



International  
Petroleum  
Corp.

# Simple is Beautiful

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# Oudna Field

## History

- One of four operated offshore licences acquired by Lundin Petroleum from Coparex in 2002
- Oudna was discovered and tested by Shell Turinex in 1978 (7000 bopd). It is a low GOR oil of 41 API
- It is located ~80 kms offshore, in 265m water depth at a depth of approximately 1600m TVDSS
- Also:
  - Birsa / Zelfa discoveries – small oil discoveries with CO2 rich gas caps / associated gas
  - Isis field – in early 2000's, this carbonate field was in late-life decline and producing at relatively low rates via the Ikdam FPSO



## Oudna Field Opportunity

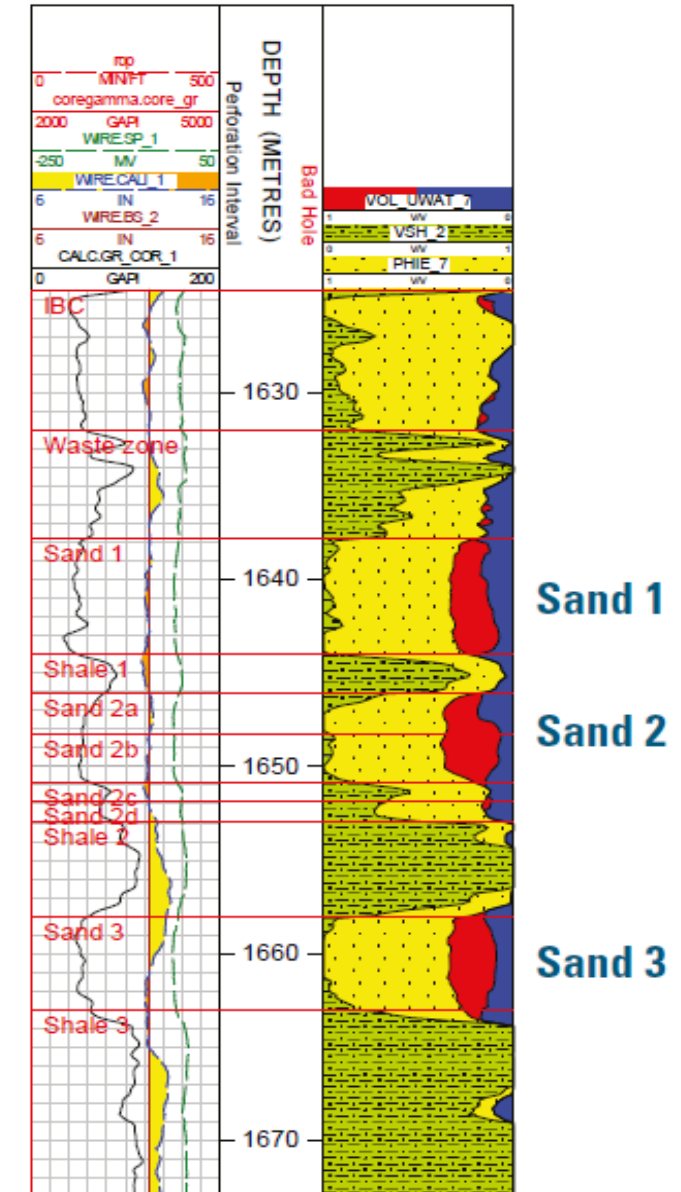
- Isis field in decline and producing at low production rates
- Isis field FPSO in the late part of its contract period giving very low daily lease rates to end 2011
- With potentially high daily production rates at Oudna field, could this low cost vessel be used to develop what had been considered an uncommercial field?
- Yes – but this would require us to:
  - Demonstrate a reserves base
  - Design a low cost / robust / simple Oudna field development
  - Gain agreement of the state oil company
  - Do it now



