



28 NOVEMBER - 2 DECEMBER 2021

# 3RD EDITION: AAPG/EAGE HYDROCARBON SEALS OF THE MIDDLE EAST GTW – AN AAPG/EAGE VIRTUAL EXPERIENCE –

# EAGE

EUROPEAN  
ASSOCIATION OF  
GEOLOGISTS &  
ENGINEERS

virtual



WORKSHOP BROCHURE

## WHAT TO EXPECT FROM THE AAPG/EAGE VIRTUAL EXPERIENCE

Due to the ongoing travel restrictions and differing guidelines from companies and organizations, the AAPG/EAGE 3rd Edition: Hydrocarbon Seals of the Middle East GTW will now be taking place virtually from 28 November - 2 December 2021 and then on-demand anytime, from anywhere, and from any device for the next 2 months. The workshop will provide the best opportunity to safely connect with industry colleagues and peers while travel restrictions, social distancing, and health concerns persist. The new dynamic all-digital platform makes it simple for you to access all the great science, networking, and technology to help you stay on the cutting edge of petroleum geoscience. Our businesses and industry are experiencing difficult times, but overcoming obstacles is what explorers do – so let's do it together.

Benefits of our virtual events:

- Easily view the live presentations, ask questions and chat with other attendees
- Easily access the technical program and details of each presentation
- View the profiles of each presenter
- Participate in breakout discussion sessions
- Networking with other attendees and schedule one on one meetings
- Access to all the presentations for up to 2 months after the workshop
- Access to a dedicated sponsorship page
- Digital delegate bag and certificate of attendance

## TECHNICAL PROGRAM COMMITTEE

**Hamad Al Shuaili (Chair)**  
PDO

**Lars Hubert**  
Masirah Oil

**Omar Al Jaaidi**  
Ara Petroleum

**Jose Guevara**  
Oxy

**Suleiman Shukairi**  
Daleel Petroleum

**Sultan Abdullah**  
Schlumberger

**Khalil Al-Hooti**  
Sultan Qaboos University

## WORKSHOP OUTLINE

This five-day workshop has the primary goal to share knowledge, case studies, techniques and workflows pertaining to the understanding and prediction of hydrocarbon seals for exploration and production in the Middle East.

Seals are a fundamental element of any hydrocarbon accumulation, and can control trap integrity, migration and charge volumes; the lateral and vertical distribution of hydrocarbons in a trap; percent fill (or spill) of a reservoir; and the flow of hydrocarbons from the trap during production. As such, the long-term economic success or failure of an exploration to development project is very dependent on seal risking. Thus, consideration of subsurface hydrocarbon seals should have a high priority early on in any subsurface evaluation programme.

In many areas, despite the clear importance of seals, they often remain the least studied and integrated element of the petroleum system and are subject to lasting dogmas (e.g. the thicker the seal the greater its capacity to seal). Elements that contribute to making seals effective, such as lithology, their brittle-ductile nature, the hydrocarbon column length, the pressure regime and trap type will be reviewed.

Both vertical and lateral seals must be identified when exploring for subtle and stratigraphic traps. Seals created by faults and other types of seals will be reviewed. Quantification of effective seals and an ability to predict seal capacity before drilling is key to safe and successful exploring. In terms of seal assessment, understanding and predicting hydrocarbon seals is typically a multidisciplinary task requiring geosciences and engineering to collaborate on both dynamic and static data. In many areas of the Middle East our approach to understanding seals varies and it is now time to come together, share what we think and we know through the exchange of workflow, technique, and case study examples.

### Workshop Objectives

The workshop has a rich program of oral presentations and e-posters covering a variety of seal aspects. It will present integration cases of seismic, special core analysis, petrophysical, geochemical, pressure, and production data. Participants are expected to leave with knowledge and exposure to the following:

- Regional and intraformational seals with field analogues
- Sequence stratigraphic framework, facies and relationships to seal occurrences
- Hydrocarbon seal architecture and capacity in carbonate, evaporite and clastic sequences
- Static (capillary) and dynamic sealing capacity and hydrocarbon retention.
- Integration of petrophysical, rock mechanics, seismic and engineering data for hydrocarbon seal assessment
- The impact of structural geology & geomechanics on hydrocarbon seals
- Sealing capacity of faults and implications for fluid flow modeling

### Benefits of Attending

The workshop is an opportunity for attendees to receive up-to-date knowledge about hydrocarbon seals in exploration and production, exposure to regional case studies and to be introduced to workflows and techniques utilized for seal detection and capacity assessment. It is an opportunity to network and share experiences.

