



The Dream Well

Closing the Gap in Completions



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Poll Question #1



What is your completions or production experience?



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Poll Question #2



What is your knowledge of “slickline” and “wireline”?



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Poll Question #2



What is your knowledge of “slickline” and “wireline”?

- 1) Low (I do not know the difference)
- 2) Medium
- 3) High

Slickline is solid or braided wire used to convey tools into and out of wells without the use of a rig (intervention)



Wireline, or electricline can do all the above plus it contains 1-7 conductors used primarily for logging, perforating, and packer setting

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Vertical Completion Architecture



Two-Trip Completion

- Tubing Replacement
- Safety Valve Replacement
- ESP Replacement

Vertical Completions Work WITH Gravity:

- Slickline and electricline work well
- Debris falls to bottom
- Upper completion workovers
- Lower completion workovers

Upper Completion

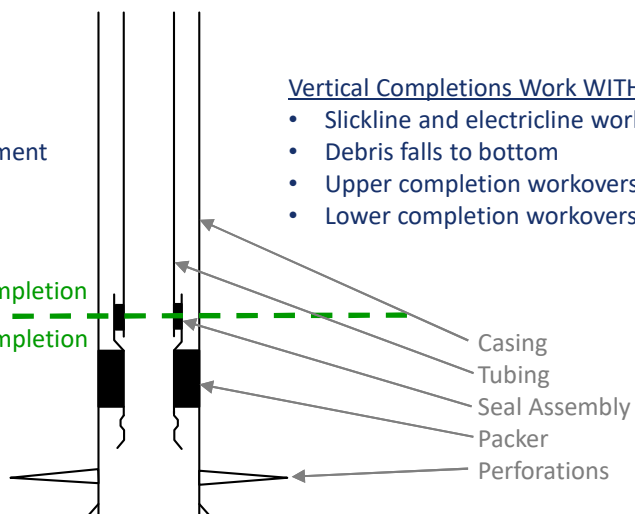
Lower Completion

Low Cost Intervention

- Slickline Plugs
- Perforating
- Electricline Packers
- Electricline Logging



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Horizontal Completion Architecture



Lost:

- Slickline
- Electricline
- Debris Tolerance
- Lower Completion Retrievability
- Data / Control per Zone

Gained:

