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Making Better Wells®

Autonomous Inflow Control Valve (AICV®) and Case Stories globally

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Vision

- **Change the oil industry**
  to become more sustainable and cost efficient

Mission

- **Making Better Wells**
  that produce more oil, less water and less gas.

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Technology Evolution Timeline

Flow Control Technology

More than 6 Zones
(Long well)

Passive Control
(Distribute flow)

Active Control
(Ability to shut off)

3 - 6 zones
(Short well)

ICD

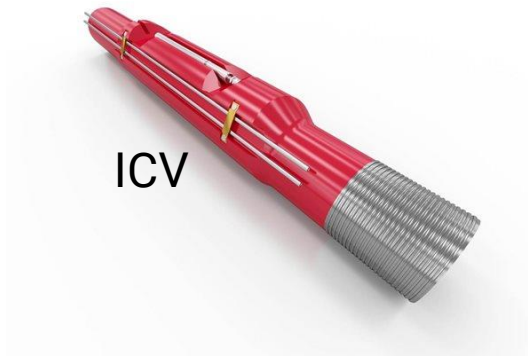
Inflow Control
Device (ICD)

Sliding sleeve
valve (SSD)

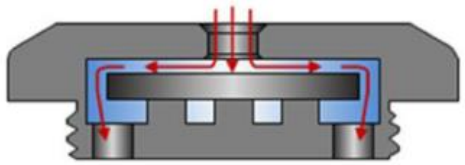
SSD

Autonomous
Inflow Control
Device (AICD)

Inflow Control
Valve (ICV)



ICV



AICD

Autonomous
Inflow Control
Valve (AICV®)

AICV®

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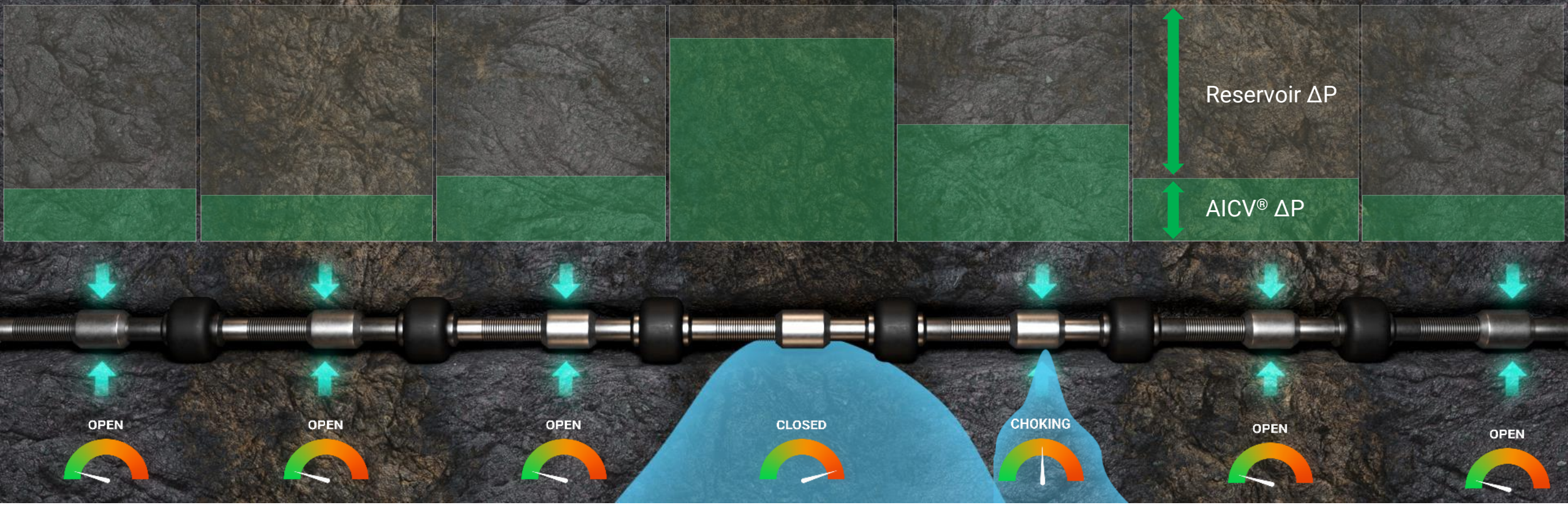
AICV® Managing Gas and/or Water Production



Features:

- Autonomously “Choking / Closing” water zones
- Autonomously “Open” for oil zones
  → By increasing draw down = **> Increased oil production**
- At multiphase flow, AICV® *gradually choke,* promoting better oil production

Results:

1. Increased oil production and recovery
2. Reduce unwanted production of gas and water
3. Reduce CO_2 emissions & energy requirements

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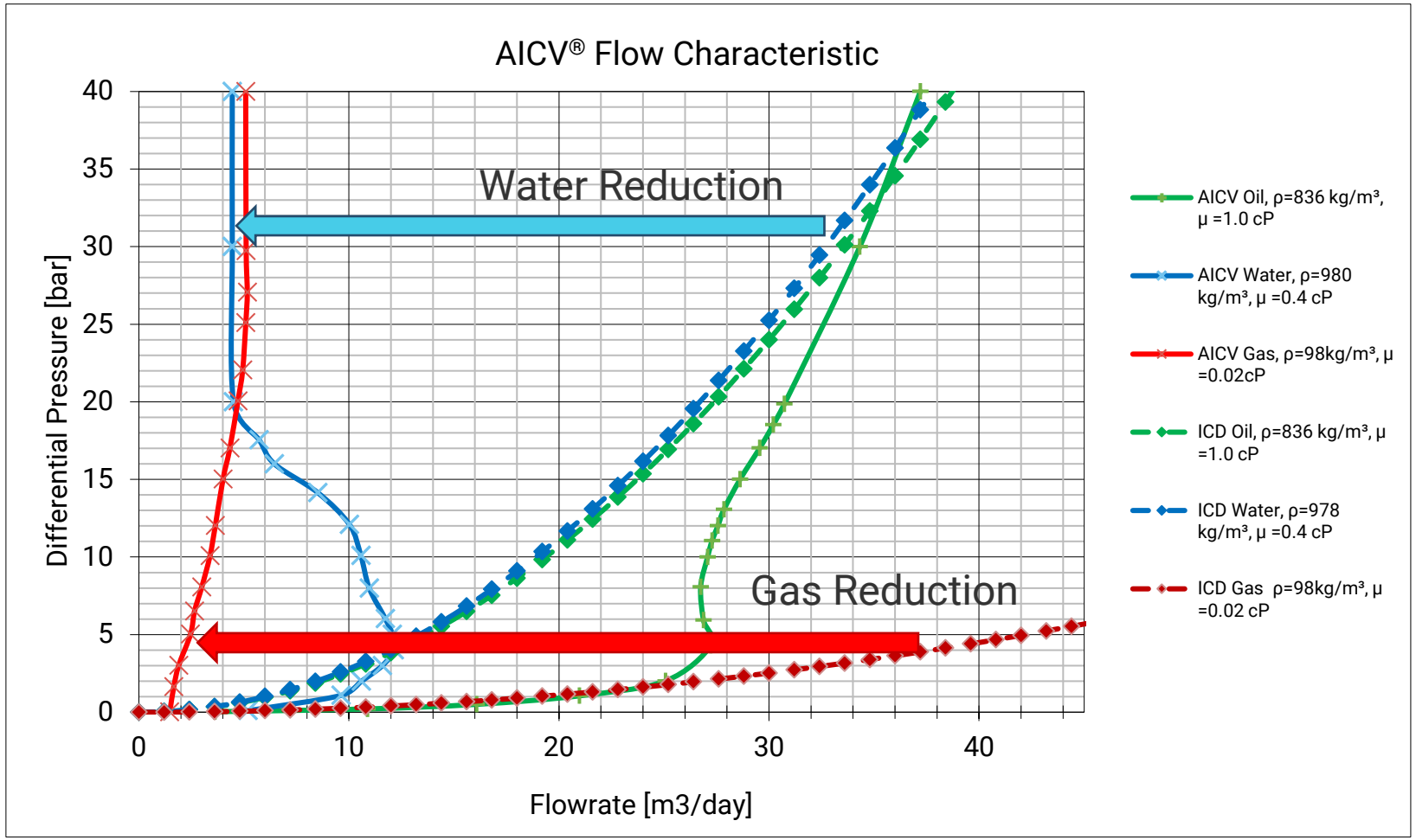
AICV® vs ICD Performance – Light Oil (1 cP)