## WORKSHOP GUIDELINES

### FORMAT

The workshop will be 5 days, consisting of presentations, e-poster presentations and breakout sessions where participants can discuss and investigate a specific theme that is of mutual interest. The first day will feature an inaugural keynote speech by a high-profile professional from the industry.

### ATTENDANCE

Registrations are invited from all relevant disciplines with experience and/or knowledge of the subject areas being addressed in the workshop. Registrations will be accepted on a first-come, first-served basis.

### CALL FOR E-POSTERS

You are invited to prepare an e-poster for presentation at the virtual workshop. If you are interested in participating, please send a short abstract to [cnavarro@aapg.org](mailto:cnavarro@aapg.org) by 28 October 2021. All e-poster presenters will have a dedicated 5 minute session during the technical program to present their work. Attendees will be able to further discuss the e-posters with the presenters via the virtual chat feature throughout the event.

### REGISTRATION TYPES & FEES

Fees are inclusive of access to all the live talks and on demand presentations for up to 2 months after the event. To register using a 'Member' rate you must be an active member of AAPG or EAGE. To register as a 'Student / Young Professional' you must either be a current student or a young professional under the age of 35 with less than 10 years of work experience.

### REGISTRATION TYPES & FEES

Member: \$525  
Non-Member: \$625  
Faculty Member: \$200  
Faculty Non-Member: \$250  
Student Member: \$100  
Student Non-Member: \$150  
To register please visit: [middleeast.aapg.org](http://middleeast.aapg.org)

### REGISTRATION DEADLINE

To guarantee your seat, please make sure to register by **22 November 2021**.

### CANCELLATION POLICY

AAPG will refund the tuition, less a \$100 processing fee, if the request is received no later than 30 days prior to the workshop. Cancellations must be made in writing. The registrar will accept cancellation notices by telephone, but all such notices must be followed up by fax or e-mail. No refund will be made for cancellations received less than 30 days prior to a workshop being given. Nonpayment of tuition does not constitute automatic cancellation. If no cancellation notice is received by 30 days prior to a workshop, participants are liable for full tuition. AAPG reserves the right to cancel a workshop if enrollment is insufficient to ensure proper effectiveness. Substitutions for individuals can be made at any time. A paid enrollment may be transferred one time to a future workshop if the request is received prior to the 30 day cut-off date.



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SESSION DESCRIPTIONS

DAY 1 SUNDAY 28 NOVEMBER

**SESSION 1: REGIONAL, SUB-REGIONAL AND LOCALIZED INTRAFORMATIONAL SEALS WITH FIELD ANALOGUES**

Regional, sub-regional and localized intraformational seals play a vital role while exploring for new hydrocarbon prospects and/or developing producing fields. For example, the analysis of an exploration target depends on how thick an oil column, a certain identified seal can trap before it leaks. Likewise, the petrophysical properties and thickness of an intraformational seal define its ability to form a barrier to flow in geological and production scales. Generally, the potential and impact of the intraformational seals depend on their areal extent, thickness, capacity, geometry and integrity.

This session will discuss Oman's intraformational seals comparing them to different field analogues from various sedimentary basins which will provide a better appreciation of their potential impact on field exploration and development.

DAY 2 MONDAY 29 NOVEMBER

**SESSION 2: SEQUENCE STRATIGRAPHIC FRAMEWORK, FACIES AND RELATIONSHIPS TO SEAL OCCURRENCES**

Sequence stratigraphy provides an excellent framework within which to integrate many scales of observations of physical, chemical and biological attributes necessary to understand seal rock occurrences across the spectrum of depositional settings. The seal rock might be deposited in the wide range of depositional environments, ranging from lacustrine trough marine shelf to bathyal. A stratigraphic unit is not a cap rock unless it seals an underlying reservoir; thus, the ideal seal rocks should occur in stratigraphic association with reservoirs. This condition is liable to be met in many types of depositional settings, particularly associated with Transgressive and Late Highstand System Tracts (transgressive marine shales on gently sloping siliciclastic shelves or evaporitic deposits in regressive supratidal sabkhas and in evaporitic interior basins).

This session will discuss the use of sequence stratigraphy framework and depositional settings associated with hydrocarbon seal occurrences, with examples from the Middle East. Furthermore, the session will address the expression of depositional sequences in seal rocks on seismic, well-log, core, and outcrop data.

DAY 3 TUESDAY 30 NOVEMBER

**SESSION 3: HYDROCARBON SEAL ARCHITECTURE, CAPACITY AND RETENTION IN CARBONATE, EVAPORITE AND CLASTIC SEQUENCES**

Seals are key elements of any petroleum system. Their importance is usually overlooked during the evaluation of the potential hydrocarbon accumulation. The effectiveness of seals depends on several factors. The most important is the thickness, continuity, and high capillary entry pressure. The typical lithology of seals in the Middle East includes shale, silt, salt, and anhydrite formations. In terms of their architecture, they can be created by vertical lithological stratifications and lateral lithological variation or porosity degradation. Additionally, faults and fractures can act as seals by impeding fluid flow. In the Arabian Peninsula, potential seals include deformation bands, and hydrodynamically-aided stratigraphic and fault rocks.