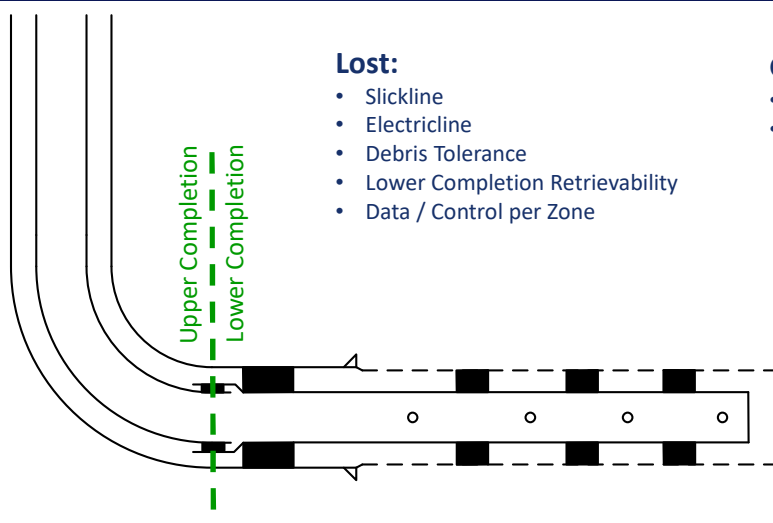
- High Production Rates
- Multi-Zone

Upper Completion

Lower Completion



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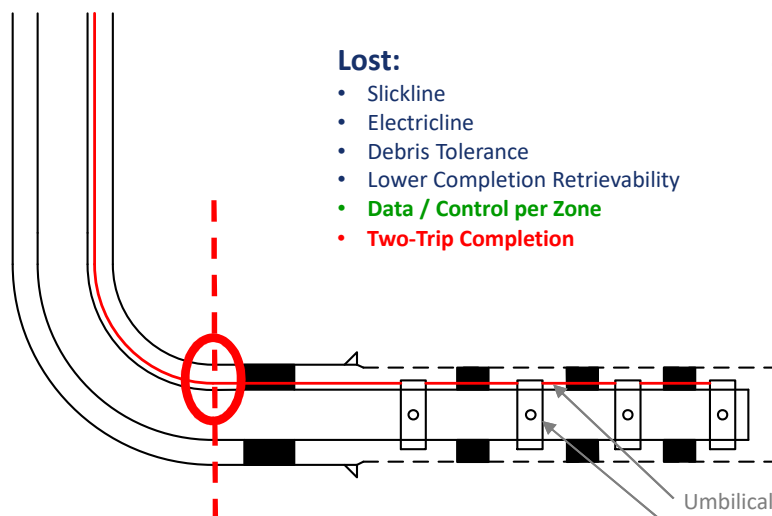


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Smart Well Architecture



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Lost:

- Slickline
- Electricline
- Debris Tolerance
- Lower Completion Retrievability
- **Data / Control per Zone**
- **Two-Trip Completion**

Gained:

- High Production Rates
- Multi-Zone

Umbilical (in red)
Interval Control Valves with Data

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Problem Definition



- Production rates are significantly improved with horizontal wells. There is no going back...
- Ease of intervention, reservoir control/data, and lower completion workover have been sacrificed.
- On Smart Wells with umbilicals, can recover the control/data feature but Two-Trip is lost!
- How can we regain some of this surrendered ground?



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Poll Questions #3



What is your knowledge of ICDs and ICVs?



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Poll Questions #3



What is your knowledge of ICDs and ICVs?

- 1) Low (I do not know the difference)
- 2) Medium
- 3) High

ICD is Inflow Control Device – A fixed choke to balance well production across multiple compartments.

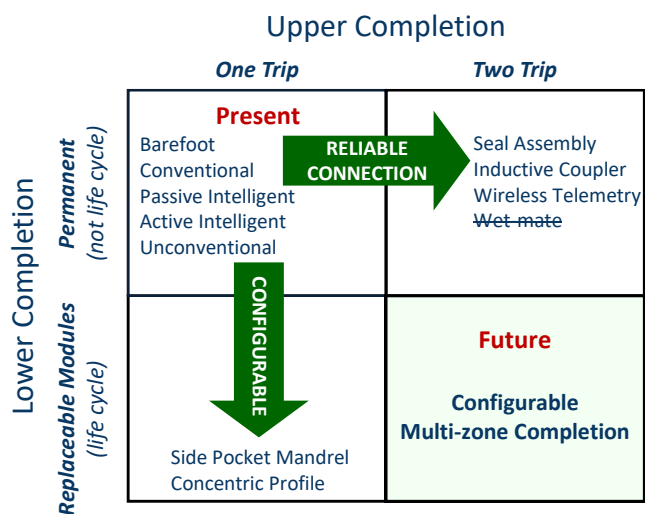
ICV is Interval Control Valve – An open/close valve or adjustable choke to control production across multiple compartments or reservoirs. Can be controlled from the surface on demand.



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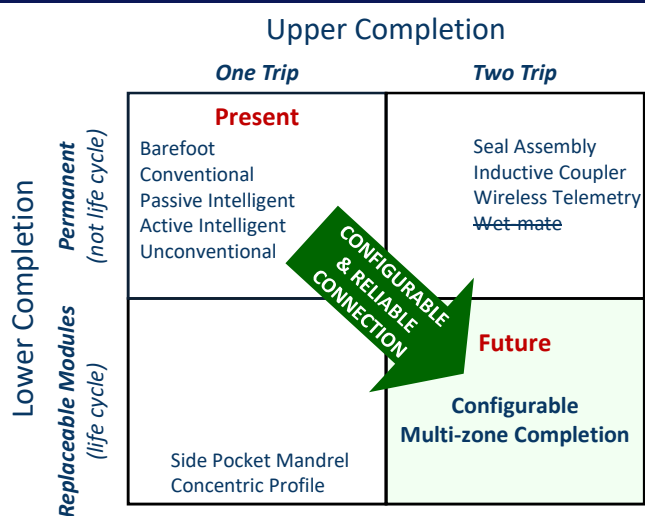
Multi-zone Completion Philosophy



