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MENAPS 2022

MIDDLE EAST AND NORTH AFRICA PERFORATING SYMPOSIUM

IMPROVING EXISTING PERFORATIONS EFFICIENCY WITH INNOVATIVE DYNAMIC UNDERBALANCE IMPLOSION TECHNIQUE, ENHANCES PRODUCTIVITY IN RAS BUDRAN FIELD

MENAPS-10-22 AUTHORS: Mohamed Samir, Hatem ElDawy, SUCO, Maria Leticia Vazquez, SLB

RAS BUDRAN SUBSURFACE OVERVIEW

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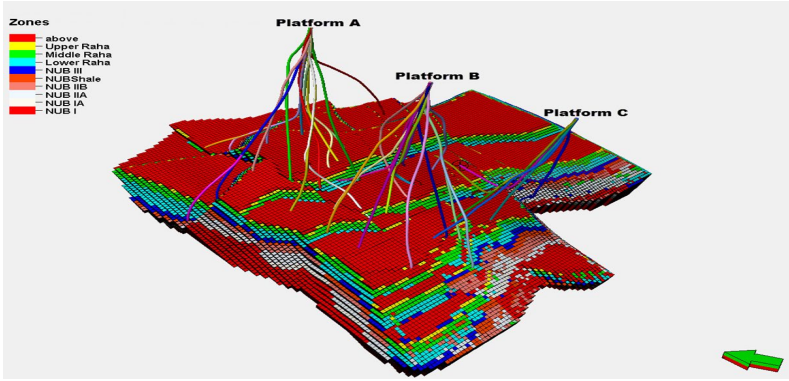
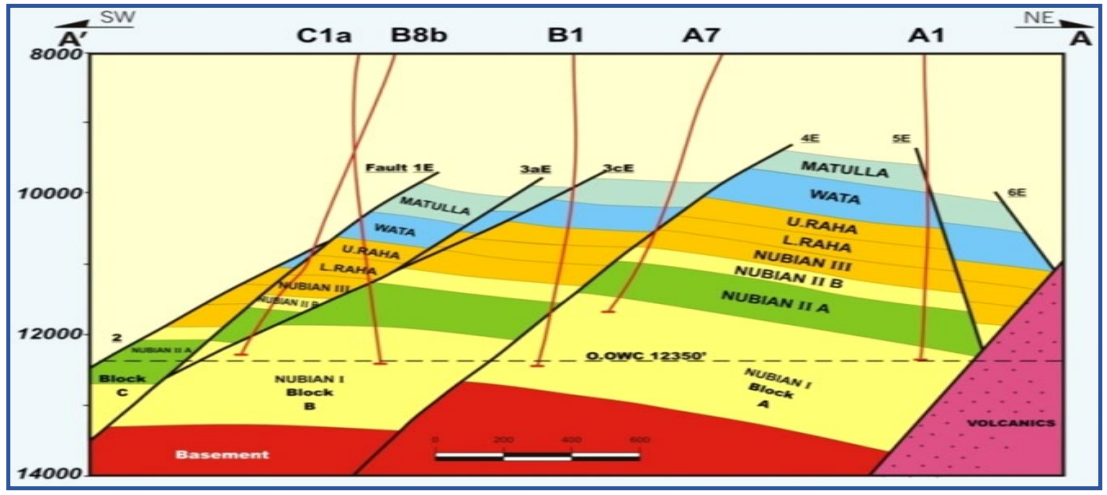
Reservoir Units
Matulla
Upper Raha
Middle Raha
Lower Raha
Unit III
Lower Unit III
Unit UIIB
Unit UIIA
Unit IA
Unit I

