

INTELLIGENT INTEGRATED SUBSURFACE MODELING (IISM)

Addressing ADNOC E&P Challenges

ADNOC RESEARCH AND TECHNOLOGY DEVELOPMENT

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AGENDA



- Overview – ADNOC
- Challenges & Solutions
- IISM Program
- Solution Examples
- Results & Impacts

ADNOC BUSINESS & 2030 STRATEGY

ADNOC is the largest oil and gas company in the UAE and is among the top ten in the world.



3.5 million

barrels of oil production capacity per day



~11 bcf

of natural gas production capacity per day

ADNOC 2030 Strategy



More Profitable Upstream

Increase Capacity

- From 3 to 5 MMbd capacity

Improve Efficiency

- 70% recovery from mature assets
- Further savings in operational initiatives

Access New Resources

- New exploration blocks for concession



More Sustainable & Economic Gas Supply

Unlock Undeveloped reservoirs

- 1.1 Bscfd by 2025

Develop Unconventional

- 1 Bscfd by 2030

Climate, Emissions, and Energy

- Decrease GHG by 25% by 2030
- Expand CCUS capacity by 500%

ADNOC & INDUSTRY CHALLENGES

ADNOC Challenges

Integration



Fallback in **production guidance** due to lack of **integration**



Lack of production optimization **action tracker**



Fast **outdating models** requiring constant updates

Subsurface & Surface



Large number of **inactive strings**



Complex mapping of **stacked channels & thin sands**



Poor recovery due to high **reservoir complexity**



Flow assurance issues impeding **well rates**



Challenging **process system** optimization of sour gas production

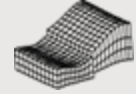
Productivity



Time consuming **modeling & simulation workflows**



Absence of **adaptive & intelligent** drilling solutions



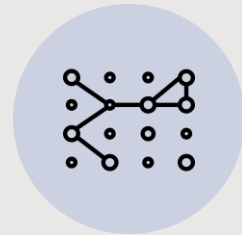
Large model size with **long** simulation runtimes