- Various AICVs for various applications
- Choking/closing for water and gas.
- ICD effect for oil
- Fluid Performance Ratio (FPR) define the effectiveness of the technology.

- Qualified and approved for most national oil companies.
- Qualified and deployed for Equinor
- Qualified for Aker BP

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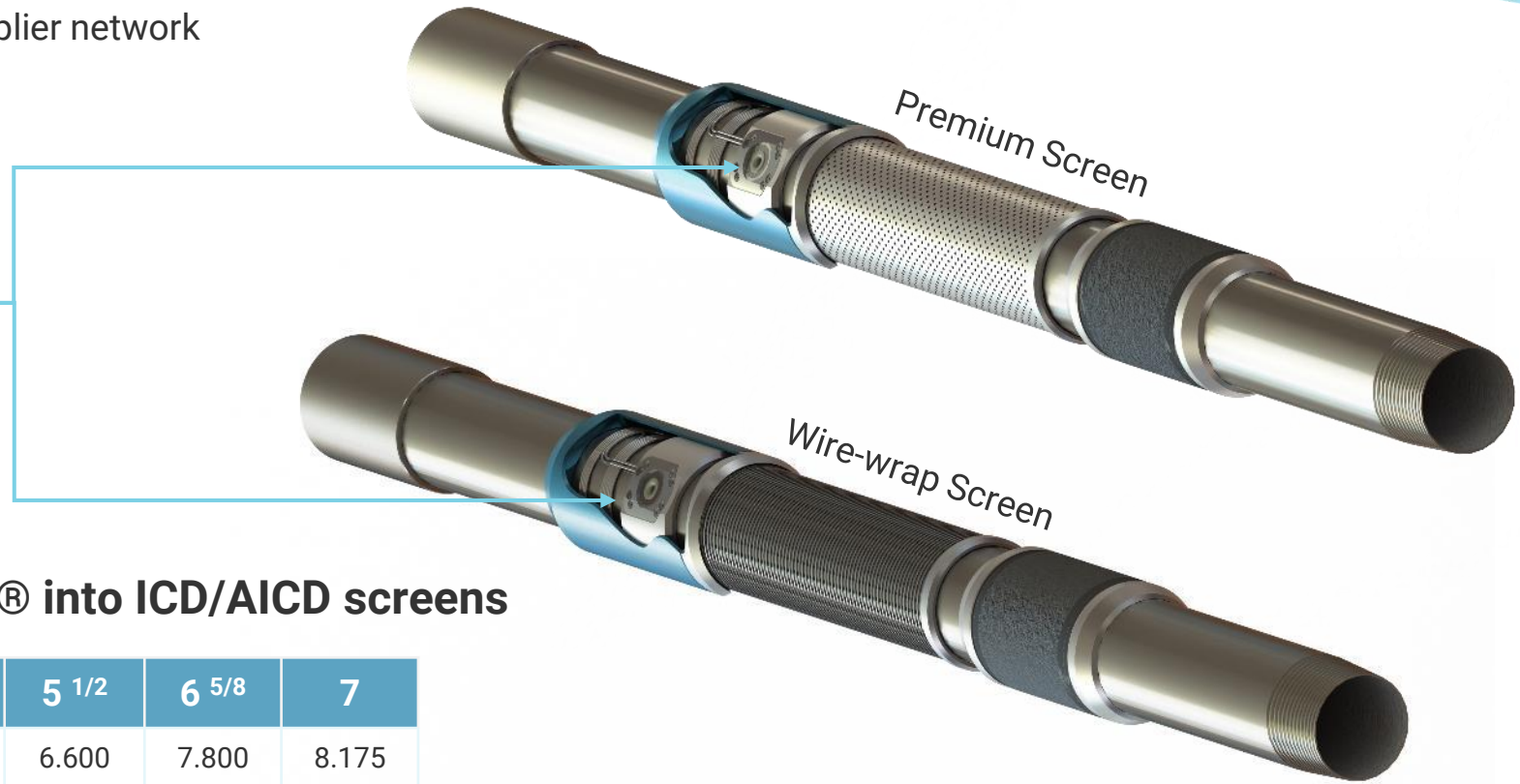
AICV® Integrated with Screens / Strainer

Design Flexibility: Single, Dual, Quad AICVs per joint
Efficient supply-chain: global screen sub-supplier network
Accessibility: Full-bore I.D.