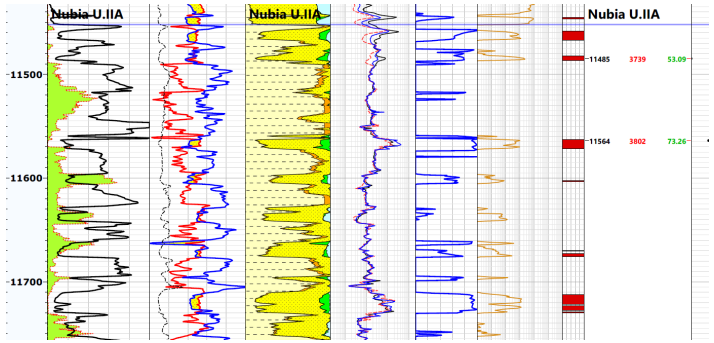


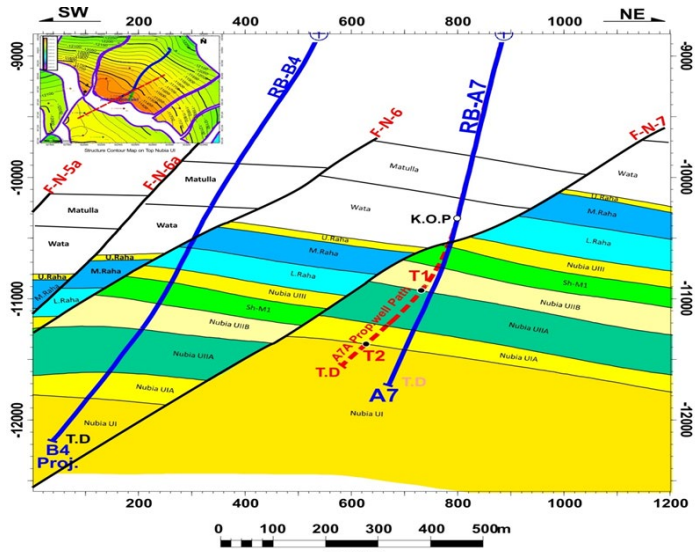


General Information
Location: North Belayim offshore Area
Discovery: **1978**
1st production: February 1983
Offshore Facilities: 3 Offshore Plattforms (A, B, C)
STOIIP: 830 MMstb
Cum. Production: 294 MMstb
Recovery Factor: ~35%
Reservoir Data
Reservoir Formation: Nubia, Raha, Matulla.
Formation Type: Sandstone, &Carbonate.
Formation depth: ~9500 ft
Reservoir thickness: ~ 2100 ft
Permeability: 40 - 340mD
Porosity: 9 - 15%
Oil Gravity (API):19 – 26

DEVELOPMENT OIL RESERVES IN THE TIGHT SAND OF NUBIAN IIA

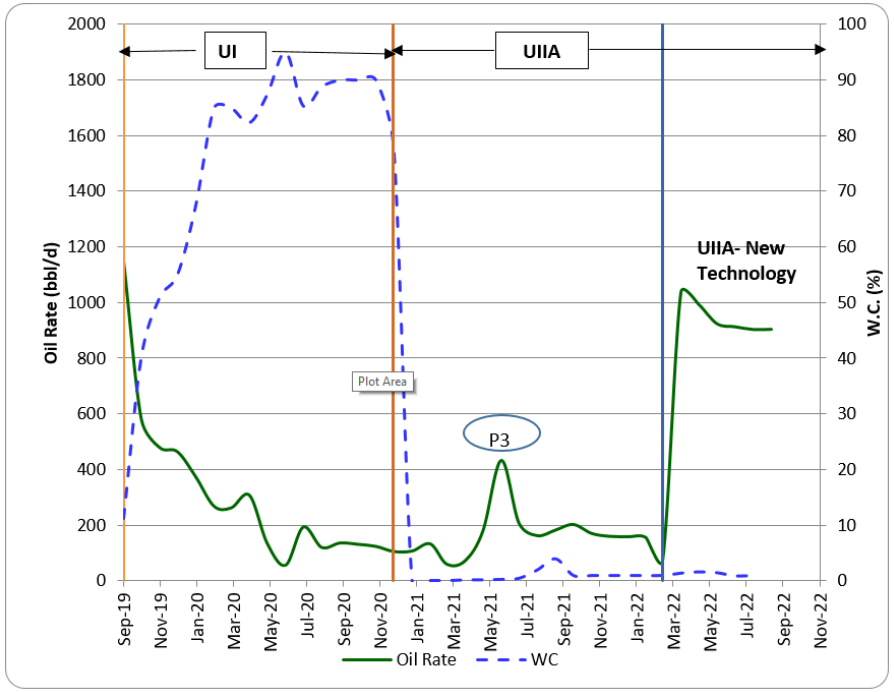
- As the challenges of Low Petro-Physical parameters (K ~ 40md, Phi ~11%, NTG~35%). UIIA wasn't considered a reservoir however it contain huge IOIP.
- UIIA was tested in wells C1a & B9 for short periods (17 and 3 days only) because of very low productivity.
-
- Well RB-C4a, which drilled in 2018, is consider the first well produced economically from UIIA (B-block)
- Encountered a challenged heavy crude in RB-C4a.
- Following the development plan to maximize oil recovery from the lower reservoir units (Nubia UIIA) and develop bypassed oil reserves in UI of block (A)
- Well RB-A7a was targeting Nubia IIA and Nubia I reservoirs in slightly higher position compared to the original well.





