

Increased oil production by reducing unwanted water production in a heavy oil field with AICV® technology

A major brownfield in the Middle East has been producing for several years with significant water production issues. The faulted sandstone reservoir produces a medium gravity (21° API) viscous oil ranging from 200-500 cP. In this mature brownfield, typical well production starts with a medium to high water cut and ramps up to above 90% within a short period. As a result, significant oil remained by-passed which leads to a lower ultimate recovery.

Challenges and Objectives

As the field has a faulted reservoir with an active aquifer, many wells were producing with very high water cut (>95%). Stand-alone screens (SAS) along with zonal isolations were not able to restrict the water production. As a result, the wells had to choke back at the wellhead to limit the water production, which also reduced the oil production, leaving behind a significant amount of recoverable reserves. Furthermore, a colossal volume of produced water at the water handling facility puts a constraint on future drilling programs as more horizontal wells were planned as a part of an in-fill development program. The objective was to delay the onset of water breakthrough as well as restrict its production upon a breakthrough in a well and accelerate the oil production to achieve the higher recovery.

Solutions

The AICV® is based on Hagen-Poiseuille's equation & Bernoulli's principle and operates autonomously. It opens for high viscous fluid such as oil and close for lower viscosity fluids such as water and gas. Due to this unique feature of the AICV®, the operator decided to complete several dozens of wells with AICV® joints and annular isolation packers for compartmentalization.

Results

Based on the regular well testing results, it was evident that AICV® choked back the high water producing zones, thus reduced the water cut by over 80% and increased the oil production by over 300%. This not only helped in reducing the load on water handling facilities, but also allowed the operator to drill many wells in the high water-saturated area, as well as close to oil-water contact to maximize the field recovery. OPEX savings the first year alone was over USD 2.4M as well as a significant reduction in carbon footprint by saving energy in pumping less water to the surface.

LOCATION
Middle East

NUMBER OF WELLS
8 wells

OPERATOR
Major Middle East E&P

DEPLOYMENT
Onshore, mature brownfield

RESERVOIR
Sandstone reservoir with faults and high-permeability streaks

COMPLETION
4-1/2" AICV® with wire wrap screen and swell packers

Results



80%

Reduction in water cut



3x

Increased oil production

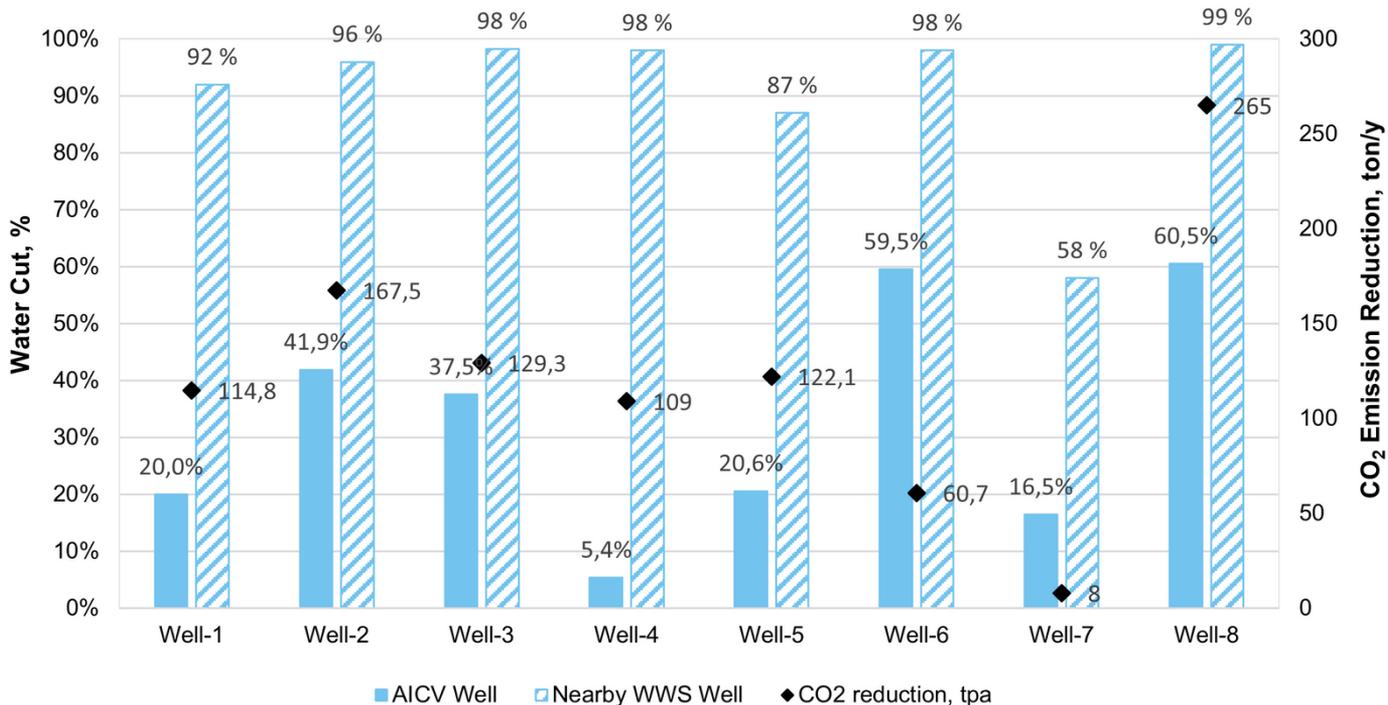


100

Tonne/y/well CO₂ reduction



Reduction in Water Production & Total CO₂ Emission Reduction



Increased Oil Production

