WATER INJECTOR WELLS THE IMPORTANCE OF PERFORATING: YARIQUI FIELD CASE STUDIES

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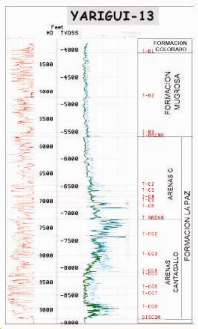
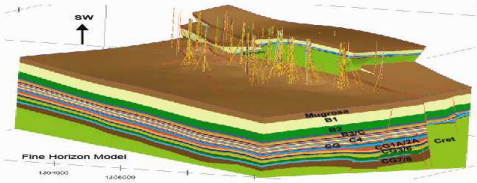
Background

1942	Discovery
1943-1949	Commercial Exploitation
1952-1962	Additional development (Maximum Rate : 20300 BOPD)
1965	First Injection pilot (Not successful)
1976-2009	Infill drilling
2009	Starting water injection
Actual	Active wells: 96 Producers/16 Injectors Production: 15000 BOPD, BSW 43% Injection: 35000 BWIPD Recovery factor: 19% @ Dec 2011

Challenge

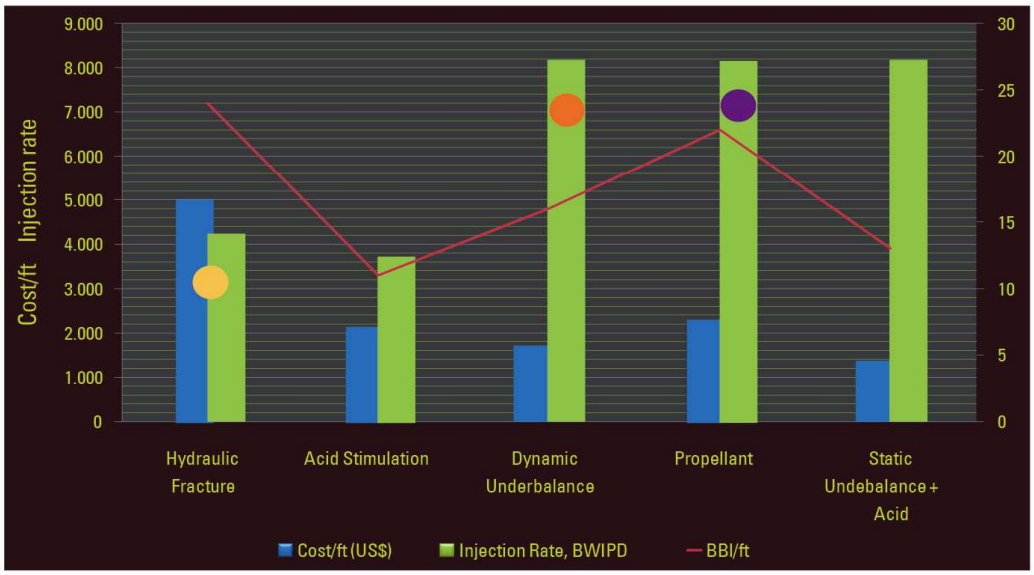
The injector wells completed during 2009 and 2010 used conventional perforating followed by hydraulic fracture and acid stimulation to increase the injection rates. The results were satisfactory in terms of injection rates per unit but the costs were high to the project. For the same reason it was not possible to complete all the units to achieve an uniform injection profile. It was necessary to find alternatives to reduce the completion costs and maximize injectivity in all the units.





Net Pay	300 ft (70ft-600ft)
Permeability	105 mD (50 mD – 350 mD)
Porosity	15 - 22 %
Depth	7300 ft TVD
Temperature	140º F
Initial Pressure	3250 psi @ -7000 pies TVDSS
Pb	2425 psi
Actual Pressure	1000–3100 psi @ -7000 ft TVDSS
API	20.5º (14º – 21º)
Viscosity	24 cp @ Pb
Bo.	1,12 RB/STB

Process



- Three out of six intervals admitted
- All intervals admitted
- Only 45% of the intervals could be fractured

Results

Implementing advanced TCP perforating technologies the total injection rate was doubled (during the initial injectivity tests) and the associated costs were reduced by 65%

Through optimized perforating it was possible to:

- Open to injection all the units
- Stimulation for all intervals with dynamic underbalance
- Simple and faster operation
- Preserve the injection selectivity with dynamic underbalance

The recommended technology is to continue using High shot density systems (12 spf) with Dynamic Underbalance Technology. And continue with the injection evaluation in the long term when the injection facilities are fully implemented.