Geological Cross Section Passing Through RB-A7a Proposed Well

RAS BUDRAN A7 CASE STUDY



RB-A7a started production in September 2019 from deeper reservoir unit (unit I). Followed by additional perforation in January 2020 in unit IIA

The well showed steep decline reaching 50 bopd.

Re-Perforate the existing perforation without any improvement. Isolate the lower unit in December 2020. Perforate additional interval in Unit IIA.

Water cut dropped to nill with maximum production of 200 bopd.

Added additional perforation using Dynamic underbalance implosion technique in May 2021, with a peak of production 400 bopd

Additional perforation in unit IIA were added in April 2022 using dynamic underbalance implosion and deep penetration charges

PERFORATION SELECTION CRITERIA

What type of formation?

What are the bottom hole conditions?

Presence of Scale, Fines migration, organic deposits?

Is the formation damaged?

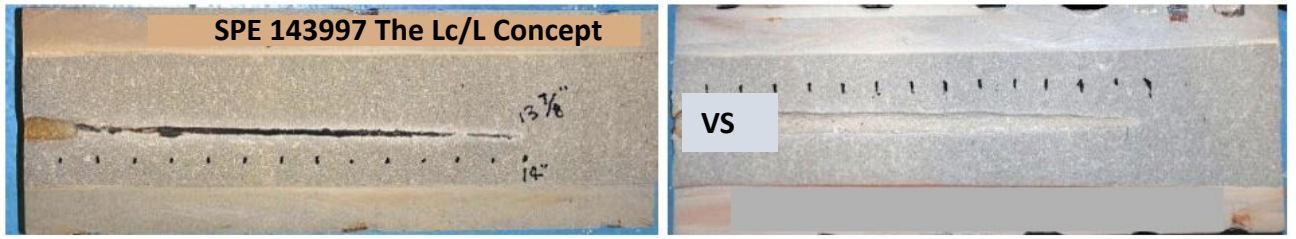
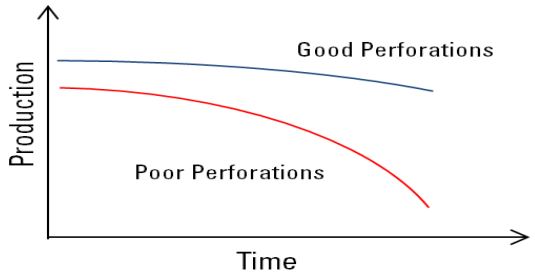


Fig 2. Photographs of perforated cores. (left) Zero DUB (or dynamic balanced – DB) core; (right) DUB core.



Reservoir Characteristics: Permeability, Porosity, UCS, Pressure?

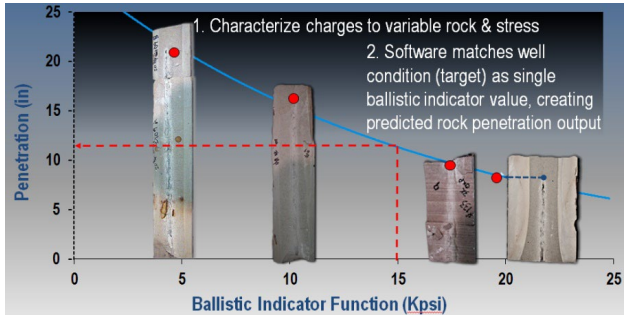
Completion Type? Minimum restriction? Rig less? Workover?

Producer/ Injector, Natural Producer or Artificially lifted?

