



# Value Creation from an Implemented Sand Management Strategy – A Case Study

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Presented by:

Masoud Khabbazi (SMS)

Nurfarah Izwana Salleh (PETRONAS)

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**1** Insight of the technical journey PETRONAS has achieved in sand management – changing culture

**2** The method and approach with the support of in-house tool by PETRONAS

**3** Case studies from different fields and the value creation

# SUB-SURFACE INITIATIVE

**SandPre** : in-house tool for sand prediction



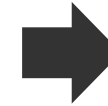
Create MEM model based on exploration well



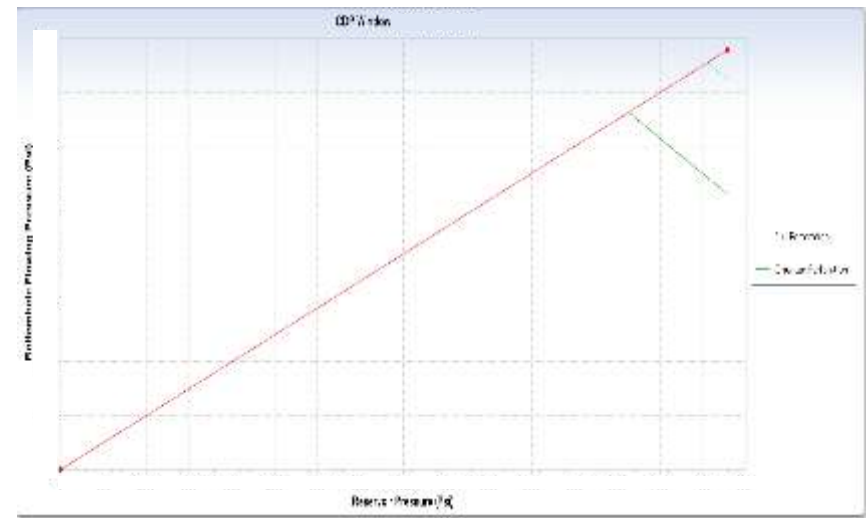
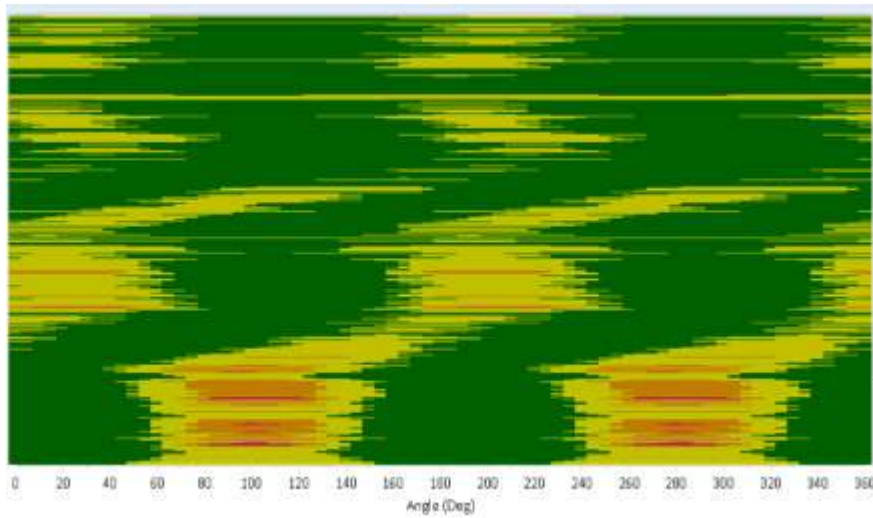
Create SOP model for production well with the same reservoir