AICV®
Autonomous Inflow Control Valve



Can also retrofit/assemble the AICV® into ICD/AICD screens

AICV® size (in)	2 7/8	3 1/2	4 1/2	5 1/2	6 5/8	7
Max OD (in)	4.130	4.650	5.600	6.600	7.800	8.175
OD Super slim (in)	3.740	--	--	--	--	--
Length	R2 or R3					
Material	304L, 316L or Alloy 825					

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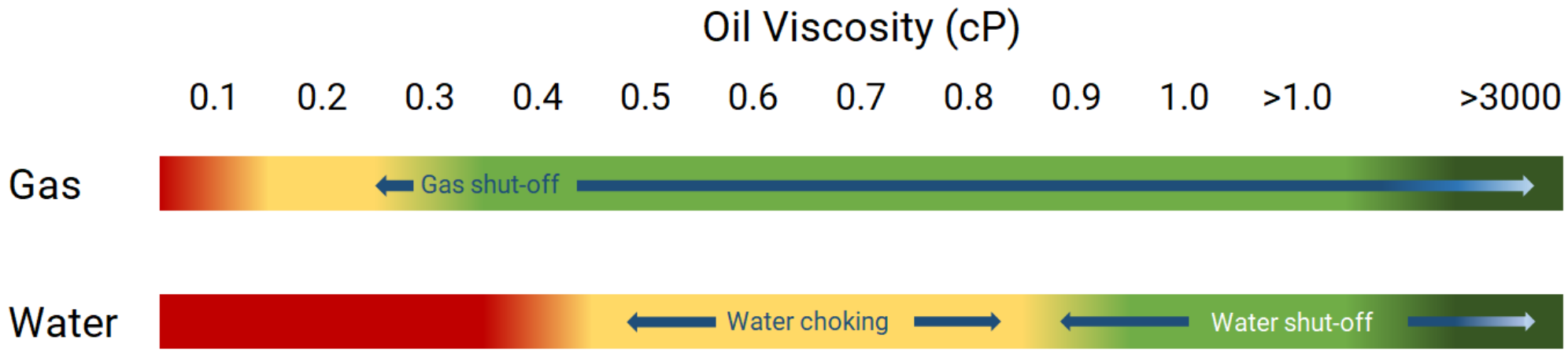
Operating Envelope

- AICV® can be installed in **new wells and existing wells (retrofit).**
- Vertical, deviated and horizontal wells.



AICV® Functionality for Gas and Water Control

Gas shut-off:	≥ 0.25 cP
Water choking:	≥ 0.6 cP
Water shut-off:	≥ 1.0 cP

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InflowControl AICV® Deployment Statistics

Stats from 2015 until Jan. 2024

> 280
Wells Deployed

17
Countries

27
Operators

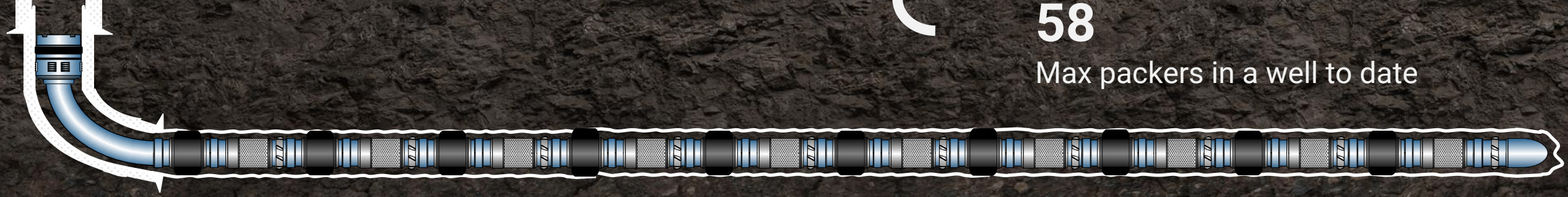
3,500 m
Max OH length to date

727 m
Average OH length

52 m
Ave. compartment length

14
Ave. number of packers per well

58
Max packers in a well to date



0.29 cP
Min viscosity to date

5,000 cP
Max viscosity to date

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AICV® Case Stories – Various Application

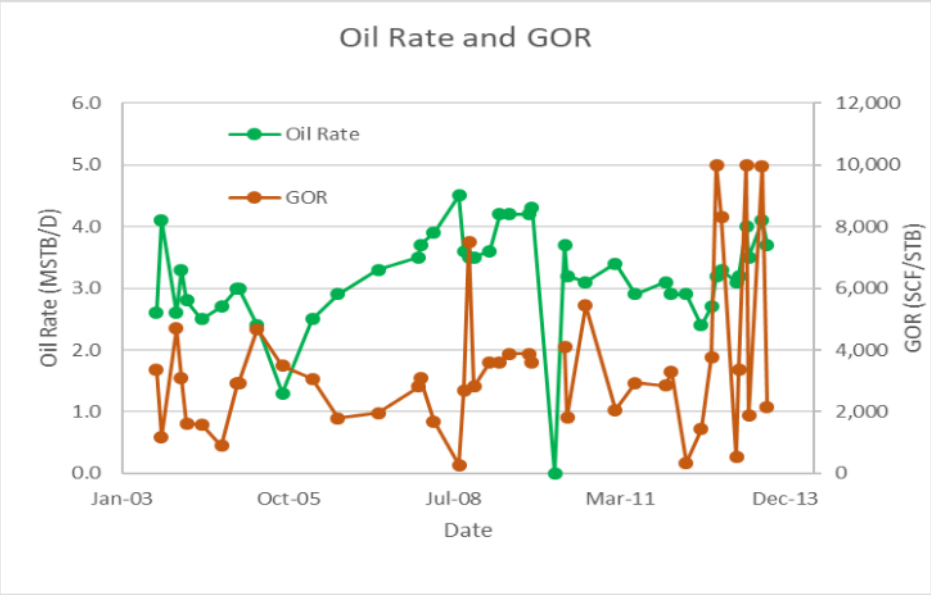
1. Re-entry well with high Gas Oil Ratio (GOR)
2. Water shut-off in medium oil – Comparison SAS, RCP and AICV®
3. Re-entry well with high water cut (WC) and low oil production
4. 90 well study for water choking

Case Study 1: Re-entry Well with High GOR

Gas shut-off in mature field (SPE-200168, IPTC-20195)

