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Screening and design the suitable Artificial Lift Technique for A Kuwaiti Well to Enhance the productivity

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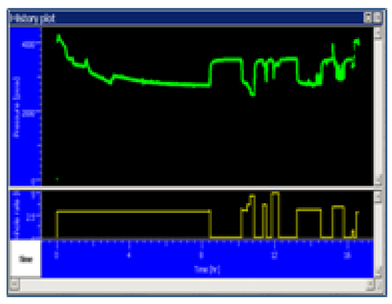
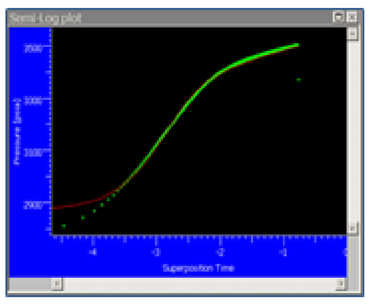
Abstract

This work is conducted for the purpose of well test interpretation of one of the wells **(**UG-XYZ) of South Umm Gudair field, south west Kuwait, having Ratawi limestone formation at a mean depth of 8789ft. Formation testing was done, downhole fluid samples were taken and analysed. Dual packer was utilized for clean up and capturing the oil sample. The gas-oil-ratio (GOR) was around 200 SCF/STB. Open-hole logs were used to know the approximate porosity and well depth.

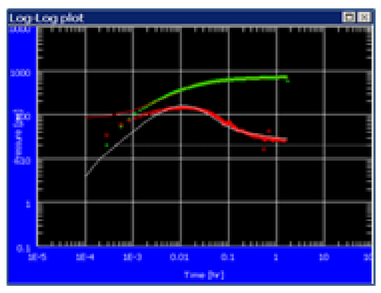
The objective of the interpretation job is to calculate the pressure profile, dynamic flow analysis (DFA) in Ratawi Limestone. Saphir is used to measure the desired reservoir properties like skin, permeability, compressibility of oil, mobility of fluid. The study recommends stimulation for the wellbore damage



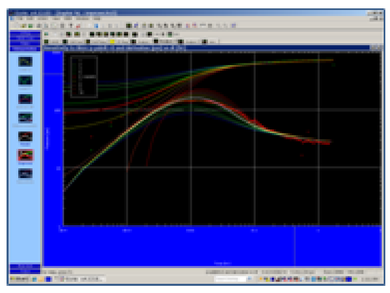
History Plot



Semi Log Plot



Log Log Plot



Sensitivity Plot

Problem Statement

Formation testing was done in Ratawi Limestone formation, having a mean depth of 8789 ft, (South Umm Gudair field), downhole fluid samples were taken and analysed. Dual packer was utilized for clean up and capturing the oil sample. The gas-oil-ratio (GOR) was around 200 SCF/STB.

Bottomhole fluid samples are taken for pressure volume temperature (PVT) laboratory analysis and longer duration testing (formation testing) is carried out. Purpose of analysis is to understand changes in fluid properties during production and recovery, by performing Differential Liberation test in measuring gas-oil-ratio (GOR), formation volume factor, density, viscosity, molecular weight of sample and evaluating the composition of gas, liquid using Gas Chromatography.

In order to find out the problem**,** models were constructed utilizing the saphir software and measuring the desired reservoir properties like skin, permeability, compressibility of oil and mobility of fluid. In order to construct a model Saphir Software is used for vertical flow calculations and it is observed that log-log, semi log plots, Horner plot gives the best values for the investigated wells.

Interpretation of Modular Dynamic Tester (MDT) data is carried out for future development of well. The objective of the interpretation job is to calculate the pressure profile, dynamic flow analysis (DFA) in Ratawi Limestone. Saphir is used to measure the desired reservoir properties like skin, permeability, compressibility of oil, mobility of fluid.

Some Basic assumptions of interpretation

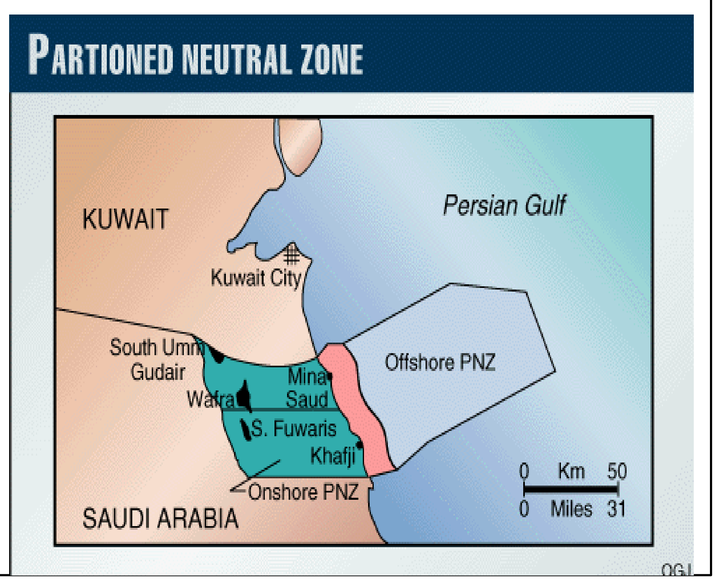
- Darcy's Law
- Diffusivity Equation
- Dimensionless Variable

Introduction

The Umm Gudair field is located on the southwest flank of the Kuwait Arch, 30 km from the Burgan field.