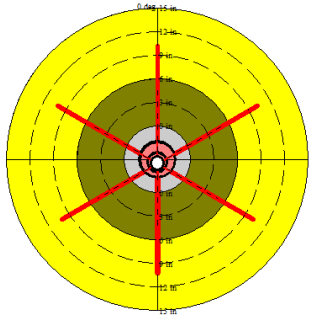
CANDIDATE EVALUATION

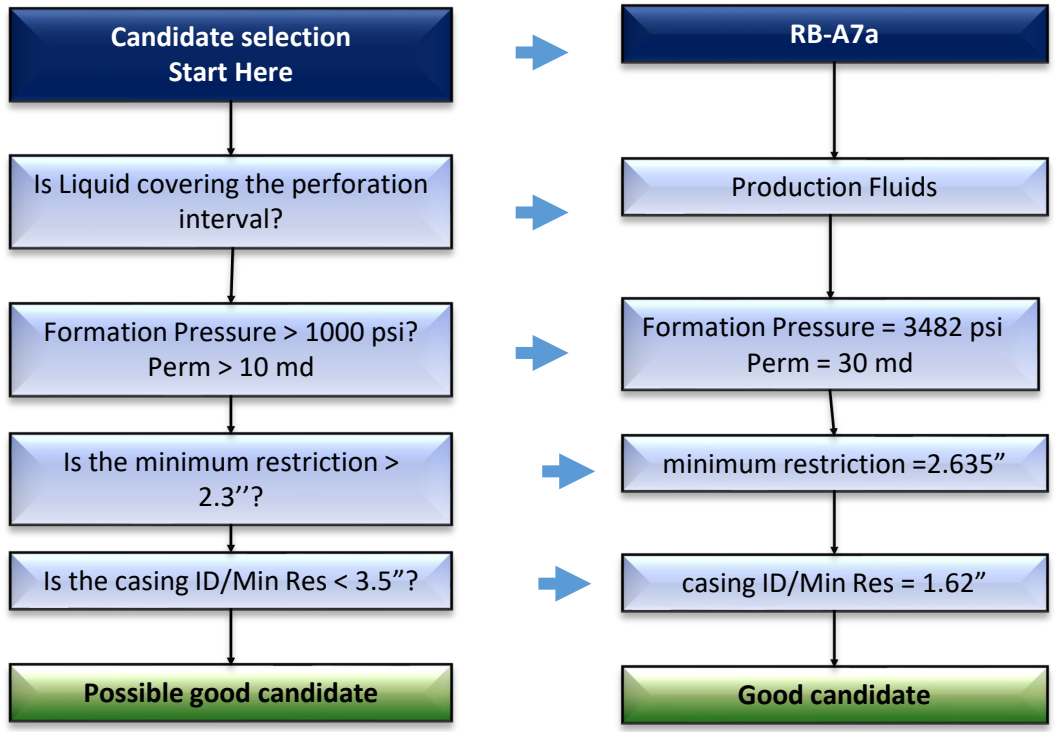
1. Need to select the deepest penetration gun/ charge for well conditions and reservoir characteristics: completion presence, rig less job, minimum restrictions, rock type, UCS

2. Perforation Tunnel needs to be cleaned for improved productivity: simulate effect of conventional perforation, static underbalance, dynamic underbalance, and dynamic underbalance implosion technique and compare productivity results.



