Successful Auto Gaslift Trial in PDO

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Outline

- Background & business case
- Auto Gaslift Technology
- Field trial
- Results & discussion
- Future work
- References
‘B’ field is already developed with gas recycling.

Around 40 wells drilled with 4 injectors

Many surprises after drilling – Sand development, Channel connectivity, sand continuity, orientation, faults…….

300 bar compressor and 4 gas injectors to inject 3 MM m3/d gas into two reservoirs

Eventual gas blow down by 2Q 2012

Reservoir studies indicated no artificial lift requirement for this field

Few wells abandoned due to poor sand development
‘B’ Field
Field Production

- Average oil rate 60-70 m³/d with some wells 150 m³/d
- Field production around 2000 m³/d oil (No water)
- Around 20 wells main contributors
- GOR ranging from 40-2000 m³/m³
- Many wells dying due to depletion, gassing out due to recycling – major production challenge
- High CO₂ in the gas calling in for duplex SS pipelines
- Gaslift would require extensive pipeline network at high cost and not planned
Gaslift is the ideal mode of lift for this field (high GOR, fluctuating rates..)

Auto gaslift was proposed as an innovative alternate to conventional gaslift

Gas pressure in the reservoir being maintained by gas injection

Completions can be re-used elsewhere

Installation relatively simple

Cost effective ($400 K + hoist cost for recompletion)

5 wells identified
Challenges

- Auto gaslift was never tried in PDO
- Only one well approved for trial
- Very tough field conditions
- Formation highly sensitive to workover fluids
- No success in stimulation
- Hoist crew with little experience in intelligent completions
- Stringent contract regulations
Five wells with average 100 m³/d gain per well

= 500 * 6.3 * 50 * 365

= 57.5 MM $ per year

Cost for installation

Workover cost – $300K per well

Equipment cost - $400K per well

= 700,000 * 5 = 3.5 MM $
The technology
Choke performance model

WellDynamics model
Pressure Drop vs. Gas Flow Rate: 3-1/2 HVC GL
Pupstr= 22200 kPa    Temp= 95 C    Gas S.G.= 0.70

Well test 10 January 2009
Model input
- ICV position: Pos 4
- Gross Rate: 137 m³/day
- Watercut: 16.4%
- Net oil: 115 m³/day
- Produced GOR: 491 m³/m³
- Solution GOR: 160 m³/m³
- WHP: 71.7 Bar
- Zenith gauge: 132.7 Bar
- Oil reservoir pressure: 200 Bar
- Oil PI: 2.25 m³/day/Bar
- Gas reservoir pressure: 230 Bar
- Gas PI: 4574 m³/day/Bar

Model prediction
- Tub pressure at top oil perfs: 139 Bar
- Sandface pressure at top gas perfs: 222 Bar
- ICV dp: 81 Bar
- GL gas (gas through ICV): 38065 m³/day

Note: These results are estimates only and have not been calibrated or confirmed. They are to be used for information purposes only.
B – XX Techlog
Auto GL completion in B-XX

Poil = 200 bar
Pgas = 240 bar
Qoil before quitting = 15 m3/d
Field implementation

- Good support from the vendor
- Re-completed the well as per plans – no surprises!
- Oil zone re-perforated using TCP underbalance shoot & pull
- Gas zone perforated using thru tubing guns using ‘PURE’ (perforating under real underbalance) technology
- Activated the gas zone and flowed for clean up, plug installed and took the flow through ICV (100% open)
- Opened the oil zone
Field implementation

- Well got loaded and quit flowing
- Closed oil zone, activated again
- This time, crack opened SSD for 2 days
- SSD opened fully after establishing continuous flow
- Well was put on test
Field implementation

Well Trends during start up
Results

- **Initial rates**
  - Qoil – 60 m3/d
  - Qgas – 140,000 m3/d
  - GOR 2333 m3/m3

- **ICV set to 8 mm choke and stabilized the flow (Slot 4)**
  - Qoil – 120 m3/d
  - Qgas – 80,000 m3/d
  - GOR - 650 m3/m3

- Well flowing stable for the last one month

It has already generated 1.1 MM $ in a month time!
Conclusions & Recommendations

- Auto gaslift proved successful in B field
- Five more wells already selected for Auto gaslift
- It is beneficial to have an ICV in the oil zone also
- Operations are relatively simple
- Conventional gaslift for the wells with no gas
- Generated interest for application in other fields of PDO
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