Gas lift challenges in NS – TAQA’s perspectives

Charles Adoga, Snr Production Engineer, TAQA Europe
Agenda

- Introduction
- GL operation, design envelope & optimisation
- GL operations out-with design envelope
- WH barrier envelope impact on GL Operation
- GL - production add & enhancement lever
- Summary
Introduction

100% - Tern Alpha

70% - Corm Alpha
Cormorant Alpha Subsea well

- Well completed and online Aug 11
- GL design parameters for the life cycle of well
  - Design CHP 120 bar
- Valve pressures = f(T)
- Gas Lift commissioned in Dec 11
GL operation and design envelope 1

CHP barg, gl chk %, WHP barg, WHT deg C

Erratic WHT

CHP > Design

Max design csg P
Valve opening P
orifice operating P

1 YR
GL operation and design envelope 1

- CHP < design
- CHP > design
- Stable WHT
- Max design csg P
- Valve opening P
- Orifice operating P
Cormorant Alpha Subsea well

- Gas lift commissioned at CHP > design
- Well operated with CHP > design most of the time
- Tubing to A-annulus communication
- Well require regular A-annulus unloading

**Lesson** – It is poor operating practice to continuously operate the CHP above the valves opening pressures.
Cormorant Alpha Subsea well

- DHPG and gas lift meter on well had failed
- Reducing CHP was recommended using WHT proxy
- This is challenging previously entrained practice
GL operation and optimisation 1

- CHP < design
- 150 Ksm3/d reduction
- Stable WHT
- GL CHK 50% to 7%
- 2% field production increase
GL operation and optimisation 2

- CHP increasing
- Oscillating CHP
- BHP increasing
- WHT very unstable
- CHK 42% to 7%
- Valve(s) blockage diagnosed
Gas lift out-with design envelope

Tern Alpha (Subsea well)

• Well completed and online Mar 2015
• 5.5 x 4.5 inch tubing c/w DHPG
• The initial reservoir pressure 5600 psia
• Subsea field consisted of 2 producers & 1 injector
• Depletion strategy was to maintain natural flow above bubble point through waterflood with gas lift as contingency for poor waterflood performance
Gas lift out-with design envelope

Well Gas lift on

WatInj started & PCV increased

Well stopped flowing.

230 days
Gas lift out-with design envelope

- Depletion plan contingency
- GL designed for 1900 psia
- Low watercut

Reality

Assumption

Actual field performance
- High watercut
- Lower pressure support

Orifice injection impossible
Unloading valves failed close
Well remain S/I
Gas lift operations barrier envelope

Leak from WH tie down bolt

2 possible leak points
5 out of 8 Tie-down bolts around the circumference of the compact spool were found to be leaking.

10% of SC potential S/I

60% of SC potential at threat

SAFETY
GL—production add & enhancement lever1

Tern Alpha (platform well)

• Well completed and online in May 1997
• Surveillance data (2009 & 2014) confirmed gas lift via 2\textsuperscript{nd} out of 4 valves
• 2\textsuperscript{nd} valve could not be consistently operated (2016) and the well died in mid 2017
• Reservoir pressure was determined - input to gas lift design
• A gas lift orifice shallowing was designed and executed (1 unloading + 1 orifice)
GL–production add & enhancement lever 1

• 9% oil production increase via S/I well reinstatement
• 4th valve (orifice) could not be pulled
• Significant embrittlement from valves packings
• Dome pressure lost in one of the valve

Lesson – understanding of reservoir and well performance changes can identify the correct lever for adding production.
GL–production add & enhancement lever2

Future opportunity to increase production potential
Deepened orifice – 17% well production increase
1.5-in barrier valves selected
Summary

- Operating gas lift as per design is important
  - optimising /stable production and maintain well integrity
  - diagnosing valve problems
- It is important to understand performance change vs. depletion strategy assumptions for GL design / operation
- Understanding the WH barrier envelope in older wells is important for safety and well integrity
- Regular review of reservoir and well performance KEY for identifying gas lift production add / enhancement