Intelligent Gas Lift Automation

EuALF Gas Lift Masterclass

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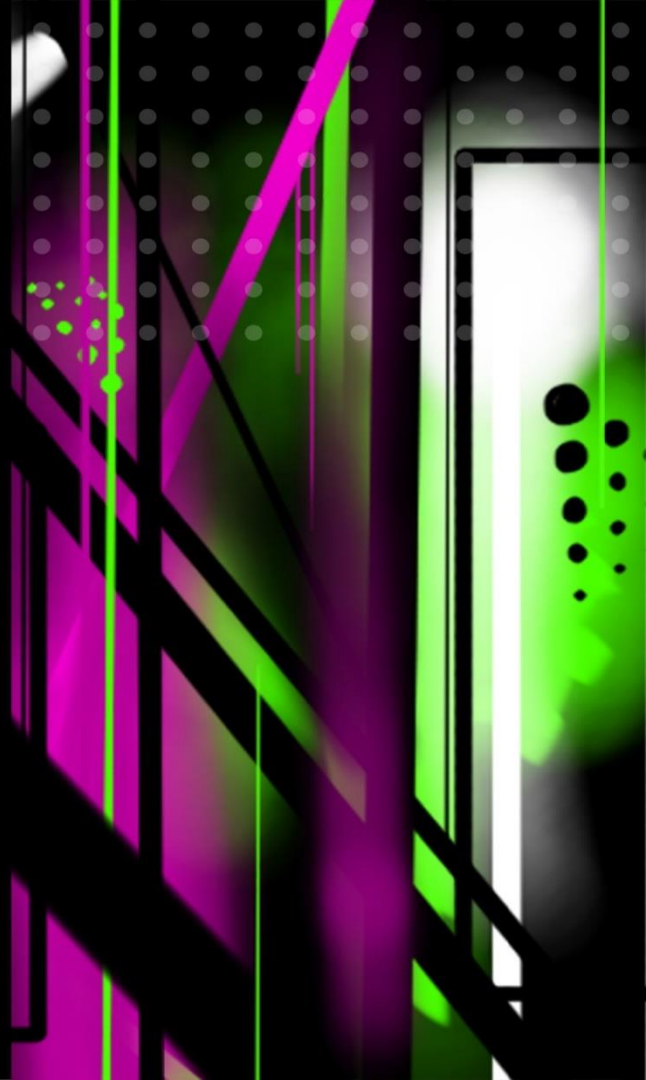
silverwell