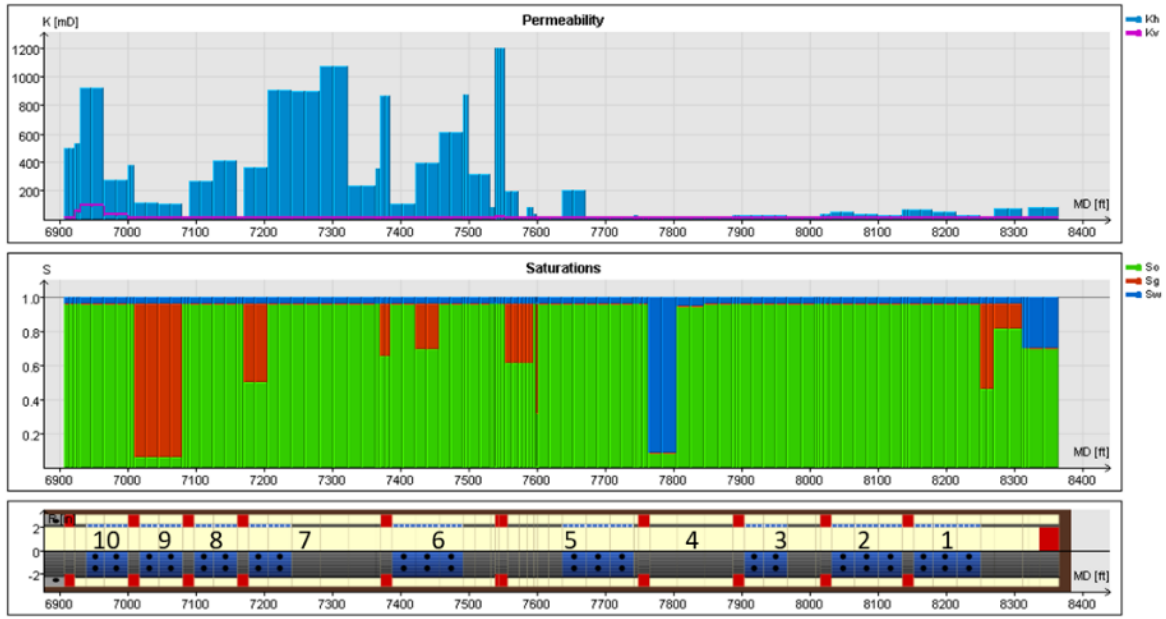
Challenge:

- Carbonate reservoir
- Well shut-in due to high GOR
- Ultra-light oil ~0.5 cP
- 1,500 ft. horizontal open-hole



Solution:

- Retrofit well with 22 AICV joints combined with hydraulic + swell packers to manage high GOR and restart oil production
- Retrofit design based on OH log / PLT Analysis



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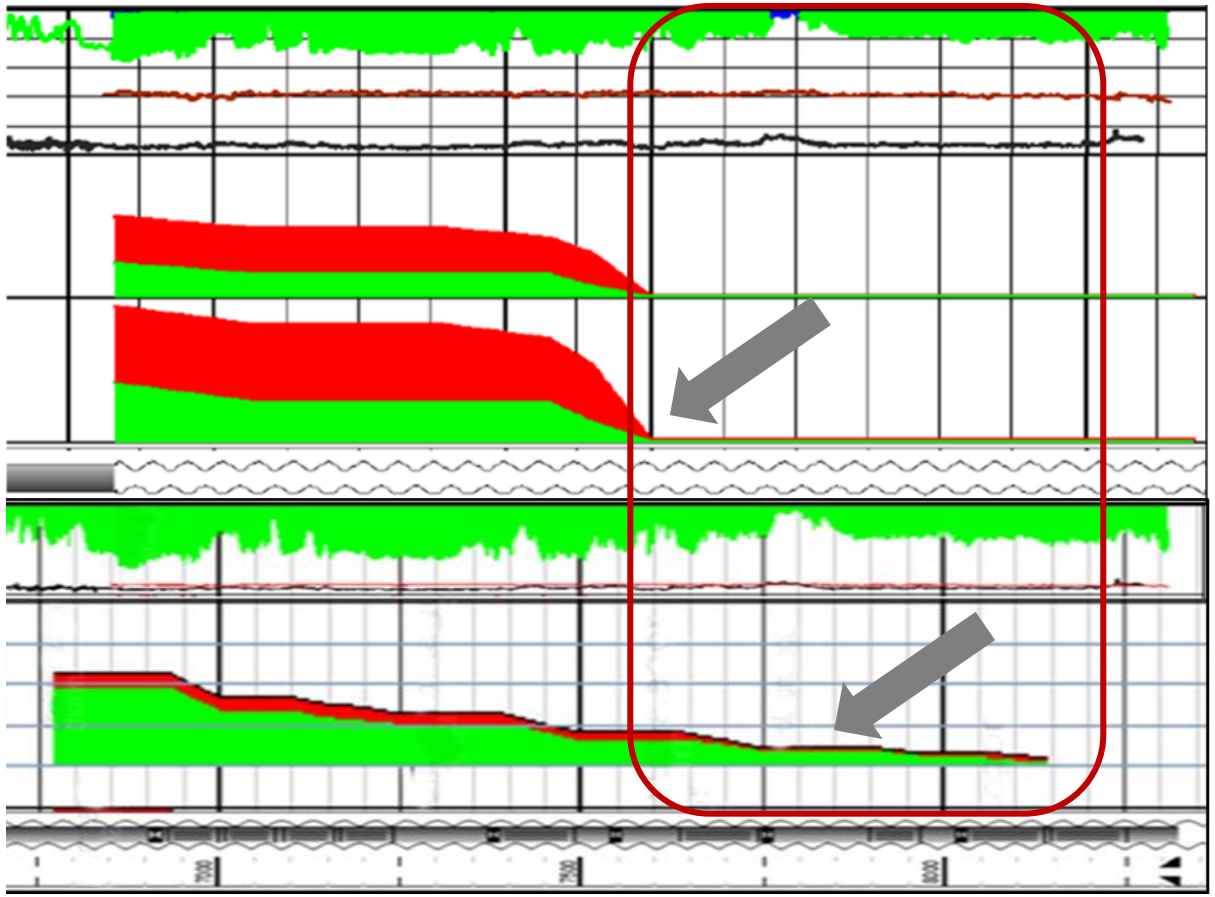
Case Study 1: Re-entry Well with High GOR

Gas shut-off in mature field (SPE-200168, IPTC-20195)

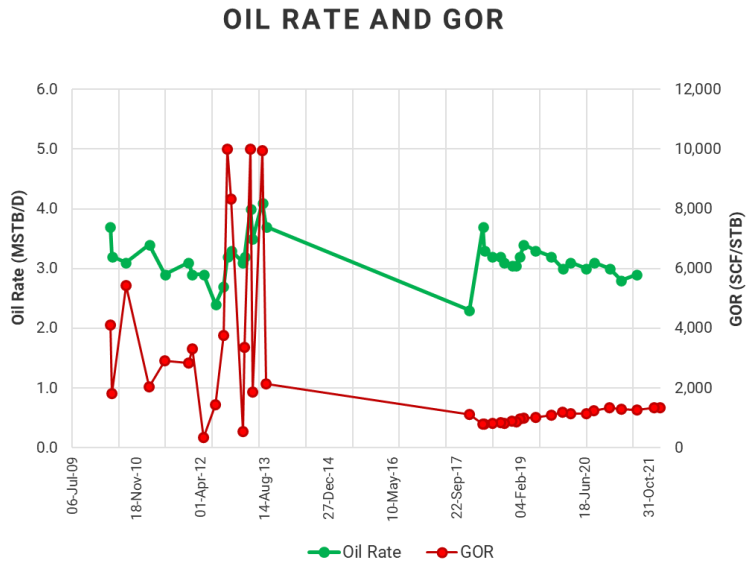
PLT Log Data

Pre-AICV®

Post-AICV®



1. > 5-year stable production
2. > 90% gas reduction
3. > 5 times more production in lower section
4. Better reservoir management - Increasing production and recovery



