The Product Development Challenge

Critical assessment of a Side Pocket Mandrel Gas Lift application

- Uncomplicated construction and inflexible operation
- Passive, Injection Pressure Operated device
- Single orifice injection flow control
- Well intervention common place
- Single well influence and control

Avoid a ‘me too’ solution with incremental benefit

Remove production uncertainty, instabilities and intervention
Digital Intelligent Artificial Lift

The Product Development Challenge

Produce a new generation artificial lift unit

- Intelligent and flexible operation
- Remove dependence on Injection Pressure Operation
- Multiple orifice injection flow control
- Continuous production without well intervention
- Reservoir wide optimisation and control

A production tubing installed asset

Remove production uncertainty, instabilities and intervention
Digital Intelligent Artificial Lift

**APOLLO 190/35**

- Digital, intelligent interface to management tools
- Pressure and temperature readings at point of injections
- No side pocket mandrel or wire line intervention
- Active device that is not an “injection-pressure-operated”
- Intelligent device - power only when switching injection conditions

Removing production uncertainty, instabilities and intervention
Digital Intelligent Artificial Lift

**APOLLO 190/35**

- Six independent switchable gas injection orifices
- Injection orifice customisable settings – 1.5mm to 5.5mm
- Real time gas injection control
- Eliminates unstable well occurrences
- Pressure differentials up to 2,775 psi (190Bar)

Removing production uncertainty, instabilities and intervention
Digital Intelligent Artificial Lift

APOLLO 190/35 – Specification

Unit dimensions: 18.1” (461mm) Length; 5.8” (147mm) OD

Tubing dimensions: 3.5” (89mm) OD; 2.89” (73.3mm) ID

Material: Fermonic 50HS (Casing); Fermonic 50 (Components)

Tubing thread type: Tenaris 511 (Pin)

Maximum temperature rating: 257°F (125°C)

Removing production uncertainty, instabilities and intervention
Surface Cable Connection

Cable Characteristics

- Two wire, twisted pair connection to the surface
- Cable protection – ¼” incoloy 40,000psi
- To supply power to the actuator drivers – required only to change open/close state
- To transmit communications instructions to/from the unit
- To transmit pressure and temperature readings from the pressure sensors
- Cable clamped to production tubing
Surface Interface Unit

Driver Interface at Surface

**SCS Box Characteristics**
- Situated outside hazardous area
- Provides Communications and power to DIAL unit
- Receives operational data from the DIAL unit at injection points:
  - Annulus Pressure
  - Production Tubing Pressure
  - PCB Temperature
  - Individual actuator open/close status
- PC software or manual operation
- MODBUS protocol
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Gas Entry Points
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Flow to Production

- Pressure protection valve
- Actuator
- Gas injection orifice
- Production tubing check valve
- Actuated check valve
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DIAL
“Digital Intelligent Artificial Lift”

Pressure protection valve

Actuator
Production tubing Check valves
Gas Injection orifices
Inlet ports
Gas Injectors and control

No Production Tubing Obstructions
Orifice sizes individually configured
Digital Intelligent Artificial Lift

**APOLLO 190/35**

**190/35** – 190 Bar maximum pressure differential

**190/35** – 3.5” production tubing configuration

Additional configurations to follow, for example:

**290/35** – 290 Bar maximum pressure differential

**290/55** – 5.5” production tubing configuration

Removing production uncertainty, instabilities and intervention
Digital Intelligent Artificial Lift

Key Operating Features and Benefits

- Deviated and heavily deviated wells
  - Deployment to greater than 60 degrees
- Depleted and unstable wells
  - Real time pressure and temperature readings
  - No intervention required for changes
  - No unstable operation when pressure fluctuates
- Dual/Multi completion wells
  - Active rather than Passive device
  - Not injection pressure dependent
- Reservoir wide optimisation and control
- No intervention scheduling for gas injection changes
A closing thought for the experts ……

It is possible to configure well completions with continuous, variable gas injection being available at more than one level at the same time …………………

With out any well intervention requirements

Thank You
CHANGING INJECTION WITHOUT INTERVENTION

THE TRADITIONAL WAY

NOT BAD...
ONLY TOOK
SEVEN DAYS!

SLICK
FIX

THE CAMCON WAY

NOT BAD...
ONLY TOOK
ONE MINUTE!

www.camcon-oil.com/cartoons
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