# Oudna Field Challenges

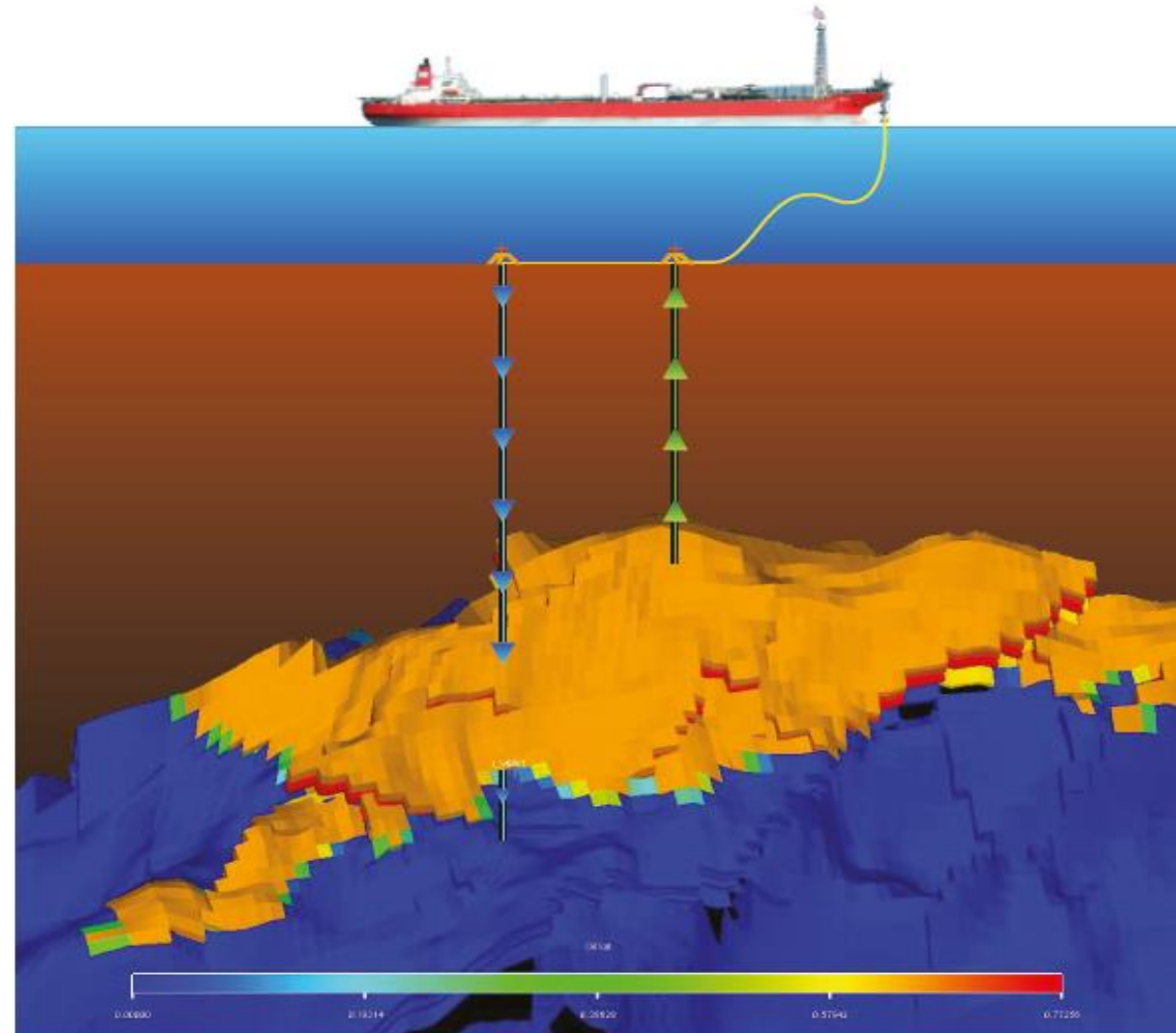
- **The structure is shallow, fault bounded and has no gas cap**
  - No aquifer assistance or pressure support likely
  - Primary depletion recovery would only be ~10%
- **The field will therefore require water injection to aid recovery**
  - This allows pressure maintenance and aids sweep
  - This can lead to 30 to 50% recovery factor depending on reservoir characteristics and geometry
- **Water injection will lead to rapidly developing water cut in the producer(s), requiring a robust (i.e. zero well intervention) artificial lift system and well completion**
  - Artificial lift will be required to maintain fluid production rates
  - Gas lift or ESP's would be the typical solution
  - Jet pump solution investigated
  - Water-breakthrough at producer will lead to formation instability
  - Expandable sand screens investigated