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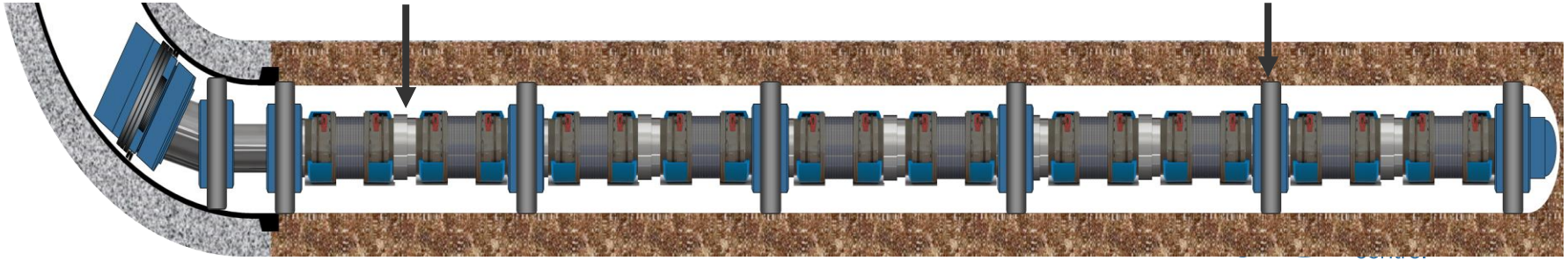
Case Study 2: Water shut-off in medium oil – Comparison SAS, RCP and AICV®

To be published in March

- Medium oil, in sandstone reservoir with strong aquifier
- 20 open compartments uniformly distributed
- 1 blank compartment
- Packers placed according to reservoir markers

20 x 4-1/2” AICV Quad Joints per Compartment

20 x 4-1/2” Oil Swellpackers



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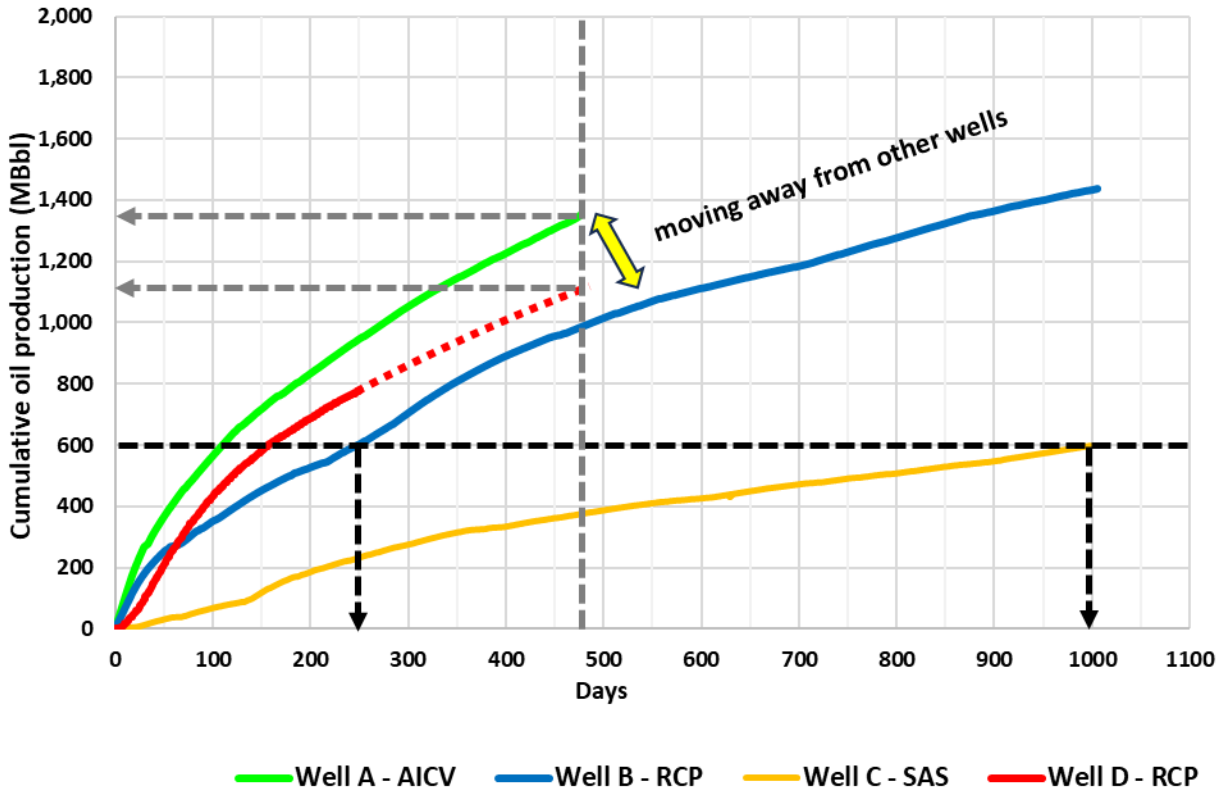