ARTIFICIAL LIFT INTELLIGENCE

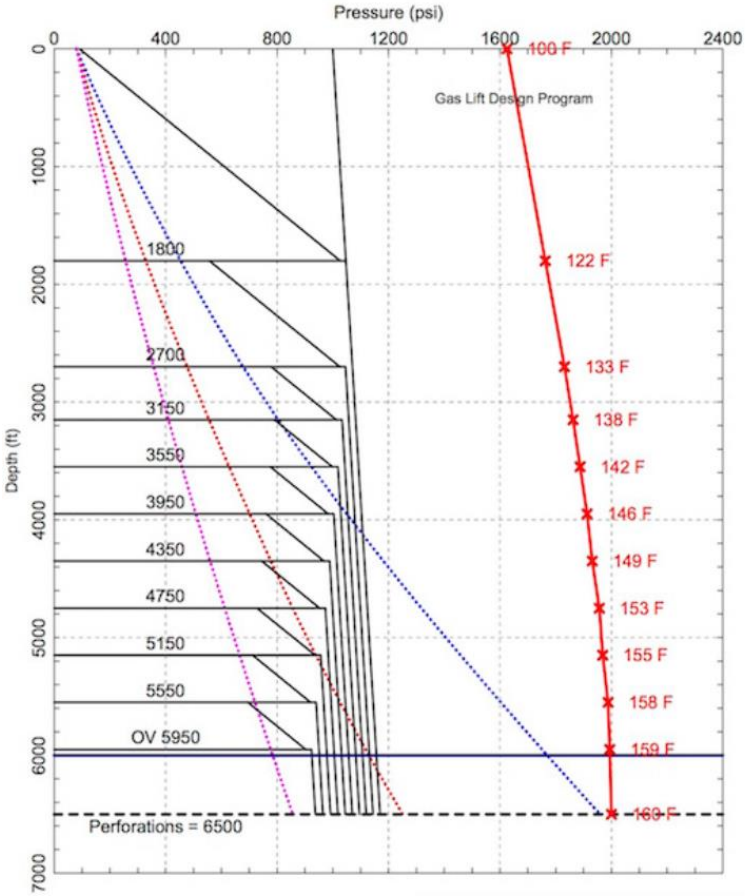


The majority of the world's gas lifted wells are operated in a non-optimal state

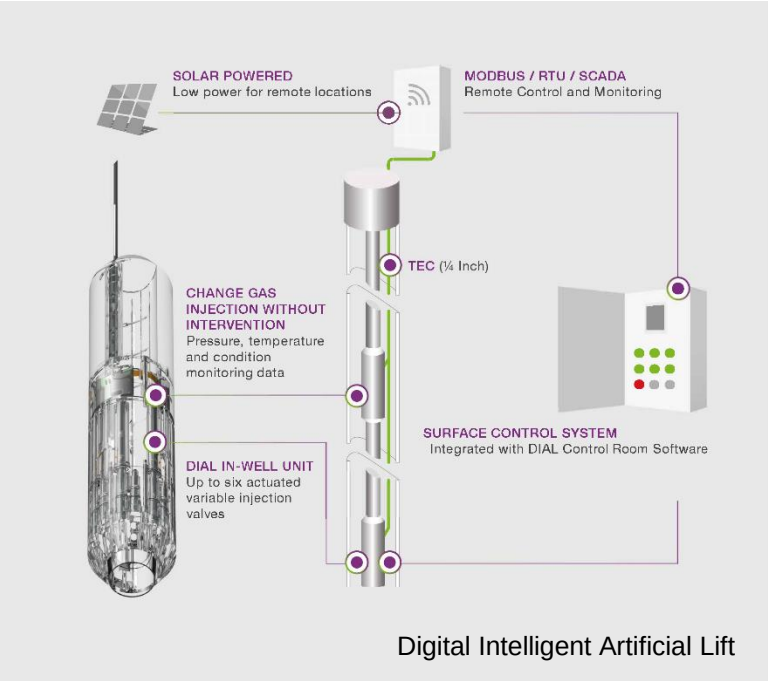
- Is my well completely unloaded?
- Is the well multi-point injecting?
- What is my lift depth?
- Am I optimized on gas lift?
- Can I lift deeper?
- Is my wellbore hydraulic model a good match to actual well performance?
- How much will I have to intervene?
- Do I have enough gas?
- What should be my lifting life-cycle?

Legacy Technology Challenges

- Narrow Operating Window.
- Design safety margins.
- Injection depth limited.
- Difficult to assess lift effectiveness.
- Intervention to optimize.
- Sensitive to well dynamics.
- Multi-point injection.
- Valve Chatter



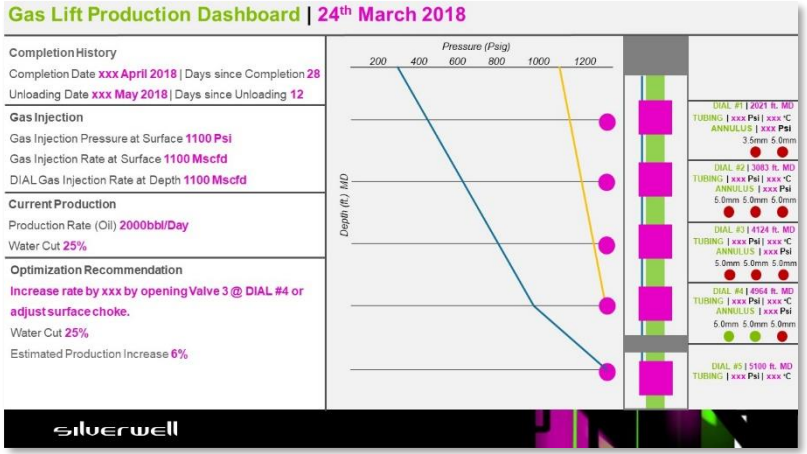
Intelligent surface operated gas lift enables continuous production optimization



