ConocoPhillips

- **Monitoring Gas Migration in a Wellbore Using DAS, DSS, and DTS**
  Jyotsna Sharma, Louisiana State University
- **Downhole Flow Loop: A Facility for Fiber Optic Flow Sensing Research**
  Max Deffenbaugh, Aramco Americas
- **Characterization of Two-Phase Slug Flow Using Distributed Acoustic Sensing in Horizontal Pipes**
  Sharifah Ali, Colorado School of Mines

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 1.6 CEUs. One CEU equals 8 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.

SPE workshop Survey

Please take a moment and let us know your thoughts on this event!

http://go.spe.org/23AWESWorkshopAttendee

See, measure and act on subsurface fracture behavior in real time.

The SmartFleet® fracture monitoring system integrates downhole diagnostics, real-time measurements and live visualization, so you can evaluate and validate fracture performance faster.

Real-Time Fracture Insights:

- Cluster level fluid distribution
- Fracture azimuth, growth rate and geometry
- Observed frac communication
- Well interference across benches
- Inter-stage communication
- Pre-frac well integrity

Real-Time Design Improvements:

- Adjust stage length while maintaining uniformity index
- Optimize perf design
- Improve time to rate and breakdown
- Improve proppant schedule to reduce pump time
- Identify impacts of well sequencing

LEARN HOW

HALLIBURTON