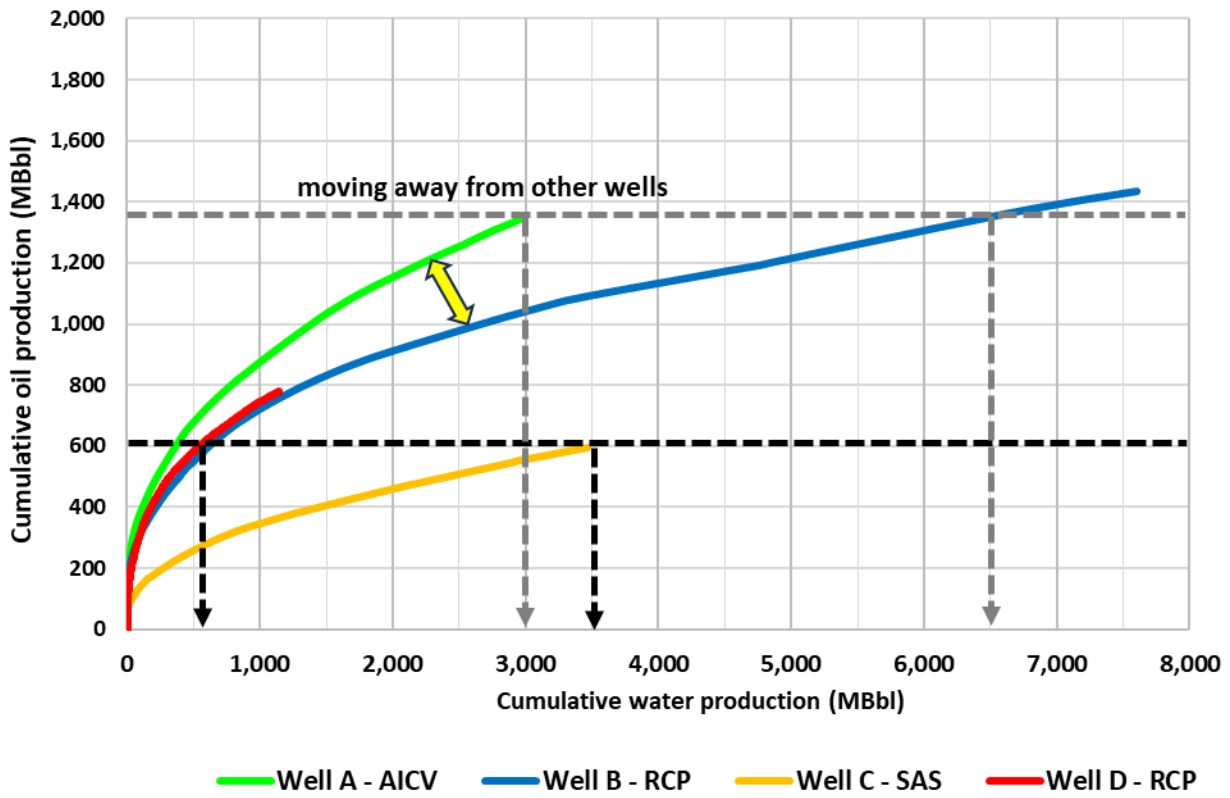

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Case Study 2: Water shut-off in medium oil – Comparison SAS, RCP and AICV®

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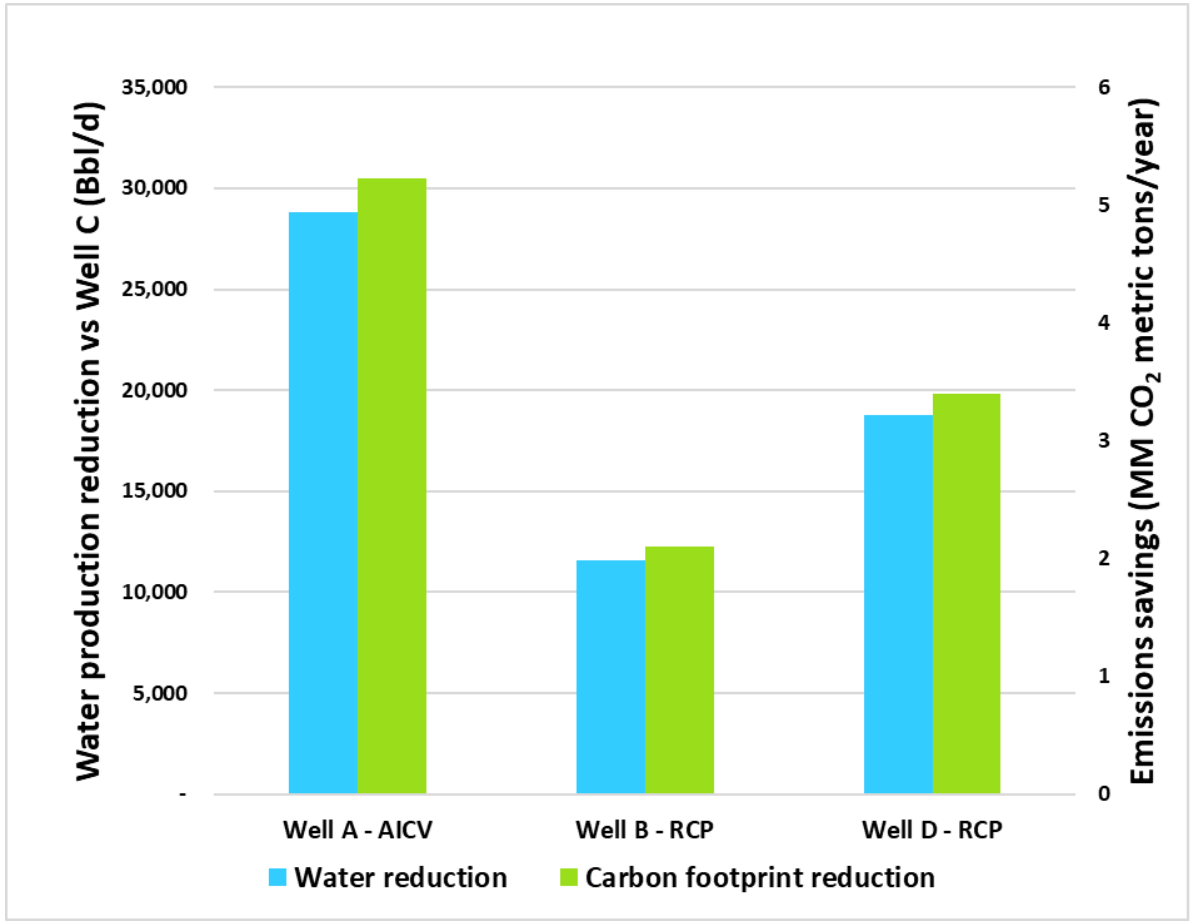
Carbon footprint reduction



- Well A/B/D Vs Well C
- Comparison @ 1.3 MM Bbl cumulative oil
- Potential energy saved by water reduction (ESP and Injection pump)
- Source of energy: Diesel (7.41E-05 CO_2 metric tons/KJ)

