Marginal and Mature Field Development and Operation

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Applied and Design Fishbone Drilling Technology for Carbonate Tight Reservoirs: The Sadi Formation

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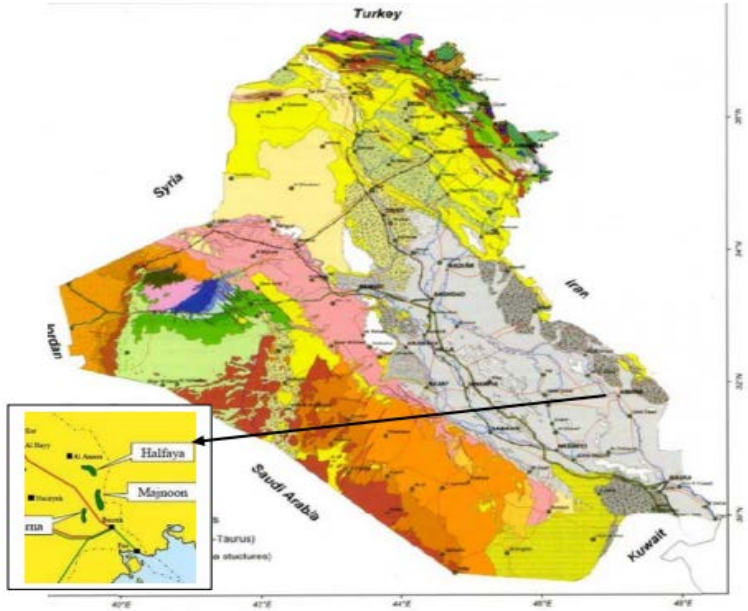
Introduction

- **Background:**
  - Discovered 1976.
  - Decline in conventional hydrocarbon reserve.
  - Increasing importance of unconventional carbonate tight reservoirs in Iraq.
- **Focus:**
  - Application of fishbone stimulation technology in the Sadi formation.



Problem statement

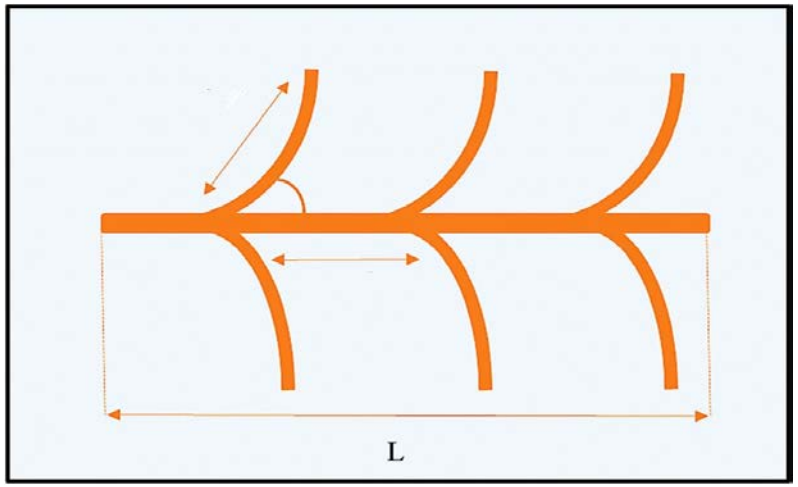
- **Challenges in the Sadi formation**:
  - Low permeability carbonate rocks with an average 0.65 md.
  - Ineffectiveness of traditional stimulation methods (e.g., Acidizing).

- **Need for advance techniques**:
  - Horizontal drilling and acidizing have limitations.
  - Exploration of Fishbone technology as an alternative solution that is applied in the Middle East , Europe and the USA.

Fishbone Technology Overview

- **Technology Description:**
  - Use of small diameter by drilling or jetting

  to Creating of branches intersecting the primary well.



- **Types of Fishbone Technology:**
  - Multilateral Stimulation Jetting Technology (MSJT).
  - Multilateral Stimulation Drilling Technology (MDST).

