Subsurface Advanced Analytics

Co-Innovation Journey to convert bytes into barrels

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PDO- Dimensions

- 75% of Oman’s Oil production from 8,000+ active wells in 240+ fields
- 7500+ km of pipelines
- Flow lines in km (15500+)
- Number of employees (8000+)
- Contractor employees (50,000+)
- Number of rigs (48+)
- Other mobile units (220+)
- 2019 kilometers driven & LTI free (1+ mln)
- Renewable Energy – Solar Investment
- Compliance with Ministry of Climate and Environment.
Diversity, Complexity and Artificial Lift

PDO - Primary, Secondary & Tertiary Recovery

North
- Carbonates
- Fractured
- Light
- 1 – 20 cP
- 1500 - 2000 m
- 35 fields

South
- Sandstone
- Unconsolidated/stacked
- Light – Heavy
- 1 – 10,000 cP
- 800 - 1200 m
- 60 fields

Development Type
- Primary, WP & GOGD
- EOR - Thermal
- EOR - Misc G1
- EOR - Chemical

Lift Type - North / South split - 2011
PDO- Subsurface Digital Journey
Data & Thinking Driven Innovation

- **Business Objectives**
  - PDO has embarked on AI/ML as part of the Digital Transformation initiatives with the main objectives of:
    - Business Process Improvement through automation and integration
    - Proactive Field and Opportunity Management by predicting equipment failures
    - Enabling a Field Development “living” plan by allowing frequent updates (Evergreen forecast)

- **Business Value - The focus has been on the following areas:**
  - Sweating the Asset
  - Deferment mitigation
  - Business efficiency
  - Business Delivery (Production Optimization)

- **Business Strategy – Actions to achieve the Business Value:**
  - In-House Capability building – Data Science domain
  - Multi-disciplines collaboration
Co-Innovation and Partnership

Decide, Develop, Deploy
Next Generation Technology Solutions For Next Generation of PDO Business

Competency - Localized
Building, Mentoring, Coaching the local talent of the country

Co-creating Value from Projects
Agile, Fast-paced, Focused
Data, Design, and Data Science

Training – Contextualized
Personalized from Global Experts
Self-Paced through Videos and Online for maximum benefit
Artificial Lift Failure Prediction Models
Data Driven Innovation

- **Business Drivers**
  - Sweating the Asset
    - Minimize ESP and Beam Pump equipments failure by detecting failure in active manner using AI/ML
  - Deferment mitigation
    - 30% associated to Subsurface, and
    - 70% of those linked to Unscheduled events (failures)

- **Business benefits - Path to Reliable Failure Prediction models**
  - 12 days advance Failure Prediction Models for ESP and RRP (AI/ML models)
  - 3 Local Omansi’s trained for Data Science in Houston
  - Better Opportunity Management & Resource Planning

- **Way forward in the Artificial Lift Domain**
  - Next phase from Proof of value to Field Ready (Eventually prescriptive)
  - Extend the failure prediction model to other fields
  - Replicate the model to other Artificial Lift systems

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Initial Failure Prediction Prototype

![Graph showing time stamp and initial failure prediction prototype]
Well Reservoir Management (WRM) Journey – Step by Step

- **Resource & Opportunity Management**
- **Leading Indicators**
  - Embed smart trigger systems; Categorize alarms to fast action
- **Surveillance by Exception**
- **Centralized Data**
- **Data Integration**
- **Lagging Indicators**

**We are Sweating the Assets**
Our Assets are safe and we know it
Our people are productive | We are cost efficient

- **Maximize Production and Reliability and Minimize Deferral**
- **Visibility of All Assets, All progress and Compliance**
- **Monitoring All Assets, Reactive to Proactive, Reduce time to fix**
- **Productivity Easy Data Performance Hierarchies**
- **Corporate Datastores**

- **Related Data**
Agility and Adaptability: – is essential in building a competent Big Data and Data Science practice in the company.

Recognition: Business Value, Competency maturity, and readiness for disruptive technologies. Knowing how to measure success and generate actionable insights.

Regulatory: Governance, Best Practices that are in line with emerging technology adoption for better and faster results.

Leadership – Strategic and Execution: Build the KSAs (Knowledge, Skills, and Attributes) for growth of the business. Set direction, goals, and resiliency culture. One of the top success criteria is Leadership in Digital Era training.

Effective Team: Co-innovating teams, Business focus with Career Growth by leveraging KSAs. KSAs for Big Data and Data Science are unique, need to grow through training and experience.

Organization Structure: Agile, Adaptive and Advancing mind set, Beyond the silos and focus on solving business challenges.

Accountability: Results oriented in Timely Fashion, Driven by Business requirements. Clear roles and responsibilities to enable faster decision-making.
Any Questions

Thank you
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