Plot CDP for target zone & conduct sensitivity analysis



Predict the save production envelope or sand control method



# SUB-SURFACE INITIATIVE

## Thru Tubing Ceramic Sand Screen

- Cater for high GOR well with sand production-higher erosion rate

### Well Background:

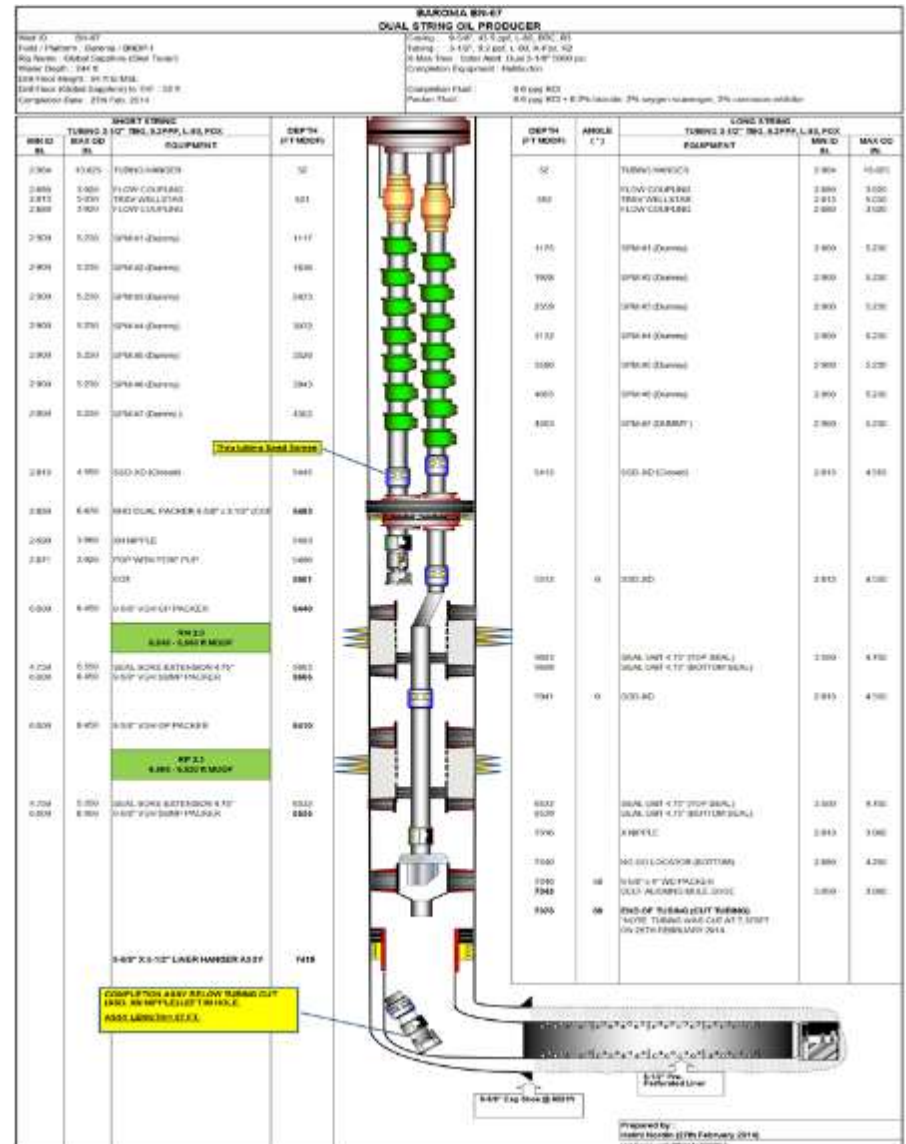
- Well was completed in Apr-95 as single oil producer
- Well was worked-over in Jul-14 as horizontal dual oil producer, completed at RN reservoir for short string (SS) and RP & RS for long string (LS)