## UDNA-1



# Oudna Field Development Plan

- Initially an extended well test was planned before fully developing the field
- In early 2005, due to increased rig rates, the EWT concept became uneconomic and the development plan was amended
- FDP revised to mitigate the main sub-surface risks (OWC and compartmentalisation)
- After review of several scenarios it was decided to drill a producer/injector pair within areas of clear seismic character
- Target - development of ~10 MMstb at 20,000 bopd peak production



# Oudna Field

## Drilling, Completion and Well Testing

- **Oudna-3 (producer) and Oudna-4 (injector) successfully drilled in early 2006**
- **Oudna-3 was completed with expandable sand-screens and a 7" jet pump (one of the largest in the world at that time!)**
- **Confirmed oil-water contact depth**
- **Extensive well testing and interference testing success**
  - Proved productivity / injectivity
  - Proved communication between wells and connectivity within the main fault block



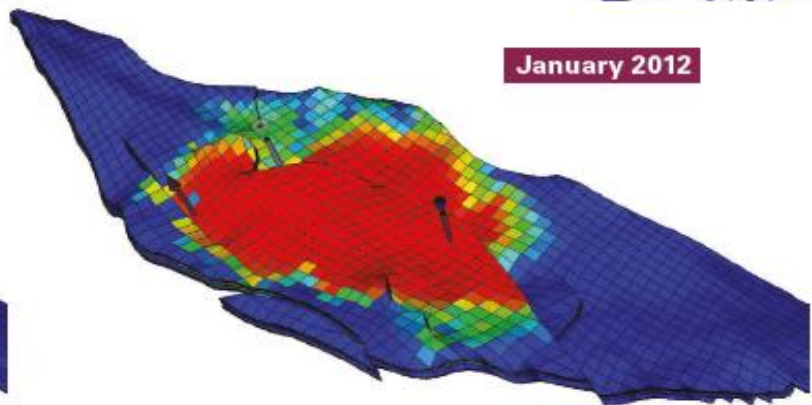
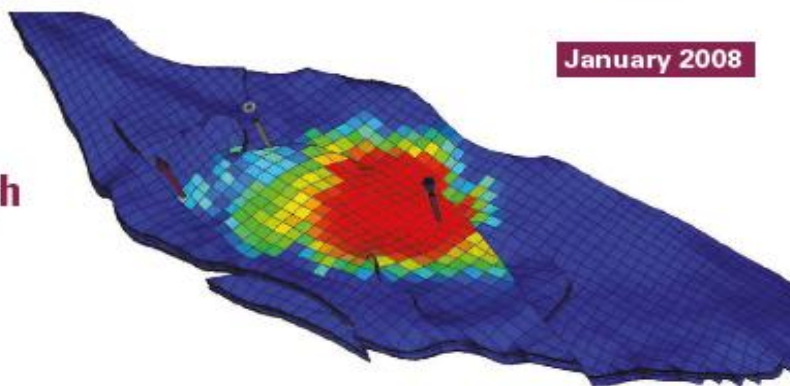
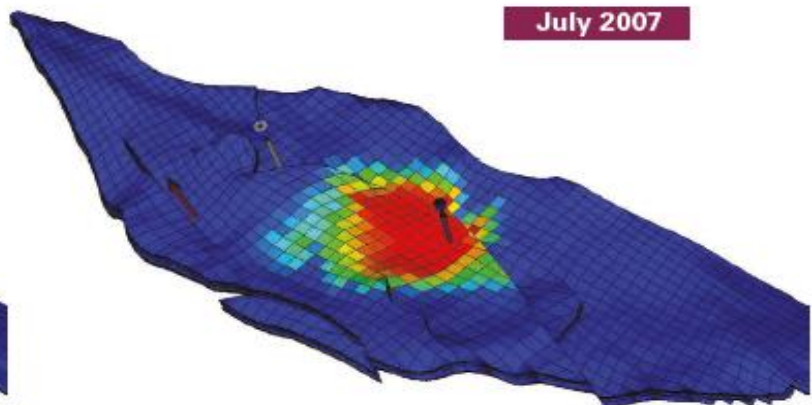
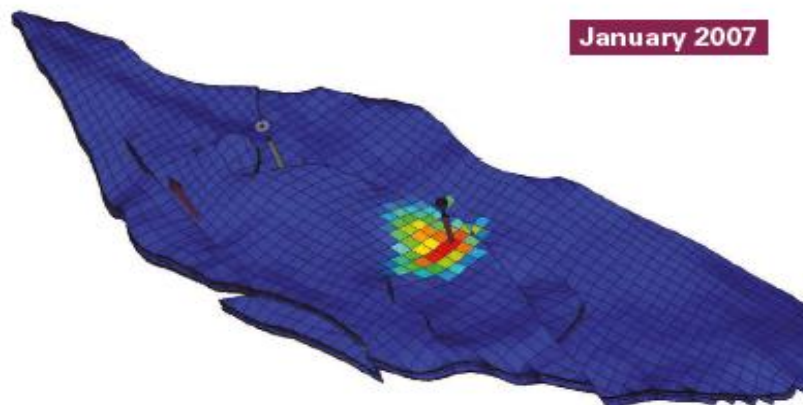
# Oudna Field Development Summary