The technology has successfully achieved lower carbon oil

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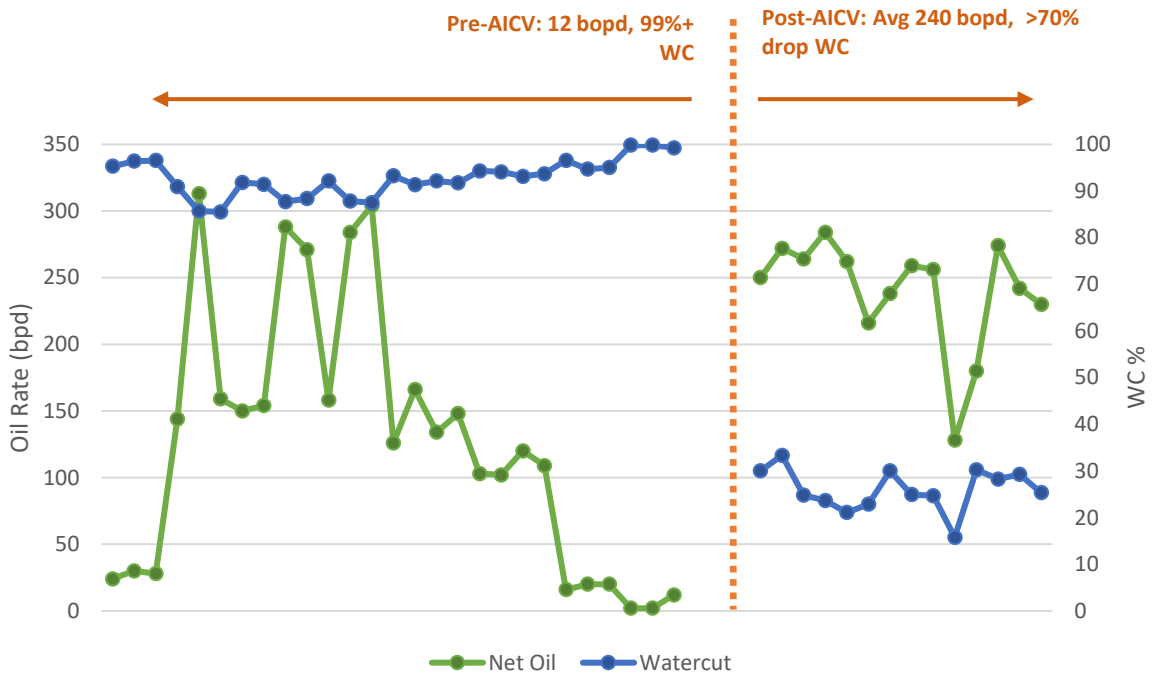
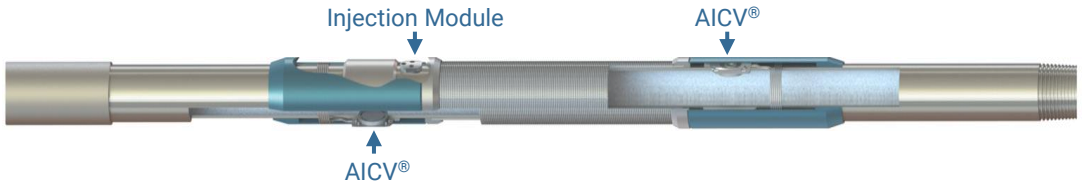
Case Study 3: Re-entry Well with High WC and low oil production

Water Shut-Off (SPE-214601-MS)

- Water shut-off
- Light Oil (~2 cP)
- Shut-in well due to high WC
- 19 Dual AICV uniformly distributed in 14 Comp.
- WC reduced by >70% from 350 to 90 bwpd
- Oil up from 25 to 225 bopd





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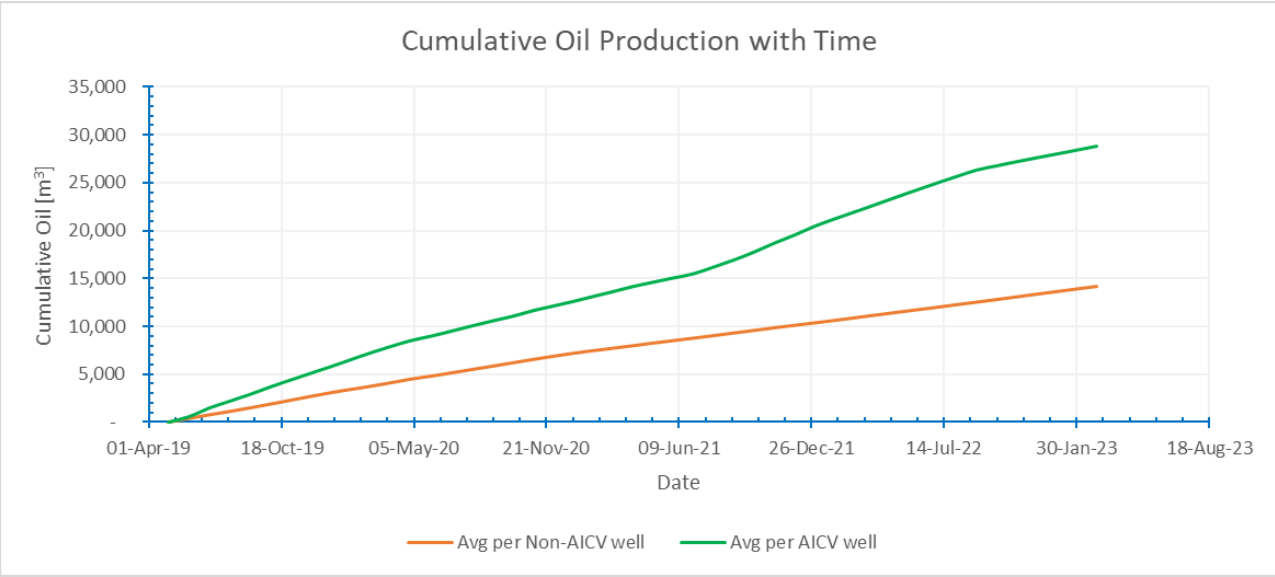
Case Study 4: 90 well study > 4 years of production data