### Well Status:

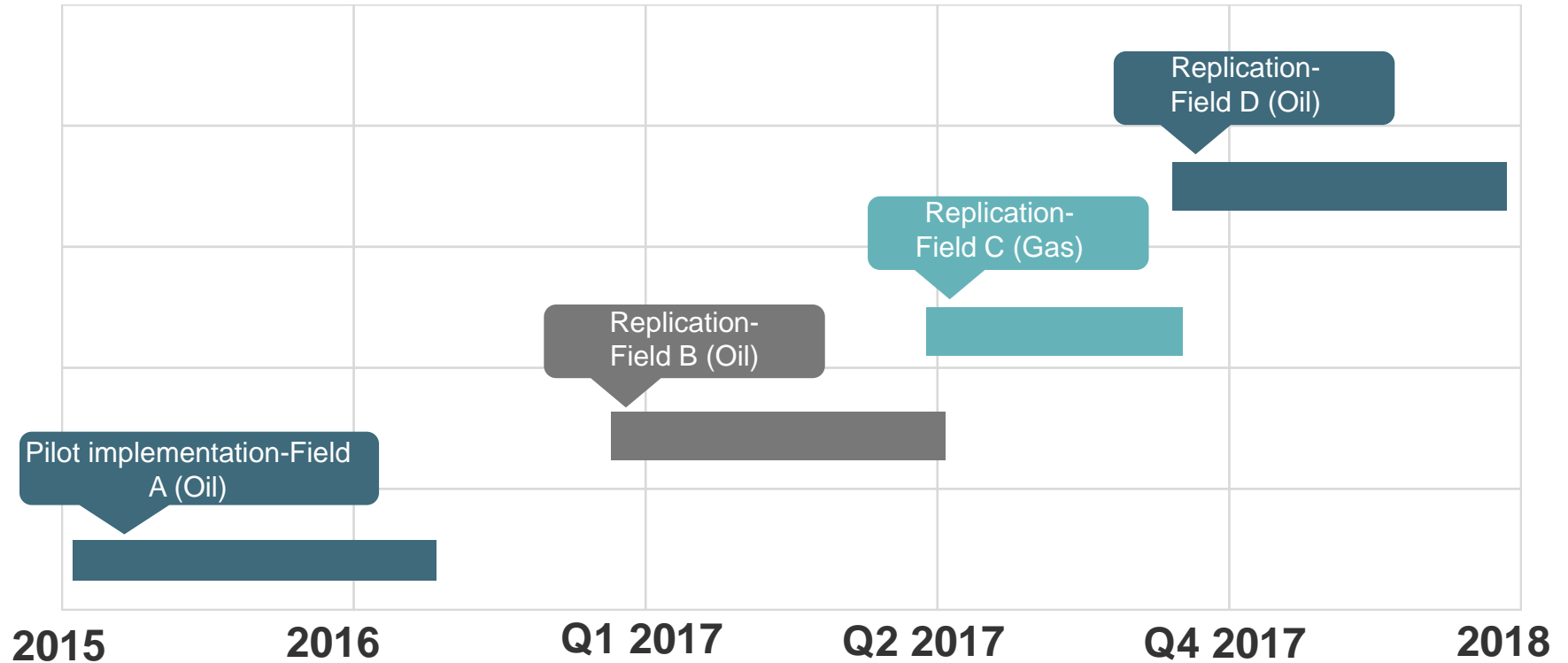
- SS:
  - Sand production started in Jun-15 & TTSS was installed in Jan- 16
  - C/I on May-16 due to high sand production & pin hole leak

### Job Proposed:

- Retrieve existing TTSS
- Drift run to 5,520ft MDTHF.
- Install 2x Ceramic TTSS hang from XN-Nipple @ 5,445ft MDTHF
- Produce the well as per bean-up procedure



# SURFACE - THE JOURNEY



**Barrels gain  
~600 bopd**



**LoPC avoidance saving  
millions MYR**

# THE PILOT – BREAKTHROUGH (2015)

**CASE STUDY**

## METHOD & APPROACH

- Worked Backwards – Export to wells, identifying limits for each line
- Created dynamic erosion model in conjunction with sampling data
- Installation of acoustics on test headers
- Targeted repeat failure with full individual investigation – ROOT cause

Use of Acoustic Monitoring & Sampling to:

- Observe the sand production trend of the well
- Calibrate the readings with manual sensor
- Establish the best practice for sand monitoring using acoustic sensor
- Perform an erosion mapping of key components in platform