Digital Intelligent Artificial Lift

Technical	Business
• **Variable orifice** size at any depth • **Deeper injection** – through use of full casing pressure to bottom • **No deviation limitation** – works in horizontal sections • **No well intervention** required for gas injection rate changes • Pressure and temperature **data** returned to surface • **Remote** monitoring and control • **Intelligent** field-wide management	Eliminate intervention Reduce OPEX Mitigate instabilities Enhance recoveries Optimise production Reduce HSE risk

Data-driven decision making enables optimized production



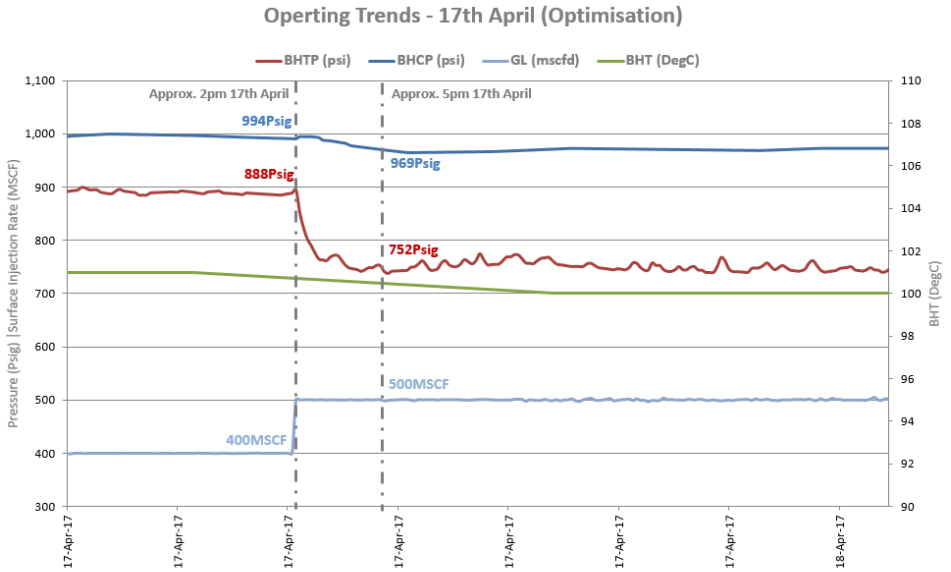
Case History 1

Well Optimization

Through downhole gauge measurement, the operator recognised the opportunity to **increase gas injection rate from 400 to 500MCFD**.

Silverwell DIAL valves were opened, decreasing casing pressure.

Net Oil Production increased **10% from 217 to 239BOPD**.



Date	Time	Chk	FTHP	CHP_A	Gross Prod (bpd)	Net Oil Prod (bpd)	Gas (mscfd)	GL (mscfd)	FLP (psi)	Sep_P (psi)	Remark
18/04/2017	11:25:00	128	254	-	265.43	239.15	610	500	150	165	GL 500 MSCFD
18/04/2017	07:45:00	128	251	-	252.7	227.68	596	500	150	165	GL 500 Mscfd.
17/04/2017	08:00:00	128	234	-	247.79	217.87	521	400	140	152	-