Massive database with complex data structure



Laborious & time-consuming data processing workflows



Isolated disciplines hindering fast & efficient model update



Complex decision making under uncertainty



Complex setup to keep reservoir models up to date



ADNOC IISM SOLUTIONS & ROADMAP

ADNOC Challenges

Integration

Subsurface & Surface

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Seismic

ML-Assisted Seismic Fault Interpretation

ML Seismic Horizon Tracking & RGT Model Generation

ML Seismic Stratigraphy

ML Seismic Conditioning



Petrophysics

ML-Assisted Log QC & Reconstruction

ML-Assisted Data QC Lab

ML-Assisted Data Pre-Processing Lab

Permeability Prediction & Rock Typing Framework

ML-Assisted Saturation Height Modelling

Optimal Layer Size to Capture All Heterogeneities



Static

Static Model Health Check

Permeability Streak Integration

Intelligent U&O Processing

Fast Track Dynamic Simulation Testing

Horizontal Well Calibration Function

Water Saturation Modeling



PVT

Intelligent PVT & EOS modeling : Foundation

Gas Injection Laboratory Data Prediction using ML

AI Flash Embedded in Reservoir Simulation

Gas Reservoirs / Gas Cap Fluid Properties Prediction using ML

Entire PVT Laboratory Data Prediction using ML

Consistency Check of PVT Laboratory Data



Dynamic

Dynamic Model Update & Consistency Check

IISM Integration to Build Reservoir Digital Twin

Automated Dynamic Model Initialization

ML-Based Model Calibration

Value-of-Information Surveillance for Optimum Reservoir Monitoring

AI-Driven Well Placement Optimization Under Uncertainty



Drilling

Intelligent Drilling Risk Analysis & Integration

Drilling Parameter Roadmaps

Equipment Recommender System (Bits & Motors) & Drill Bit Survival Modeling

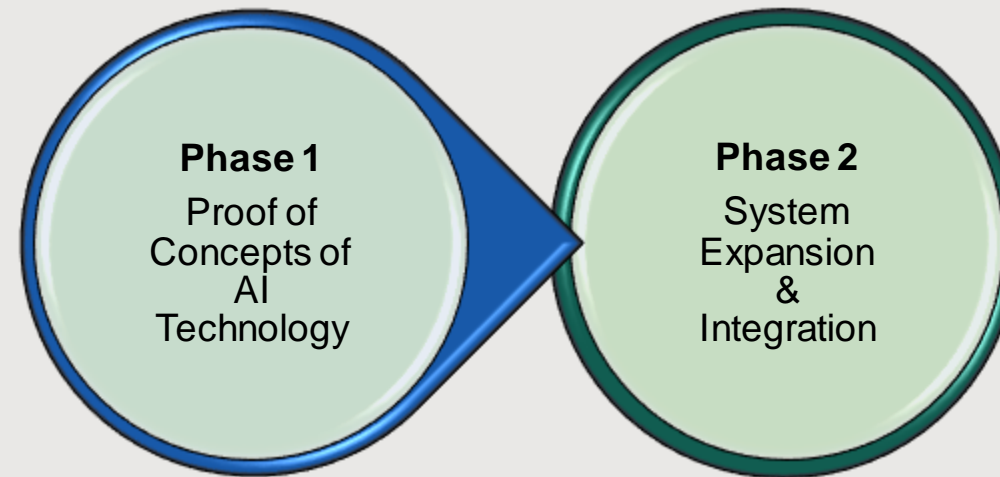


ADNOC IISM INNOVATION - PROGRAM & LEADERSHIP

Objectives

- Enable UAE and ADNOC 2030 Digital Strategy
- Enable Integrated Projects Execution De-Risking