- **Fast track project – started April 2005 to first production Q4 2006**
- **Marginal field commercialised**
  - Low cost FPSO
  - Flexible partners and progressive Government of Tunisia
  - Skip EWT and go straight to full-field development
  - Simple, reliable vertical well design
  - High reliability 7" jet pump (high rate, minimum maintenance)
  - Expandable sand screens to mitigate sand production
- **Target: commercial field development of 10 MMstb at 20,000 bopd peak production**

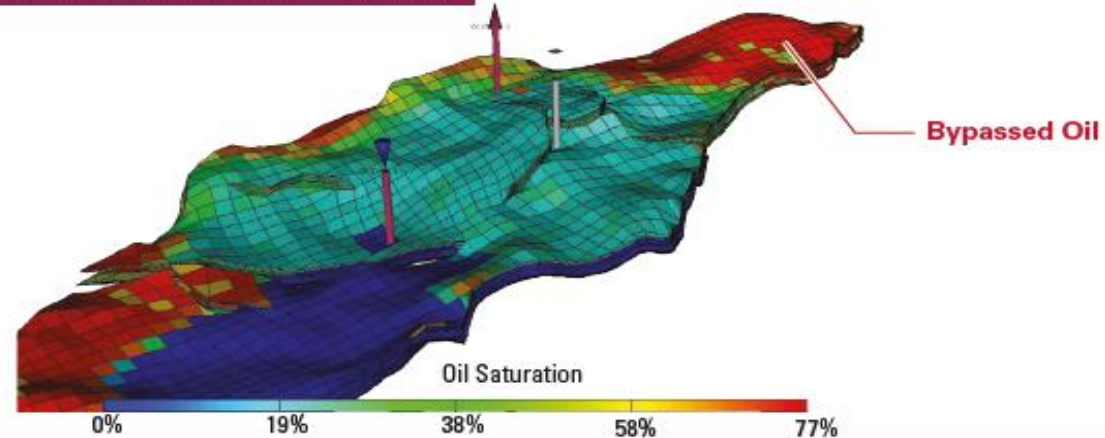


# Oudna Field Model Update Simulation Results

- Updated model consistent with earlier results
- Model predicts production rates of over 20,000 bopd initially
- Model predicts initial water-breakthrough at producer in May 2007
- Model predicts main fault block swept to close to Sor at end 2011
- Model produces approximately 10.5 MMstb



Simulation Oil Saturation at end 2011





## Ultimate Field Performance

- **Water breakthrough observed in the same month as predicted by the reservoir simulation model**
- **Step-wise build in water-cut as successive sands broke through**
- **Second production well not drilled following review of small scale faulting in the field**
- **Cumulative production to February 2012 was 10.4 MMstb, almost exactly in line with pre-development forecasting**
- **Jet pump was still operational, with the field producing some 1400 bopd at 94% water-cut**
- **However.....**

# Oudna Field Abandonment

- .....flowline / riser damage was sustained during a storm in Q1 2012
- Repair costs uneconomic given the very late life of the field
- Decision taken to abandon the field
- Wells were abandoned and the vessel removed in Q3/4 2012
- The vessel has been the FPSO for the Bertam field in Malaysia since Q2 2015