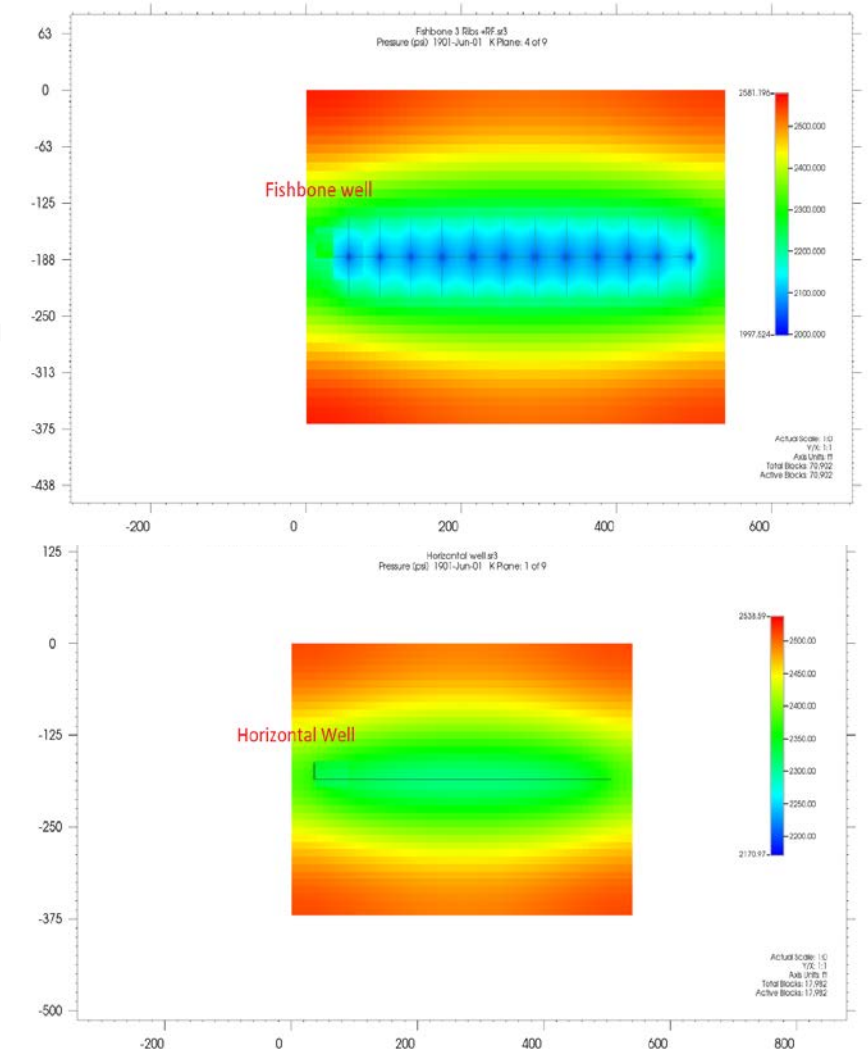
Methodology

- **Hypothesis:**
  - Determine how Fishbone stimulation technology enhance hydrocarbon recovery in carbonate tight reservoirs compared to conventional horizontal well?
- **Simulation Approach**:
  - Numerical reservoir simulation
  - Comparison between Fishbone well and conventional horizontal well.
- **Parameter Evaluated:**
  - Oil recovery factor
  - Cumulative oil production
  - Oil production rate
  - Average hydrocarbon pore volume

Simulation Setup

- **Model Details:**
  - Rectangular section of Sadi reservoir.
  - Dimension: 540 ft x 370 x 91 ft.
  - Fishbone well: 12 branches with three ribs each
- **Geological and reservoir properties:**
  - Initial reservoir pressure: 5000psi
  - Average porosity : 0.11%
  - Average permeability: 0.65 md
  - PVT: oil formation factor, viscosity oil and gas, compressibility …etc.