Project Phases

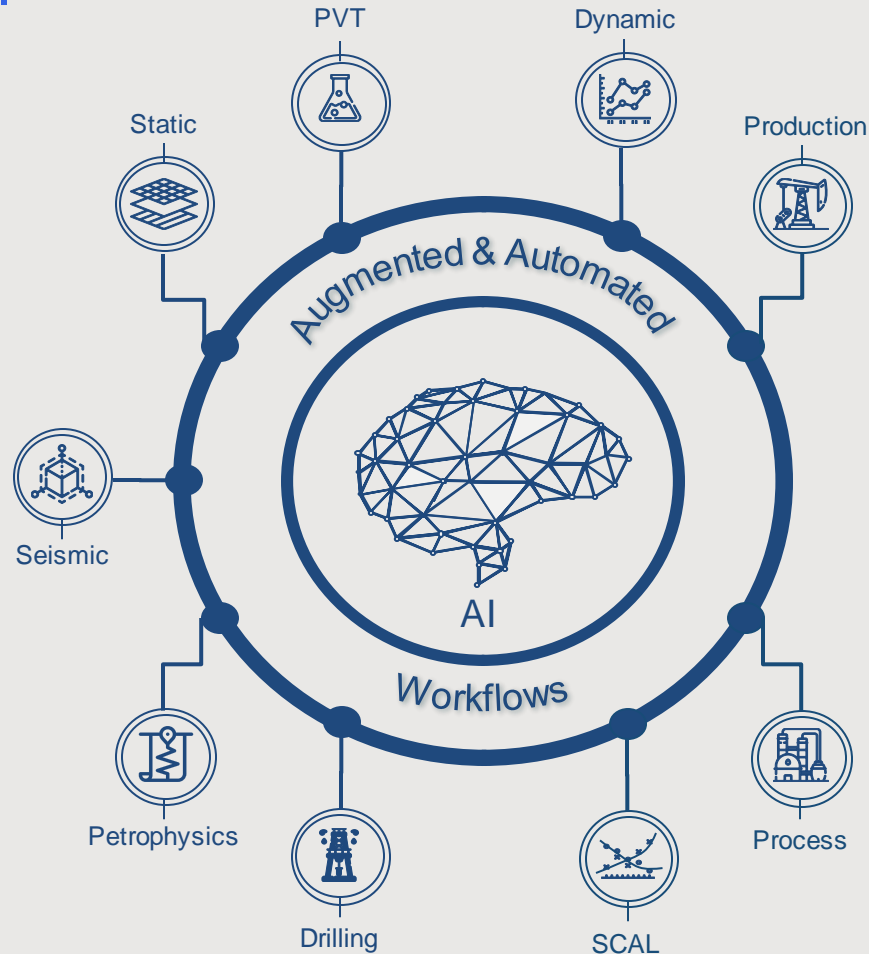


Leveraging AI & Automation
in Subsurface Modeling

AI & Data Integration
Across Disciplines

IISM - INNOVATION BUILDING BLOCKS

Subsurface Disciplines



Building Blocks



Intelligence: embedding AI and automation at all levels to extract insights, optimize processes and elevate people productivity.



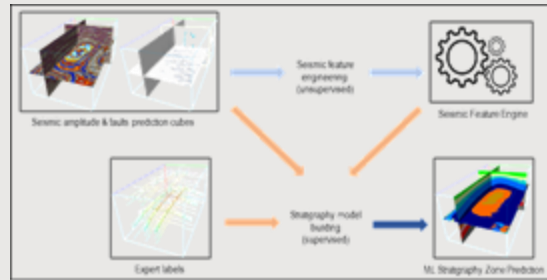
Integration: enabling a smooth data flow between AI solutions ensuring a deep integration to avoid integration losses.



Operationalization: enabling a seamless journey from modeling to operations optimization.

IISM – PHASE II EXAMPLES

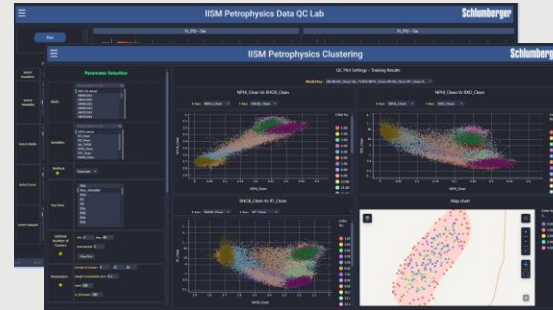
Seismic



ML-based solution to automate seismic stratigraphic interpretation & detection of interesting stratigraphic features.

Petrophysics

SPE 211719



ML-assisted solution to automate QA/QC & reconstruction of well log & core (SCAL & RCA) data.

Static

SPE 211661



ML-driven solution to identify & predict permeability clusters per zone, per rock type & even in the absence of rock types.

Dynamic

SPE 211061



ML-based solution to generate "ensemble" of history matched reservoir models using intelligent proxy models.

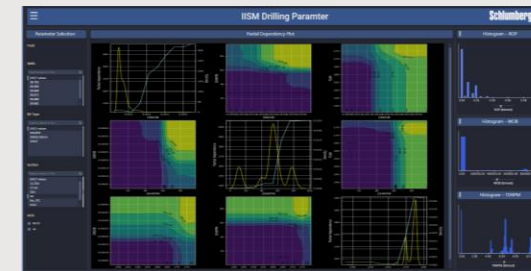
PVT

SPE 211080



ML-driven automated solution that predicts gas injection laboratory experiments for EOR studies.

Drilling



ML-based solution that analyzes drilling data to identify an optimum set of drilling parameters.

IISM – RESULTS & POTENTIAL IMPACTS



Khalid Kuleib

Senior Vice President
ADNOC Research & Development

“... Over the next 30 years the IISM has the potential of delivering more than **10 billion dollars** in added value to ADNOC alone. And multiples of this to the industry at large...”



Reduce FDP lifecycle from over **3 years** to under **5 months** resulting in massive value generation.



Establish **intelligent processes** for faster data processing and interpretation resulting in **97% efficiency gain**.



Unlock opportunities through **AI-driven FDP optimization** leading **3-5% increase** in production.



**THANK
YOU**