Case History 2

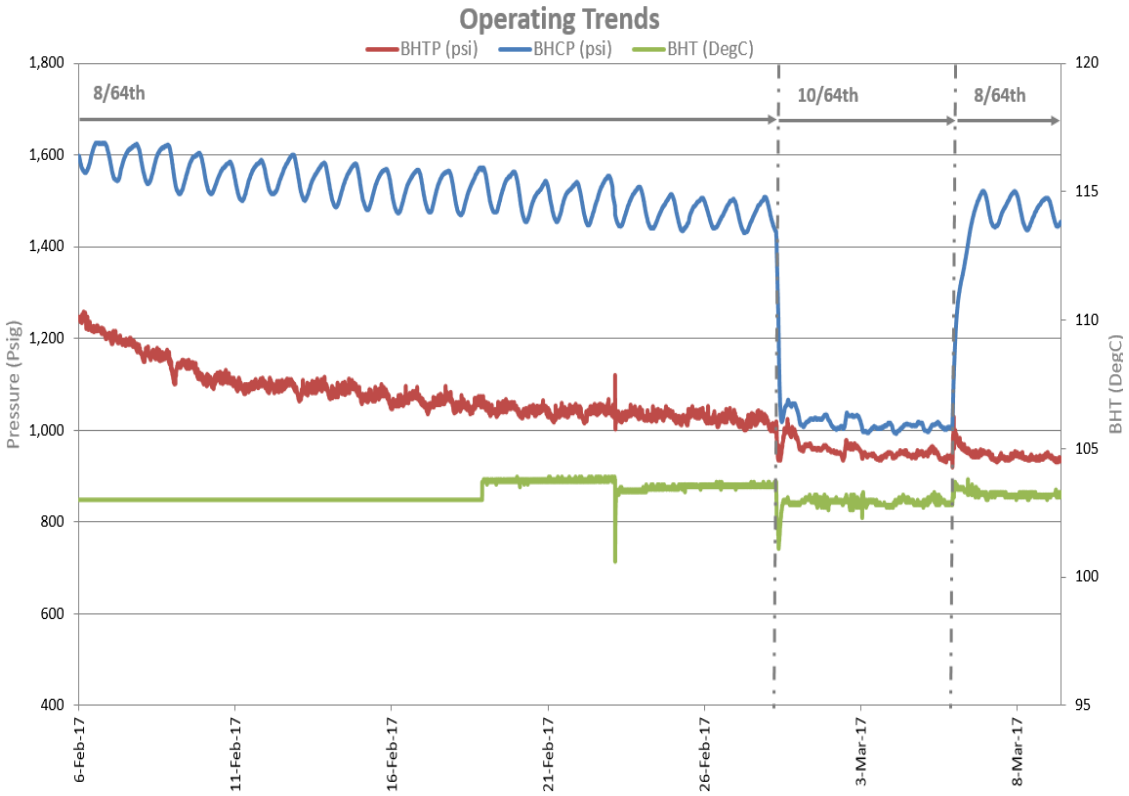
Mitigating Instability

8/64th orifice size causing **multi-point injection** and well instability.

Upper IPO valve continuously **opening and closing**.

Operator **increased the port size** to 10/64 by opening an additional valve. **Well stability achieved**.

Valve closed to replicate issue and confirm the DIAL action.