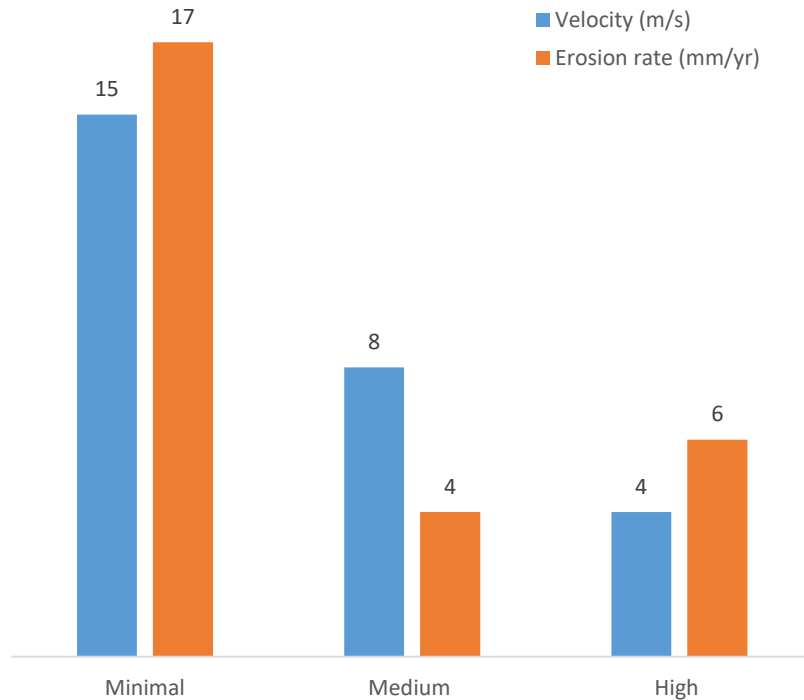
Use of 3-D UT Measurement:

- To record the 3-D profile of current wall thickness
- To identify the bends currently at risk



# THE PILOT – BREAKTHROUGH

**CASE STUDY**

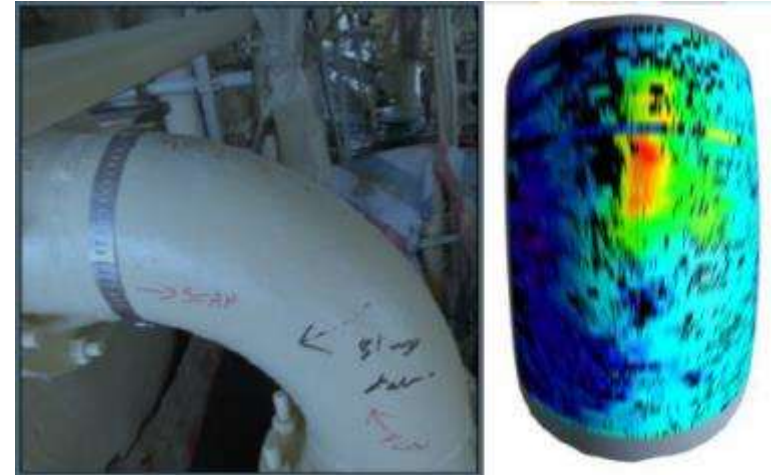


## ACOUSTIC MONITORING RESULT

- Well ranking best on severity of erosion rate and velocity
- Focus string for further monitoring

## 3D UT RESULT

- Avoided one LoPC at the main inlet of separator
- Severe erosion observed below MAWT ~50% loss
- Team fabricated new spool as precaution



# THE LEARNING CURVE

From the pilot, PETRONAS established sand management strategy for other fields.

- Internal evaluation and gap identification based on field
- Establish sand management strategy for 3 years ahead
- Launch in-house tool for sand erosion and deposition prediction – SET (Sand Erosion & Transportation)



- Sand erosion analysis for string level and platform level
- Sensitivity analysis based on production rate, sand rate & etc.
- Can be updated monthly based on well test data & sand count
- Categorize the wells based on severity

## SET VALUE CREATION



Cost saving : in-house analysis.  
Model for >40 platforms



Bean up opportunity (restricted well) : gain ~2000bopd (total since 2015)