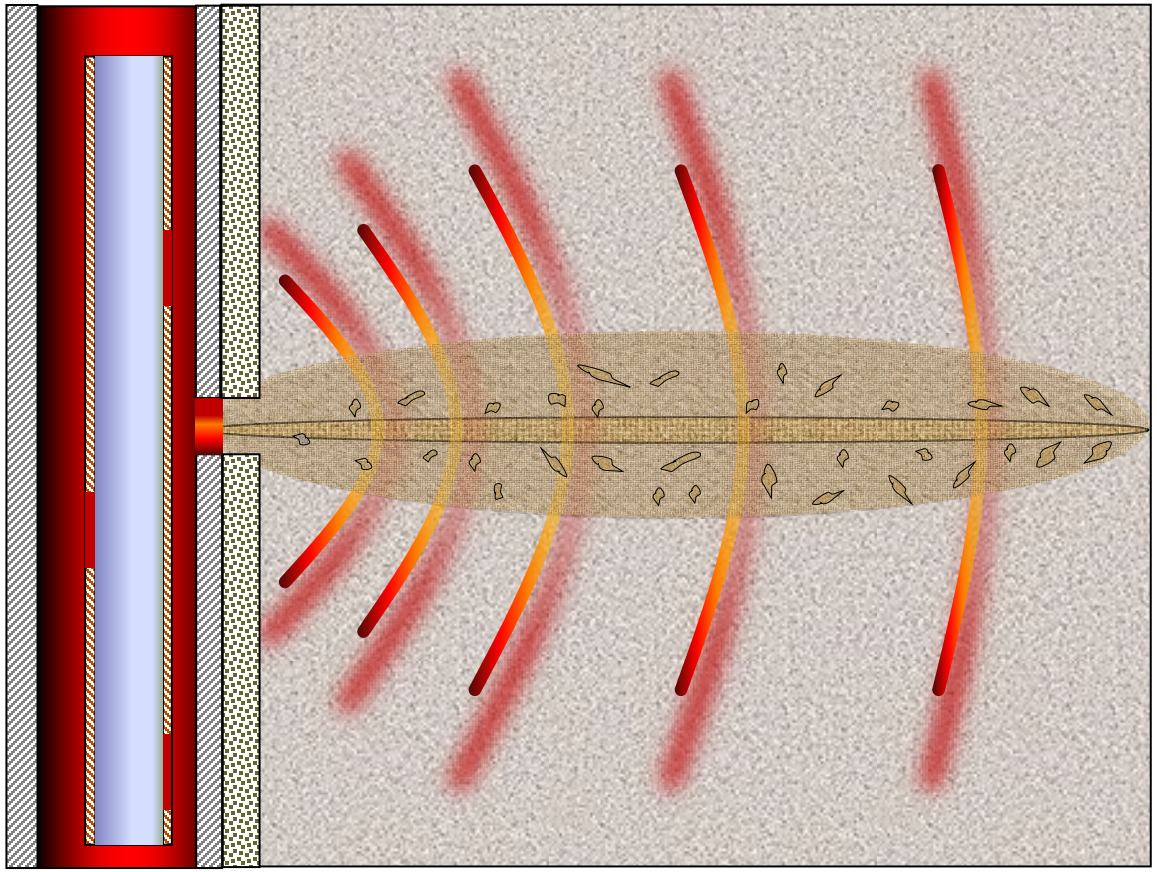
Simulate well with software based on API 19B Section 2

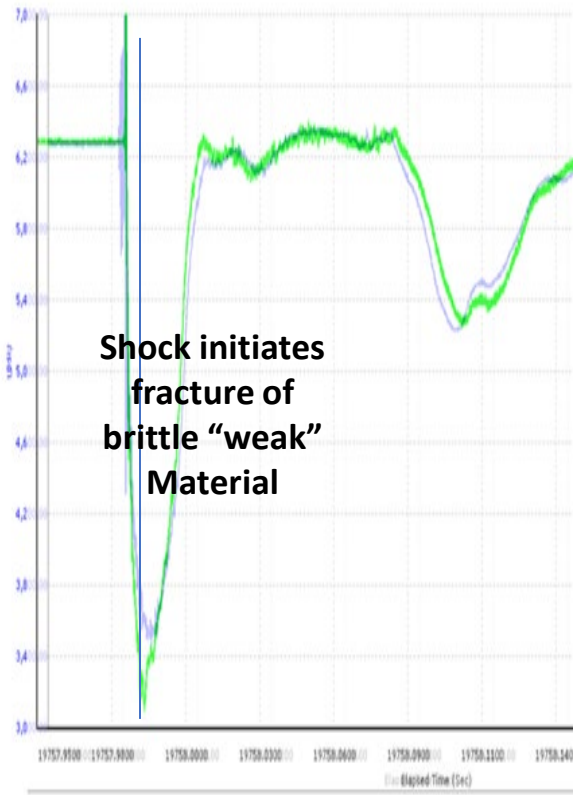




UNDERBALANCE IMPLOSION CONCEPT

An implosion chamber is placed across the interval to be treated, the chamber is opened, and material removed from tunnel.