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Multi-zone Completion Philosophy



Must do **BOTH** at the same time



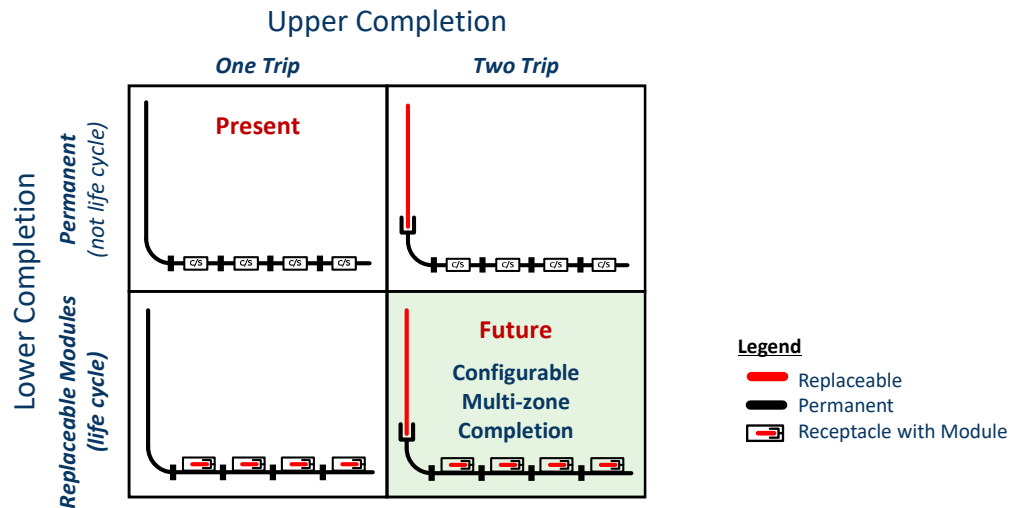
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Multi-zone Completion Architectures



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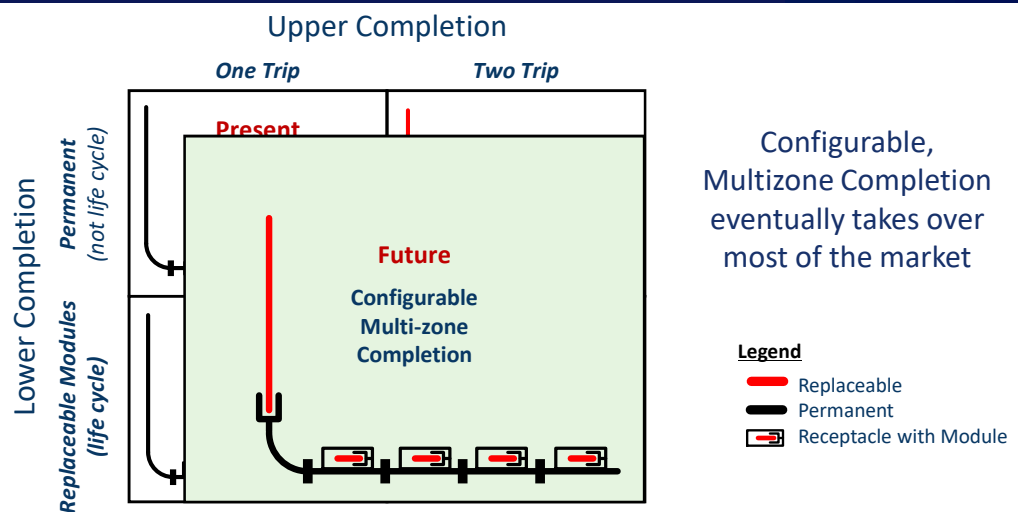