Assessment of seals using a rigorous strategy is vital in the appraisal phase. However, production and injection-related activities might alter seals hydrocarbon retention characteristics, and therefore, must be incorporated in all stages of the field development plans. Understanding and predicting hydrocarbon seals is typically a multidisciplinary task requiring geosciences and engineering to collaborate on both dynamic and static data.

This session discusses challenges confronted in the evaluation of seal capacity and best practices for the assessment of seal quality in Oman with emphasis on case studies from different reservoir rock types.

DAY 4 WEDNESDAY 1 DECEMBER

**SESSION 4: INTEGRATION OF PETROPHYSICAL, ROCK MECHANICS, SEISMIC AND ENGINEERING DATA FOR HYDROCARBON SEAL ASSESSMENT**

Seals are fundamental element of any hydrocarbon accumulation. And despite their clear importance, they often remain the least studied and integrated element of petroleum system. Elements that contribute to making seals effective, such as lithology, their brittle-ductile nature, the hydrocarbon column length, pressure regime and trap type should be integrated when assessing seal effectiveness.

Both vertical and lateral seals must be identified when exploring for subtle and stratigraphic traps, including fault bound accumulation whether or not the fault has a sealing potential. Quantification of effective seals and an ability to predict seal capacity before investment is key to safe and successful exploration.

In terms of seal assessment, understanding and predicting hydrocarbon seal is typically a multidisciplinary task requiring geosciences and other subsurface engineers to collaborate on both dynamic and static data.

Seismic data, special core analysis, petrophysical evaluation, geochemical, pressure and production data can all be integrated. In addition, top seal ductility and brittleness, seal integrity and capacity, fluid pressures recorded in a compartmentalized accumulation can all contribute to a good assessment of the hydrocarbon seal.

Seals control migration pathways into traps. A trap may be empty not because a fault leaked once-trapped hydrocarbons but because a fault sealed and prevented hydrocarbons from migrating into a trap and filling it in the first place. Similarly, top seals can restrict vertical migration into shallow traps and control the vertical and lateral distribution of hydrocarbons within a basin.

DAY 5 THURSDAY 2 DECEMBER

**SESSION 5: THE IMPACT OF STRUCTURAL GEOLOGY & GEOMECHANICS ON HYDROCARBON SEALS**

The structural geology and geomechanics play a crucial role in Hydrocarbon industry that cascades on different layers of scales, life cycle of fields, and disciplines.

In exploration environments risking traps are related to fault, top seals and trap geometry, these also imposes greater uncertainty on characterization compared to later life cycle of the field development. On the other hand, in the production environments; characterization of compartmentalization or fluid segregation possibly caused by fluid flow during production is required. This have implications on reserve estimates, and effective production strategies.

From Basinal and regional perspective, knowing and honoring the structural geology history and deformation style provides an insight to critically define the potential targets in working play to target exploration prospects and leads, where it can provide an effective sealing or seals that would leak resulting in shallow reservoirs to fill, for example.

This also have an impact on the fractionation or segregation on hydrocarbon fluids. Spill points, fault seal, top seal failures, fault rock characterization and variations of fluid contacts are all outputs that allows to risk or de risk the targeted areas and enables reducing uncertainties. Tools such as seismic, basinal model, burial history, diagenesis, fault seal analysis, juxtapositions, etc. are there to provide methods and concepts to strength between the hydrocarbon seals and its association with structural geology and geomechanics. Nevertheless, the role of dynamic aspect of traps while production and its impact, such as on fault stability are crucial to address as well as the controls on column and flow of hydrocarbon like the effect of overpressure on fault seal capacity, lateral water pressure changes, and combined hydrodynamic-membrane seal.

Geomechanics is fundamental in understanding the controls on rock fracture and fault development and fault activity. It assists in estimating fault conductivity and critical to determine reservoir behavior during production. It assists to reproduce subsurface stress state using lab methods and principles for rock failure and fault behavior to relate the rock mechanics. Applications like top sealing effectiveness and capacity and Hydrocarbon retention/column as well as critically stressed faults that can be conductive or reactivation for a fault flow.

This session will emphasize on the use of structural geology and geomechanics linked with exploration and development, with examples from the Middle East. Additionally, will express the tools and concepts utilized along with uncertainties accompanied with calibration and iterative nature of validation.

TO REGISTER, PLEASE CLICK HERE

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