Brownfield water control - AICV® vs SAS wells

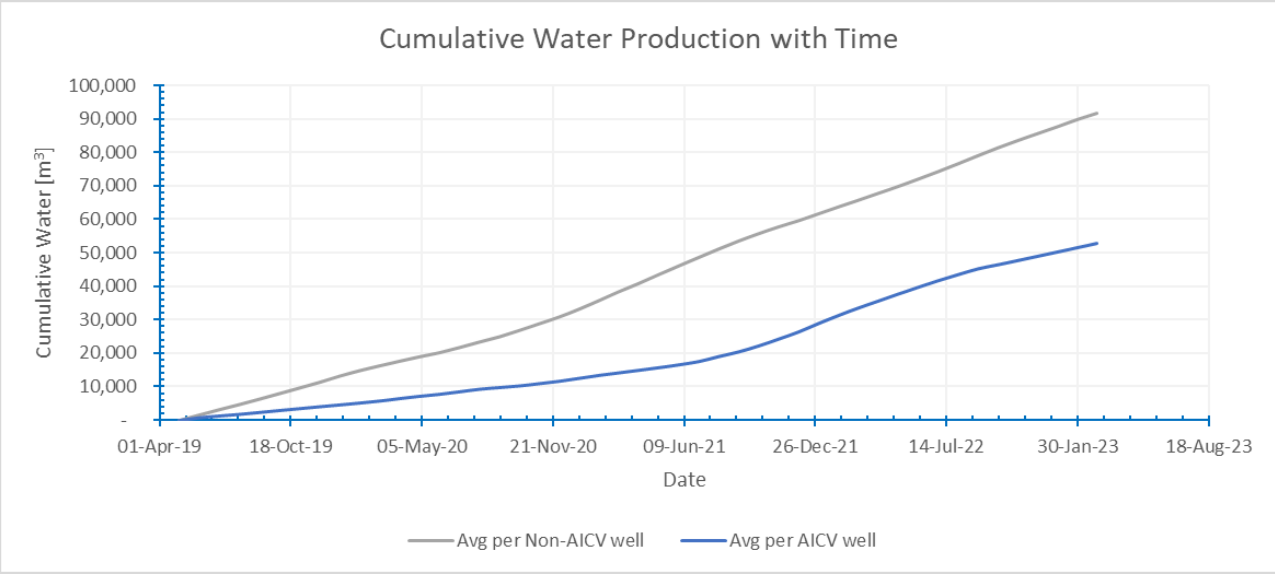


AICV average cum oil: 28,258 m3

OH average cum oil: 14,203 m3

AICV increased cum oil per well:

- **14,055 m3** *(additional)*
- **2x increase**



OH average cum water: 91,640 m3

AICV average cum water: 52,890 m3

AICV reduced cum water per well:

- **38,750 m3**
- **1.7x reduction**

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Summary

- > 280 AICV® wells deployed globally
- Fra 0.25 cP til 5000 cP
- AICV® and reservoir understanding improving oil production and recovery – reduce unwanted gas, water and CO_2 emisions.

YouTube

1 

UNWANTED WATER & GAS production in the oil industry

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2 

The BASIC ASPECTS of a typical HORIZONTAL WELL

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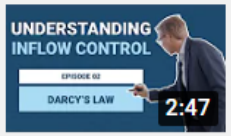
3 

DARCY'S LAW applied to the OIL RESERVOIR

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4 

The HEEL TO TOE EFFECT in horizontal wells

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5 

The 3 STEPS of OIL PRODUCTION in horizontal wells

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6 

CALCULATING the MOBILITY RATIO of water & gas to oil

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7 

The FUNCTION of inflow control; ICD, AICD & AICV

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8 

The PHYSICS of the ICD - Inflow Control Device

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9 

The PHYSICS of an AICD - Autonomous ICD

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10 

The PHYSICS of the AUTONOMOUS Inflow Control VALVE

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11 

MULTIPHASE FLOW with AICV® completion

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12 

The AICV and Reservoir Modeling

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Thank You

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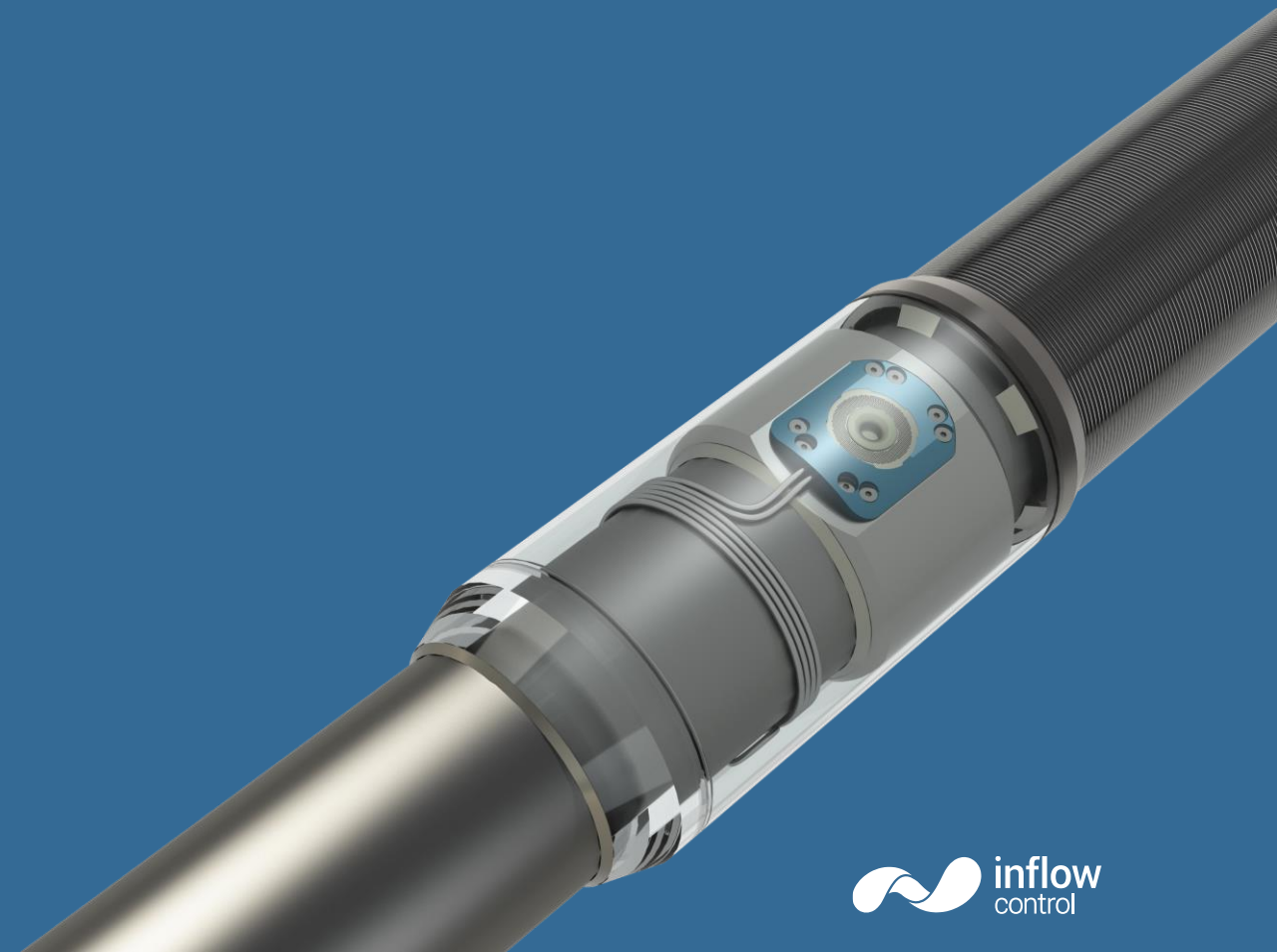

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