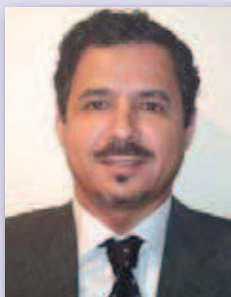


# Sand Control and Mitigation

Implementing Theoretical and Laboratory knowledge to Enhance Sand Control Experience

JW Marriott Hotel, Kuala Lumpur, Malaysia • 26th - 28th July 2010



## Course Facilitator:

**Musaed N. J. Al-Awad, Ph.D.,**  
Professor and Head of Petroleum  
and Natural Gas Engineering  
Department,  
King Saud University,  
Riyadh, Saudi Arabia

### Capitalise on the Expert Knowledge to Gain Maximum Value on these Vital Issues:

- ❖ **DETERMINE** causes of sand production
- ❖ **LEARN** basic rock mechanics related to sand control
- ❖ **GAIN** a theoretical background on establishing sandstone failure criteria
- ❖ **DEVELOP** your knowledge on sand-free production rate selection
- ❖ **SELECT** the best sand control method
- ❖ **OPTIMIZE** recent sand control and sand management methods
- ❖ **CITE** practical examples on sand control issues
- ❖ **FIND** out about case histories in sand production

**UNI** training courses are thoroughly researched and carefully structured to provide practical and exclusive training applicable to your organisation.

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## Workshop Overview

Participants at the end of this course will be able to have a well rounded knowledge of the causes that make wells to sand, while you learn the various methods of sand control. He will be familiar with basic rock mechanics necessary for sand control applications. Additionally, the participant will be able to run laboratory tests necessary for evaluating sanding rock properties as vital input parameters for most sand control techniques. Finally, the trainers will calculate and solve practical examples. The 1<sup>st</sup> day will focus on rock mechanics testing related to sand production issues. The 2<sup>nd</sup> day will be devoted to sand production from intact sandstone formations. The 3<sup>rd</sup> day will focus on sand control in unconsolidated sand formations.

### DAY 1 | 26th July 2010

#### ROCK TESTING BACKGROUND RELATED TO SAND PRODUCTION

##### Morning Session 1

- Introduction to Oil and Gas Industry
- Reservoir Rock Types and Properties
  - ❖ Unconsolidated sand
  - ❖ Weak to Moderate Strong Sandstone.
  - ❖ Others

##### Afternoon Session 1

- Rock Failure Criteria
- Discrete and Multi-State Triaxial Compression Test
- Rock Elastic and Frictional Properties Measurement

##### Morning Session 2

- Earth In-Situ Principal Stresses and World Stress Map
- Elastic, Plastic, and Viscous Models of Rock Behavior
- Overview on Common Rock Mechanics Tests

##### Afternoon Session 2

- Tutorial on using Laboratory Derived Data for:
  - ❖ Establishing Failure Criteria
  - ❖ Defining Frictional Properties
  - ❖ Computing Elastic Properties

### DAY 2 | 27th July 2010

#### SAND PRODUCTION IN INTACT SANDSTONE FORMATIONS

##### Morning Session 1

- Application of Rock Mechanics in Petroleum Engineering Practices
- Causes and effects of sand production

##### Afternoon Session 1

- Yield-Zone Theory
- Sanding Capability Prediction Approach
- Typical Sand Control Laboratory Set-Up
- Sand and Sandstone Samples Demonstration

##### Morning Session 2

- Linear-Poroelastice Solution for Stresses around Circular Boreholes (Kirch Solution).
- Coupled Darcy-Kirch Solution for Sand-free Production Rate Prediction

##### Afternoon Session 2

- Tutorial on Calculation of:
  - ❖ Production Induced Yield-Zone around the Productive Zone
  - ❖ Calculation of the amount of Movable Sand

### DAY 3 | 28th July 2010

#### SAND PRODUCTION IN INTACT SANDSTONE FORMATIONS

##### Morning Session 1

- Sand Downhole Control Concept:
  - ❖ Completion Techniques in Unstable Formations
  - ❖ Chemical Methods
  - ❖ Well and Perforations Orientation
  - ❖ Downhole Emulsification

##### Afternoon Session 1

- Sand Surface Management Concept:
  - ❖ Accumulation, Cleaning and Disposal
  - ❖ Sand Production Monitoring
- Case Studies

##### Morning Session 2

- Sand Transportation
- Sand Particle Size Distribution
- Gravel Packing Design
- Frac and Pack Stimulation

##### Afternoon Session 2

- Review and Conclusions
- Multiple Choice Assessment

## About Your Course Facilitator

**Professor Musaed N. J. Al-Awad, Ph.D.**, is the chairman of Petroleum and Natural Gas Engineering, King Saud University, Riyadh, Saudi Arabia. He published more than seventy articles in scientific journals and conferences proceedings and conducted numerous research projects. Most of them are directly related to petroleum related rock mechanics (sand control issues, wellbore stability analysis, permeability-Stress relationship, and shale characterization), and oil well drilling engineering (drilling fluids characterization, hard set cement characterization, high angle and horizontal well orientation analysis). He is the author of "Petroleum and Natural Gas Engineering Overview for Non-Specialists". Some of those related to sand production include:

Musaed N. J. Al-Awad, and Saad El-Din M. Desouky: **"Prediction of Sand Production from A Saudi Sandstone Reservoir."** Oil & Gas Science Technology Journal - Revue De L' Institute Francias Du Petrole, Vol. 52, No. 4, pp. 1-8, July-August, 1997.