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Multi-zone Completion Architectures



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Dream Well – Configurable “On Demand”



Two Trip Connection

- Seal Assembly
- Inductive Coupler
- Wireless Telemetry

Replaceable Modules

- Barefoot (open only)
- Conventional (open/close)
- Passive Intelligent (fixed choke)
- Active intelligent (variable choke)
- Unconventional (open/close)
- Hybrids (mix and match)
- Sensors (pressure, temperature, flow)

Legend

- Replaceable
- Permanent
- Receptacle with Module



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Dream Well – Configurable “On Demand”



Two Trip Connection

- Seal Assembly
- Inductive Coupler
- Wireless Telemetry

Replaceable Modules

- The key to achieving a life cycle completion
- If we cannot replace the lower completion, we MUST be able to reconfigure it
- Any permanent lower completion cannot meet reservoir life cycle requirements

Legend

- Replaceable
- Permanent
- Receptacle with Module



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Déjà Vu – We Have Done This Before...

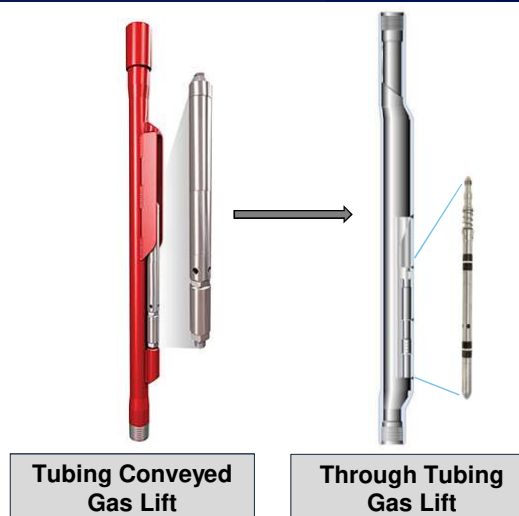


Through-tubing conveyed advantages:

- Change-out on demand
- Intervention with slickline vs rig
- Tailored to well performance
- Enabler for gas-lift optimization
- Lifecycle operability
- Fully commoditized



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Tubing Conveyed Gas Lift

Through Tubing Gas Lift

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How to Implement – Integrated Design



Each system has profound influence on the other

All four systems must be “co-developed” for compatibility

1. Connector Technology

- Inductive Coupler
- Wireless

2. Permanent Side Pocket Receptacle

3. Multiple Replaceable Cartridges

- Fixed choke (ICD)
- Electric controlled variable choke (ICV)
- Pressure and temperature gauge
- Flow meter
- Battery Pack (for wireless)

4. New Generation of Electricline Tractors and Manipulators

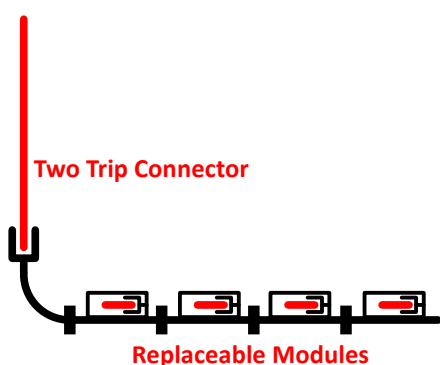
- Lighter duty
- Specific tasks
- Commoditized



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Configurable Multi-zone Completion Equals The Dream Well



- ✓ Regains the surrendered ground
- ✓ Functionality on demand
- ✓ Manages production performance
- ✓ Lifecycle operability
- ✓ Optimize reserves
- ✓ Improves economics
- ✓ Future proof



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Final Poll Question



Do you “believe” that a Configurable Multi-zone Completion is the Dream Well of tomorrow?



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Configurable Multi-zone Completion Equals **The Dream Well**

Questions?



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