Umm Gudair field is operated into two different parts North and South. North is controlled by Kuwait and south by Saudi called Joint Operation.

A map for the Kuwait oil fields and describes the different areas of production: Ahmadi, Burgan, Magwa, Umm Gudair, Al Wahfra, Sabriyah, Raudhatain, and Minagish is shown below.



Recommendations & conclusions

1. Interpretation of buildup for vertical well SUG-XYZ using saphir with the help of PVT data gives Log-log, a Semi-log and History plot which shows the total skin factor is "11.7".
2. The mobility for the well SUG-XYZ is very low because of damage to the wellbore.
3. Stimulation is required for a well SUG-XYZ.

Effect of errors on the different input parameters

This is summarized in the table below:

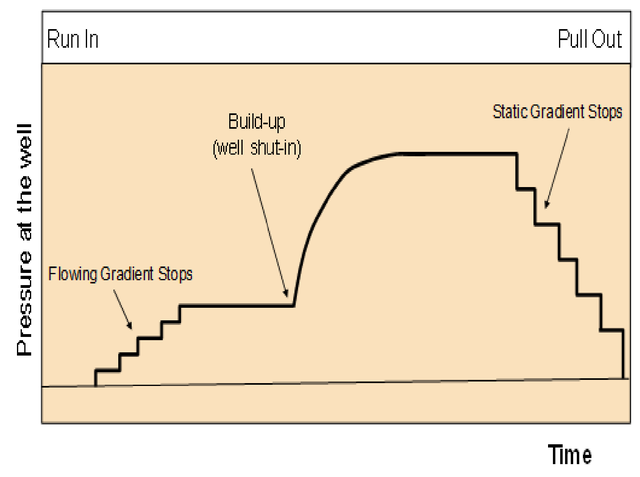
	Storage & Skin		Permeability		Boundary	
	C	Skin	k.h	k	Area	Distance
r_w ↑ 10%	-	↑0.1	-	-	-	-
ϕ ↑ 10%	-	ε	-	-	↓10%	↓5%
c_t ↑ 10%	-	ε	-	-	↓10%	↓5%
μ ↑ 10%	-	-	↑10%	↑10%	-	-
h ↑ 10%	-	ε	-	↓10%	↓10%	↓5%
q.B ↑ 10%	↑10%	ε	↑10%	↑10%	↑10%	↑5%

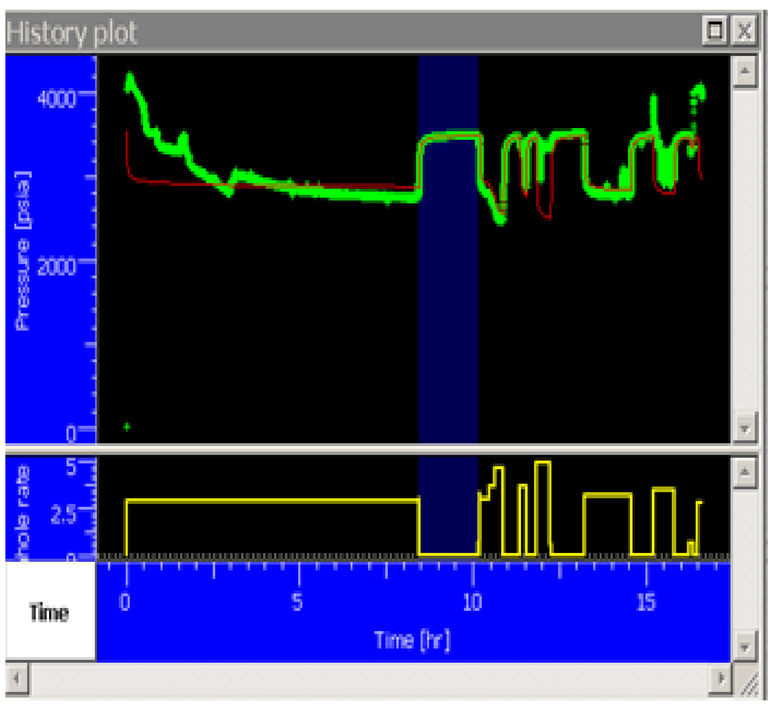
Methodology

In order to find out the problem, models were constructed utilizing the saphir software and measured desired reservoir properties like skin, permeability, and compressibility of oil and mobility of fluid. The objective of the interpretation job is to calculate the pressure profile and DFA in Ratawi limestone.

Approach:
- QAQC
- Edit data
- Extraction and diagnostic
- Model generation
- Model refinement
- Sensitivity study

Build- Up Analysis





Results

Standard Oil Test

Well = Vertical - Limited entry
Reservoir = Homogeneous
Boundary = Infinite

Pi = 3540 psia
k.h = 12.6 md.ft
k = 1.4 md
Skin = 6
C = 2.56E-6 bbl/psi

Default values are used!