Heterogeneity is going to investigate latter



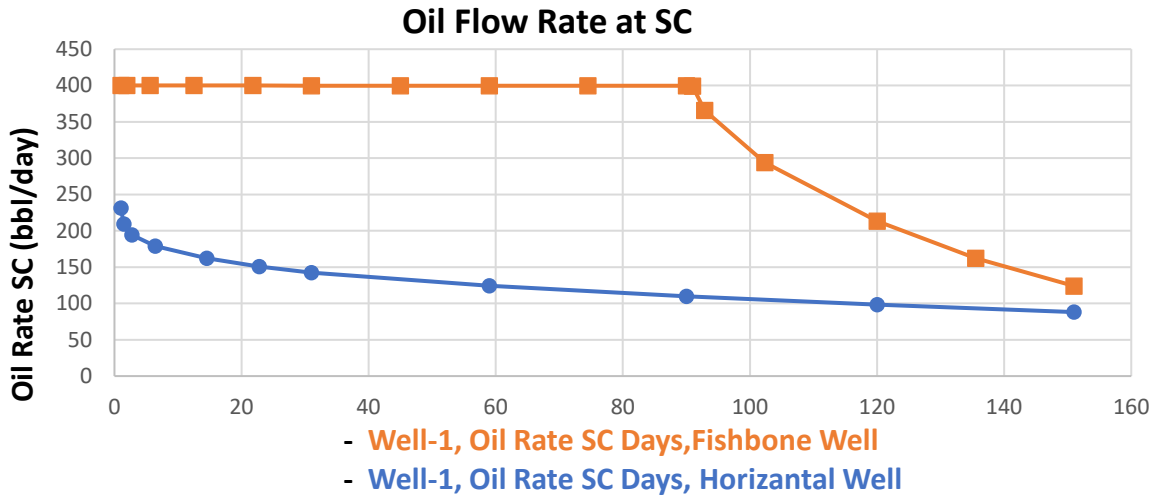
Results and Discussion

- **Oil production rate:**

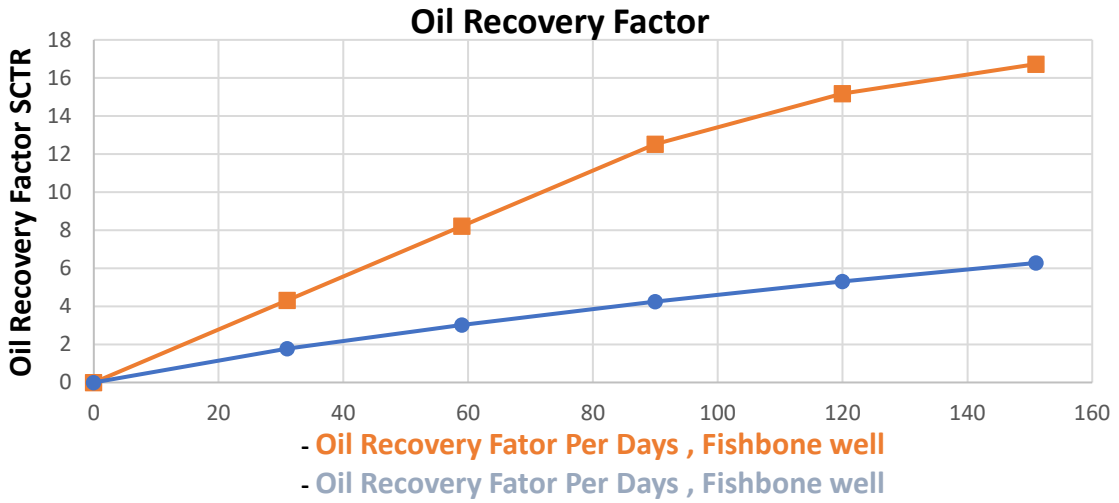
  Assumed max 400 bbl/day

  bubble point pressure 2000 psi

  - Fishbone well: 400 bbl/ day.
  - Horizontal well: 240 bbl/day.