Musaed N. J. Al-Awad: **"Controlling Sand Production in Heavy Oil Formations Using Downhole Emulsification Process."** Journal of Engineering, Vol. 7, No. 3, pp. 171-179, 1997.

Musaed N. J. Al-Awad: **"The Investigation of The Source of Sand Produced from Competent Sandstone Reservoirs."** The Second Jordanian Mining Conference, Jordanian University, Amman, Jordan, pp. 393-405, April 26-29, 1997.

Musaed N. J. Al-Awad, Abdel-Alim H. El-Sayed and Saad El-Din M. Desouky: **"Factors Affecting Sand Production from Unconsolidated Sandstone Saudi Oil and Gas Reservoir."** Journal of King Saud University, Engineering Sciences, Vol. 11, No. 1, pp. 151-174, 1999.

Musaed N. J. Al-Awad and Abdel-Alim H. El-Sayed: **"Experimental and Modeling of Friable Sandstone Oil Reservoir Consolidation Using Steel Making Slag."** The Engineering Journal of the University of Qatar, Vol. 14, No. 3, pp.1-22, 2001.

A. M. Hemeida and Musaed N. J. Al-Awad: **"Using Local Gravel to Control Sand Production in a Saudi Oil Field."** Journal of Engineering and Applied Science, Faculty of Engineering, Cairo University, Vol. 48, No. 5, pp. 1009-1020, October, 2001.

Musaed N. J. Al-Awad: **"The Mechanism of Sand Production Caused by Pore Pressure Fluctuation."** Oil & Gas Science and Technology journal, Revue de L IFP, pp. 339-345, Vol. 56, No. 4, 2002.

Musaed N.J. Al-Awad and Talal Y. AlAhaidib: **"Prediction of Sand-Free Oil Production from a Saudi Oil Reservoir."** The 7<sup>th</sup> Offshore Mediterranean Conference and Exhibition (OMC-2005), Ravenna, Italy, March 16-18, 2005.

Musaed N. J. Al-Awad: **"Evaluation of Mohr-Coulomb Failure Criterion Using Uniaxial Compressive Strength."** The Saudi Meeting on Oil and Natural Gas Exploration and Production Technologies (OGEP-2008), Riyadh Saudi Arabia, 6-8 2008.

Some of his projects and practical experience include:

Musaed N.J. Al-Awad: **"Physical and Mathematical Modeling of Sand Production Problem in Hydrocarbon Reservoirs."**

Abdel-Alim Hashem, Musaed N. J. Al-Awad, and Omar Almisned, G. M. Hamada and Emad S. Al-Homadhi: **"Developing New Slurry to Prevent Sand Production from Unconsolidated Sandstone Oil & Gas Reservoirs."**

Omar A. Almisned, Abdulrahman A. AlQuraishi, and Musaed N. J. Al-Awad: **"Effect of In-Situ Stresses and Heterogeneities on Relative Permeability of Some Saudi Reservoirs."**

Musaed N. J. Al-Awad, and, Abdulrahman A. AlQuraishi: **"Developing a New Filter to Prevent Sand Production from Unconsolidated Sandstone Oil & Gas Reservoirs."**

## Who Should Attend

This course is suitable for intermediate level petroleum engineers, geologists, technologists and field personnel working in the oil and gas industry with a technical or operational interest in wells that produce sand.

### In-House Training

Cost effective In-house courses, tailored specifically to your organisation's needs, can be arranged at your preferred location and time. If you would like to discuss further, please contact our In-house division at [iht@unistrategic.com](mailto:iht@unistrategic.com).

### PRE-COURSE QUESTIONNAIRE

To ensure that you gain maximum value from this course, a detailed questionnaire will be forwarded to you upon registration to establish your exact training needs and issues of concern. Your completed questionnaire will be analysed by the course trainer prior to the event and addressed during the event. You will receive a comprehensive set of course documentation to enable you to digest the subject matter in your own time.

## Why you cannot miss this event

When developing a sandstone oil or gas reservoir, a prediction of sand production is required to evaluate the necessity of sand control. Sand prediction technology also assists in selecting the economically most attractive sand control techniques.

This course will enable participants to understand the key factors that need to be accounted for when managing the risk of sand production and how these are integrated into developing an effective and economical sand control process.

### Program Schedule

#### (Day 1 - Day 3)

08:30	Registration
09:00	Morning Session Begins
10:40 - 11:00	Refreshments & Networking Break
12:45	Luncheon
14:00	Afternoon Session begins
15:30 - 15:50	Refreshments & Networking Break
17:00	Course Ends