Structure database for  
monitoring & surveillance plan

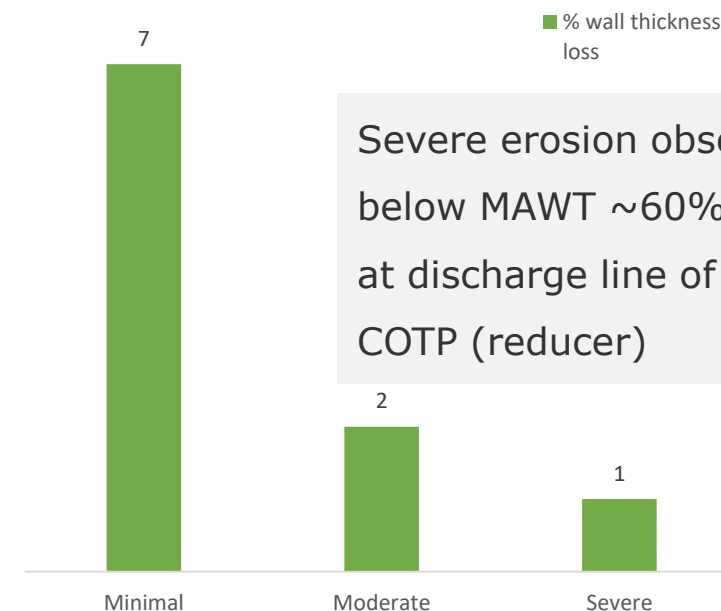
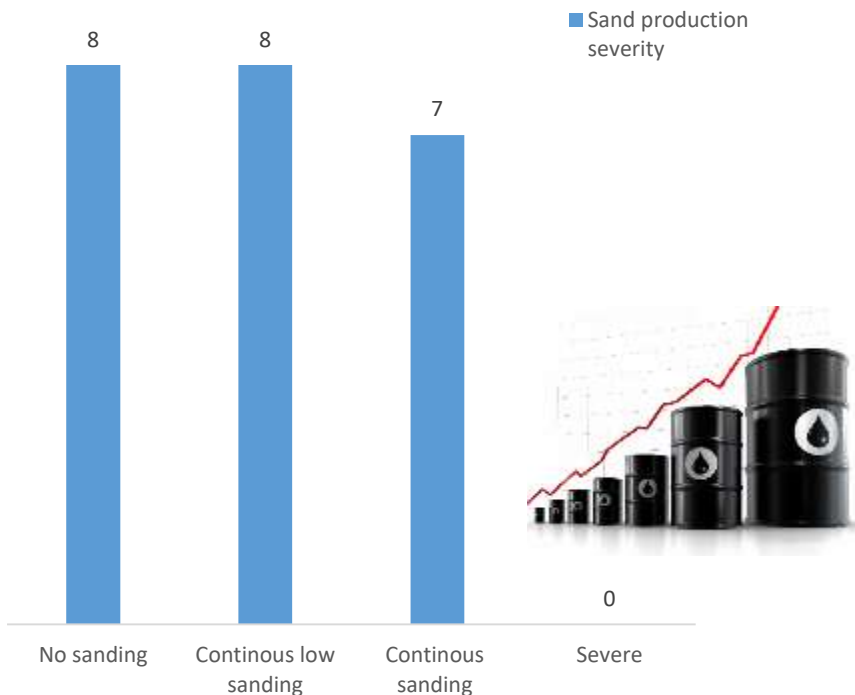


# REPLICATION – FIELD B (2017)

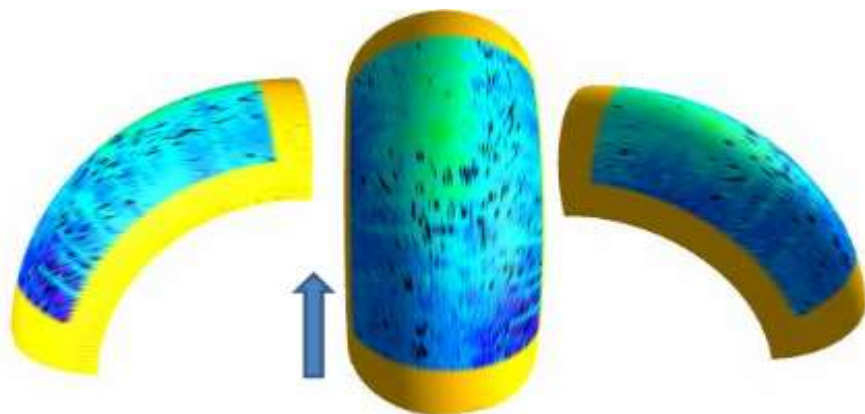
**CASE STUDY**

Replicate the same concept as Pilot case:

- 23 strings are monitored using acoustic (obj: indication of sand production)
- 10 locations are inspected using 3D UT



Severe erosion observed below MAWT ~60% loss at discharge line of COTP (reducer)



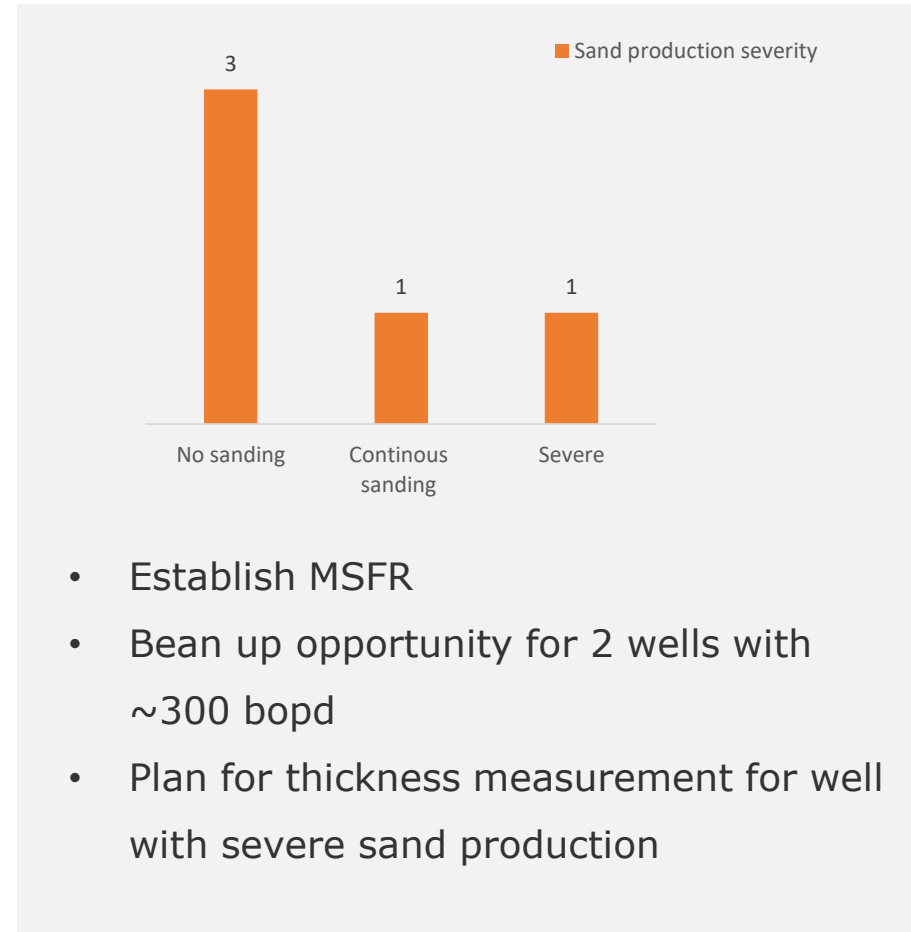
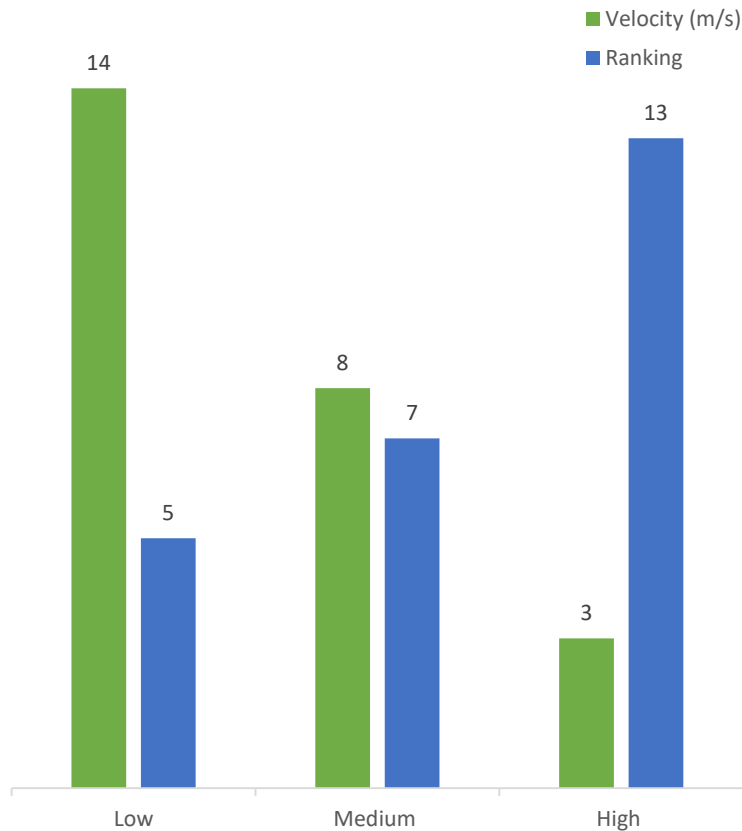
Bean up opportunity for one well with no sanding issue