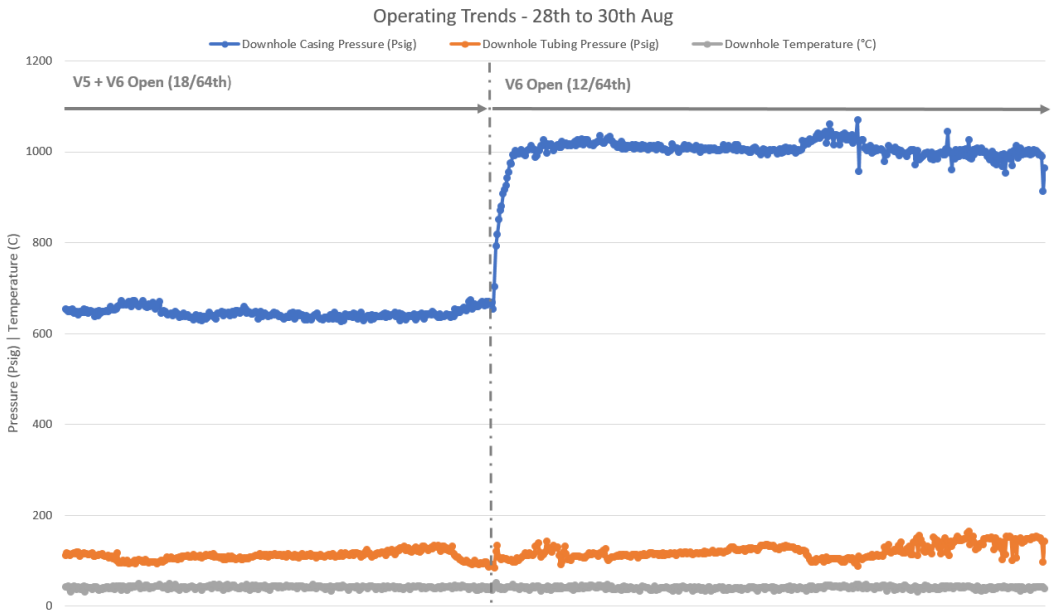
Case History 3

Gas Management

Through downhole gauge measurement, the operator recognised the opportunity to **reduce the gas injection rate**.

The **valve combination** was changed from **18/64** to **12/64ths**.

The operator increased casing pressure and **increased Net Oil Production by 18%.**



^Date	SPT Code	Total Fluid(bbl/d)	Oil	Water	Total Gas(MCF/D)	Gas Lift Gas(MCF/D)	Reservoir Gas(MCF/D)	GOR	Total GOR	Water Cut(%)	Tubing Pressure(PSIG)	Duration (Hrs)	Casing Pressure	Flow-Line Pressure(PSIG)	Test Separator Pressure
		stb/d	stb/d	stb/d	mscf/d	mscf/d	mscf/d	scf/stb		%	psig		psig	psig	psig
06/09/2017	0	81.36	81.36	0.00	472.12	356.54	115.59	1420.73	5803.12	0.00	999.00	10.00	755.71	45.82	39.93
01/09/2017	0	68.19	68.19	0.00	493.73	354.53	139.20	2041.23	7240.12	0.00	999.00	10.00	775.80	46.14	40.11
23/08/2017	0	69.38	66.30	3.08	591.11	480.89	110.22	1662.45	8916.00	4.44	999.00	10.00	449.03	46.78	39.84

Cross-functional business-case development accelerates technology adoption

More production

- **Accelerating return-on-investment**
- increased well production from **enhanced lift efficiency**

Less intervention

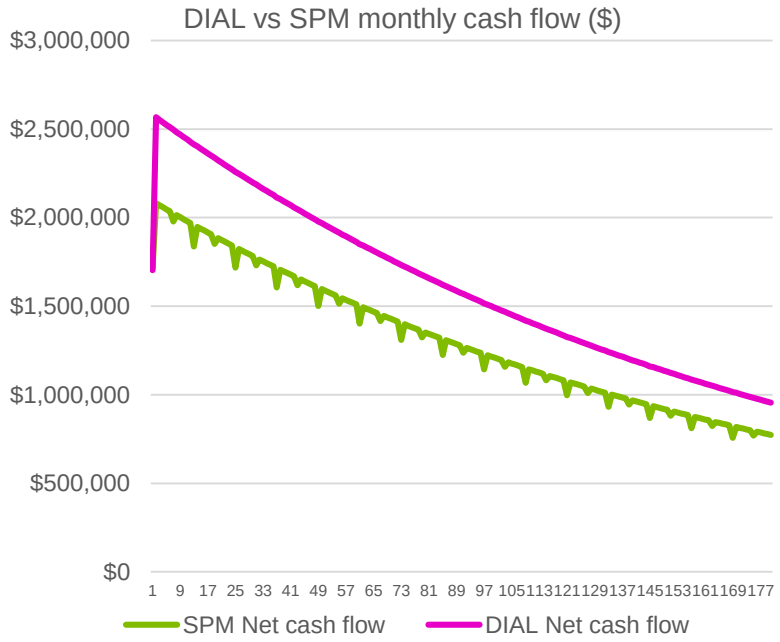
- **Reducing opex & risk**
- reduced well down-time from **intervention-free operation**

More data

- **Informing production optimization**
- increased insight from **multiple in-well sensors**

Less uncertainty

- **Enabling decisions**
- reduced misunderstanding from **integrated gas lift**



Thank you!
Questions?

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