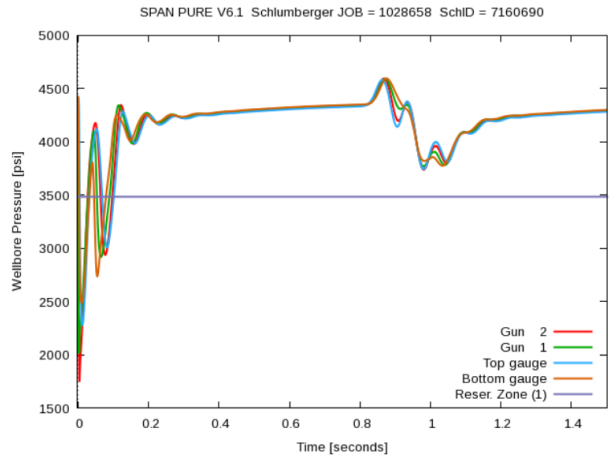
Does not open new holes in the formation.

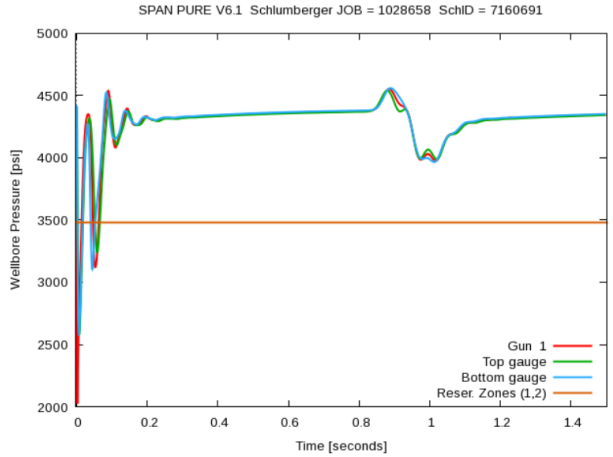
Uses special shaped charges to create an implosion downhole

The objective is to create a local implosion (fastest possible drawdown) to clean debris from existing perforation tunnels

Requires sufficient formation pressure and formation permeability

STRATEGY AND DESIGN

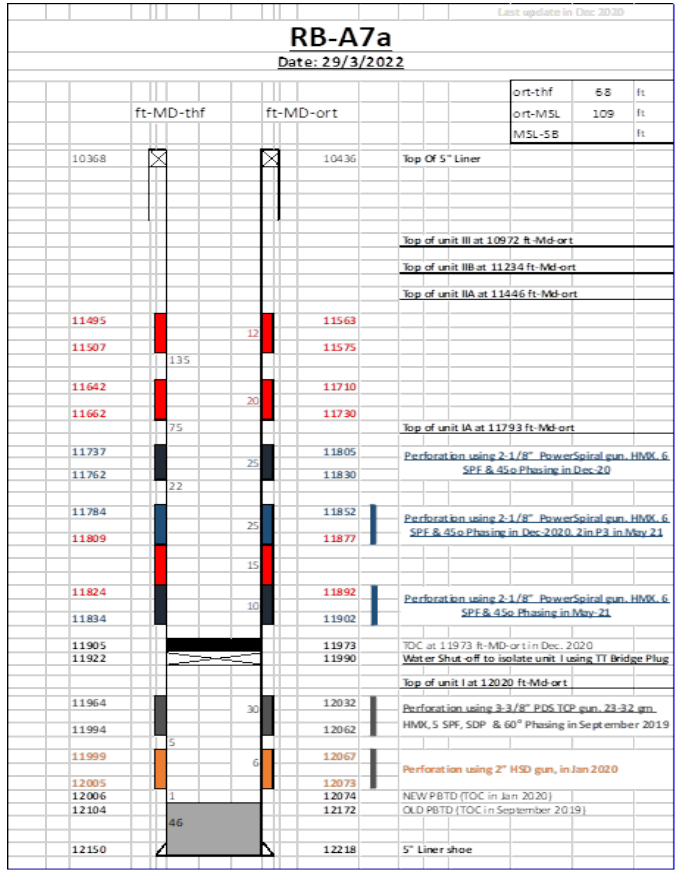




Add perforation across UIIA (11710 to 11730, and 11563 to 11575) ft-MD-ort.