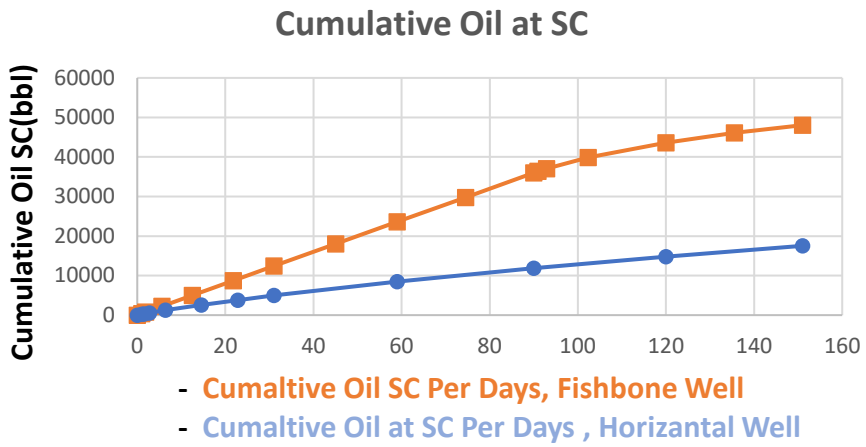


- **Oil recovery factor:**
  - Fishbone well: 17%
  - Horizontal well: 4.2%

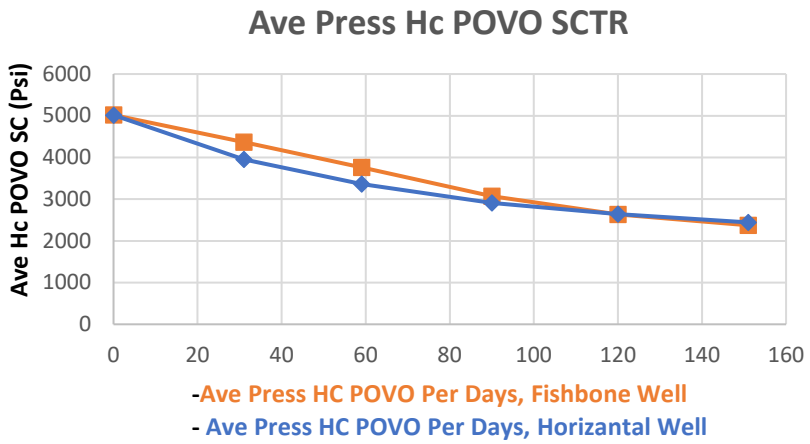


Results and Discussion

- **Cumulative Oil Production:**
  - Fishbone well: 49,593 bbl
  - Horizontal well: 19,437 bbl



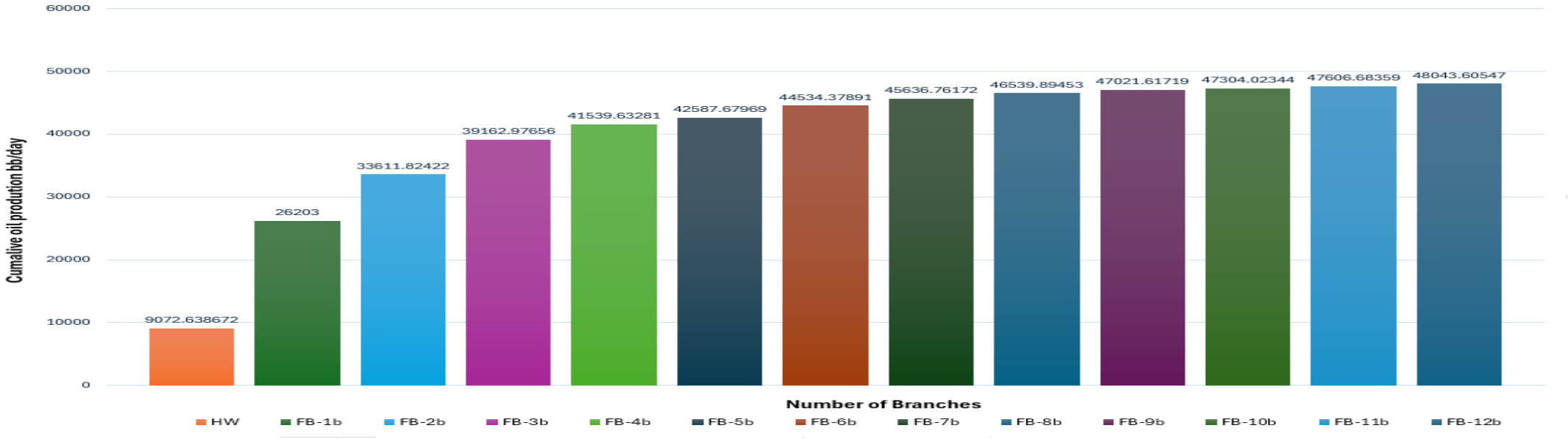
- **Average pressure hydrocarbon pore volume:**
  - Both wells arrived at the end of run to same average pressure.



Conclusion

- **Key findings:**
  - Fishbones stimulation technology significantly enhanced hydrocarbon production and recovery
  - Effective for tight reservoirs like the Sadi formation.
  - Promising alternative to conventional stimulation methods.
  - Fishbone with 6 branches can effectively enhance the productivity compared to horizontal well.

Optimization of the number of branches



- **Prospects:**
  - Potential for border application in similar reservoir.
  - Need further research and development.
  - No published real cost but mentioned less than hydraulic fractured cost.

Thank you