

# Water Shut-off in Light Oil wells using Autonomous Inflow Control Valve (AICV®) Technology for a Major Middle East Operator

An operator in the Middle East has conventionally developed its field using barefoot wells and performing intervention work as production deteriorates. While barefoot wells are often cost effective given its low CAPEX and high initial productivity, there is limited control when unwanted fluids such as water and gas start producing (including fines). This will eventually hinder well performance due to higher mobility of unwanted fluids restricting oil flow leaving bypassed oil (2.6 cP) or in a worst-case scenario, forcing the well to be shut in due to high water cut. In this field, about 40% of the inactive strings have suffered from water issues and experience early water breakthrough.

## Challenges and Objectives

In addition to high water cut, installation of packers including compartmentalization was a challenge given the presence of washouts in certain zones. This was mainly due to the fact that most wells were drilled 12 years ago. The main objective is to allow the well to produce oil economically while reducing water production.

## Solutions

Two wells that were initially completed as horizontal barefoot completions with 6" OH sections were selected as candidates. A detailed evaluation of the reservoir, production and completion data was performed to predict the potential improvement across each well. Number of joints and compartments were optimized through various sensitivity analysis while meeting the desired production target. The following table illustrates the total compartments and joints in each well.

A 4-1/2" retrofit design was proposed with a range of 12 to 19 AICV® joints in each well. Following initial near-well model, AICV® was further optimized using actual well data from OH logs and measurements including but not limited to deviation survey, caliper logs, permeability etc. A detailed workflow and best practice were also established to ensure the AICV® completion is deployed successfully without having any QHSE incidents.

LOCATION  
Middle East

NUMBER OF WELLS  
2

OPERATOR  
Major National Operator

DEPLOYMENT  
Onshore

RESERVOIR  
Fractured Carbonate

COMPLETION  
Retrofit application with 4-1/2" AICV® with premium screens and swell packers

## Results



**70%**

Water reduction



**100%**

Improved oil production & slower decline rate



**200K tons**

CO<sub>2</sub> emissions reduction



Well	AICVs Deployed	Number of Compartments	Application Type
Well 1	19 Dual AICV® Joints	14	Water Shut-off
Well 2	12 Dual AICV® Joints	12	Water Shut-off

## Results

Both wells showed significant reduction in water production. Water cut was reduced by 60-70% across both wells while oil has seen to exceed expectations by an increase of more than 100%. With the following return, the wells are expected to provide a payback period of approximately 2-3 months for the AICV® technology.

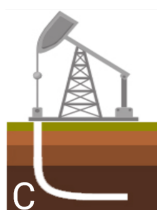
In addition to the increase in oil production, handling and disposal costs of water were reduced significantly for the operator. With the reduction of water, up to 200k tons of carbon emission per year were also reduced from just two wells (equivalent to 43,000 vehicles).

Upon deployment of the AICV® completion, preliminary production performance results were noticed:

❖ Water shut-off

❖ Light Oil (2.6 cP)

❖ Shut-in well (WC)



➤ Well revived

➤ WC% reduced by >70%

➤ Oil up by >1,800%

➤ Producing: 10 months+

❖ Water shut-off

❖ Light Oil (2.6 cP)

❖ Shut-in well (WC)



➤ Well revived

➤ WC% reduced by >60%

➤ Oil production back to initial

➤ Producing: 6 months+