Add perforation across UIA (11877 to 11892) ft-MD-ort

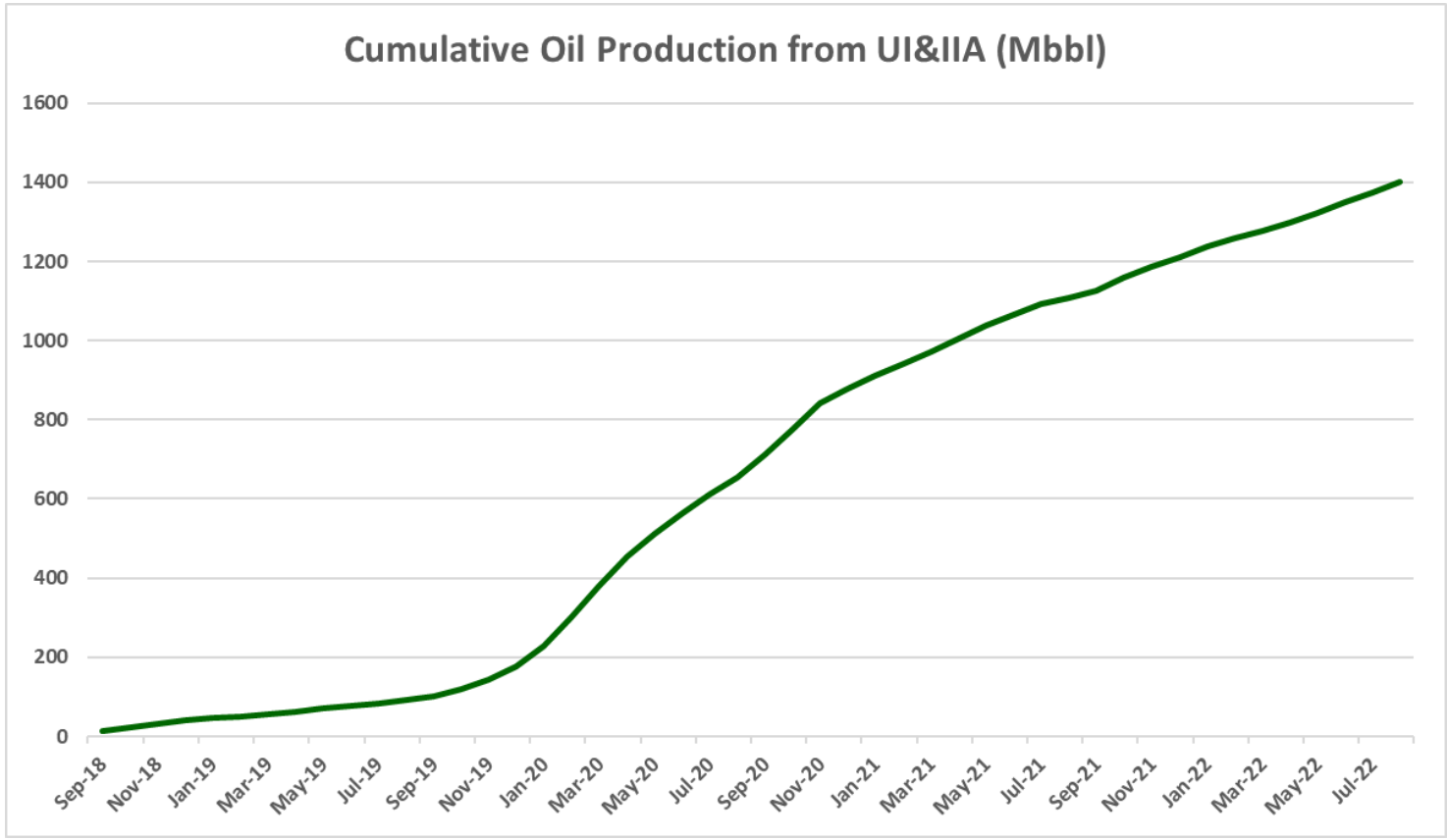
Perform Implosion for the open perforation in UIA (11852 to 11902) ft-MD-ort.



CONCLUSION AND RESULTS

The Major Achievements:

- Initial target of commercial production from UIIA in Block A &B for the first time. (Produced till now **1.5 MMBBL**).
- Add additional **60 MMstb** to the field STOIIP and succeeded to **double** the remaining reserves for the field.



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Q&A

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