- Gain of ~100bopd (whole campaign cost covered)

# REPLICATION – FIELD D (2017)



- All wells in Field D are producing with high GOR
- Pre-work before the campaign: Well ranking based on priority (velocity & history)
- Acoustic as monitoring for wells with TCSS



# VALUE CREATION

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By managing the sand on surface:

- Opened up more opportunity
- Proper surveillance and monitoring in place
- Risk management is addressed
- Standardization of process flow

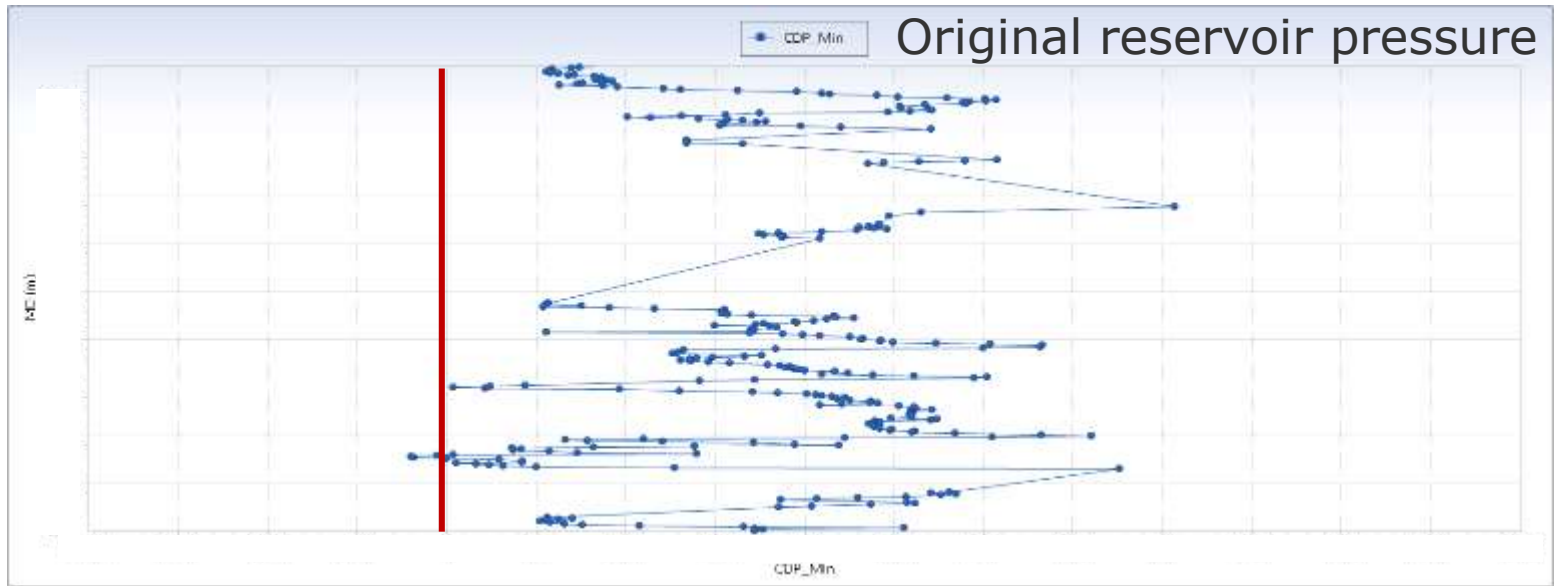


**PETRONAS**

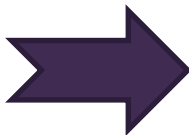
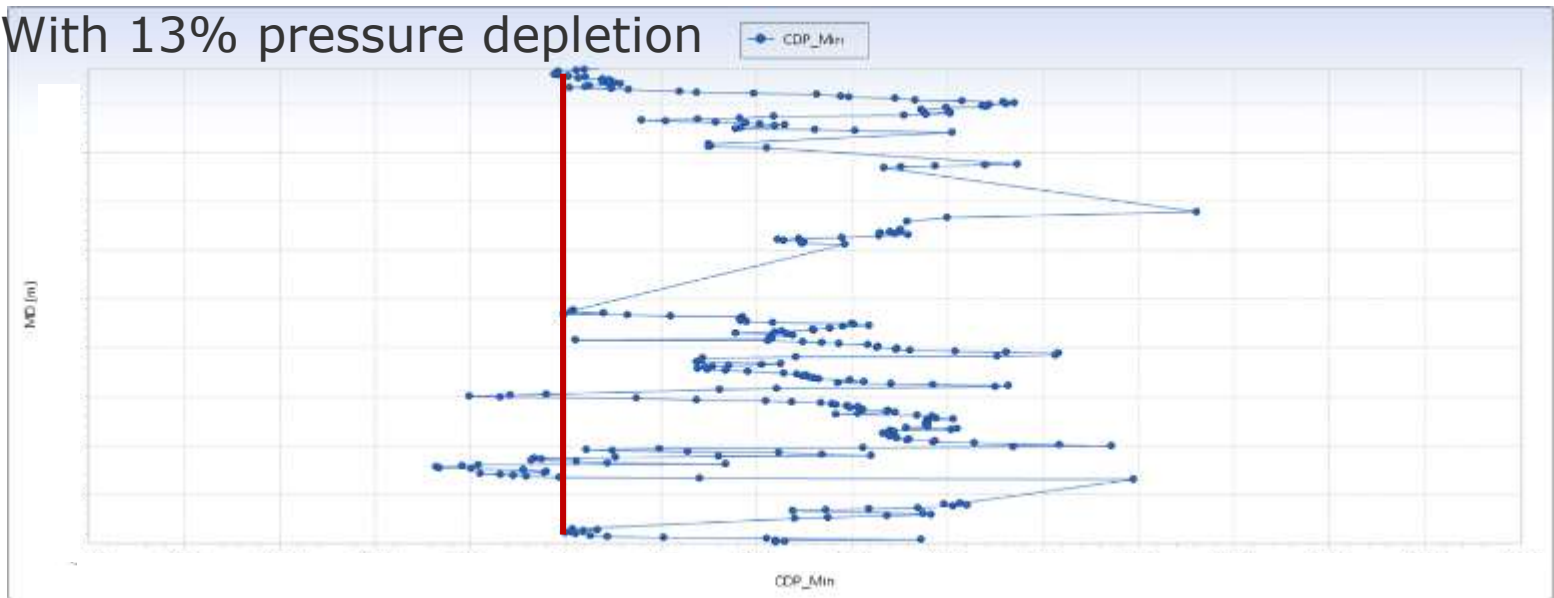
**Thank you**



# SANDPRE UTILIZATION



With 13% pressure depletion



# SANDPRE UTILIZATION

