

# WaterWeb® Service

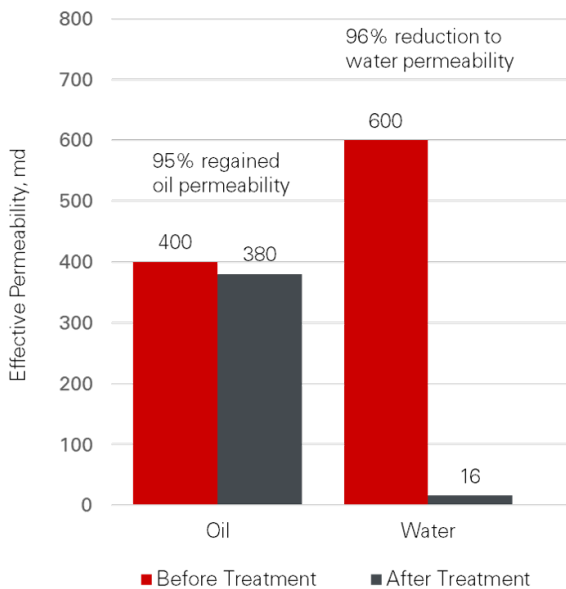
## SELECTIVELY REDUCING WATER PRODUCTION FOR IMPROVED PRODUCTION PROFILES AND WELL LIFE EXTENSION

### OVERVIEW

Halliburton WaterWeb service uses unique polymer chemistry to selectively reduce water effective permeability in the reservoir, helping impede water flow and enhancing hydrocarbon flow to the wellbore. With WaterWeb, the resulting improved oil/gas recovery potential stems from a reduced water column giving improved natural lift for the residual oil and/or gas.

In addition, it helps prolong and sustain production by enhancing reservoir drainage. WaterWeb is applicable to sandstone and carbonate lithologies.

WaterWeb works by adsorbing onto the rock surface, reducing effective permeability to water by more than 90 percent with little to no damage to hydrocarbon permeability. In effect, WaterWeb creates resistance that holds back water while allowing oil and gas to pass freely.



The above graph shows the response of an oil saturated core and a water saturated core before and after treatment with WaterWeb service. In this case, the effective permeability of the water saturated core was significantly decreased while the effective permeability in the oil saturated core was minimally impacted. Both permeabilities were measured at residual oil and water saturations, respectively.

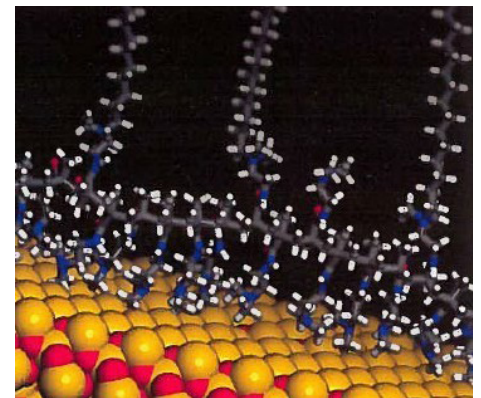
### APPLICATIONS

WaterWeb offers a range of relative permeability modifier (RPM) polymers depending on the permeability range of the reservoir. This service is ideal for use in wells that have:

- » Permeability greater than 0.1 mD and less than 8000 mD
- » Bottomhole temperatures of up to 325°F (163°C)
- » Multi-layered formation without crossflow within the reservoir
- » RPM formulation optimized for different lithologies, including sandstones and calcite-rich formations

### BENEFITS

- » Reduce water production
- » Increase hydrocarbon production
- » Reduce costs associated with produced water
- » Extend the economic producing life of the well
- » Increase recoverable reserves



WaterWeb polymer adsorbs to the rock surface, selectively decreasing effective water permeability with little to no damage to hydrocarbon flow.

**EASY TO USE AND FIELD PROVEN**

WaterWeb service requires no special placement techniques. It is unaffected by multivalent cations, oxygen, or acids. It does not require rig time or zonal isolation. WaterWeb service works by immediately adsorbing to the rock matrix as it is being pumped (it does not gel or “set up”), so the wellbore can immediately be brought back to production after the treatment. No shut-in time is required.

To date, Halliburton RPM chemistry has been used in more than 3,000 wells around the world with excellent results.

**CASE HISTROY**

A cased-hole and perforated well producing from an onshore laminated sandstone oil reservoir was completed in 15 different zones (681 ft gross interval, 155 ft of net perforations) with the following properties: 20°API oil, average permeability ~195-md, average porosity ~13 percent, and BHT~280°F. Water production had been a major challenge in this reservoir, limiting the economic life of many wellbores. Production rates for the well before WaterWeb service were reported as

1200-BFPD, 260-BOPD, 960-BWPD, and 80 percent water production. Figure A shows the wellbore schematic and the results of a production logging tool (PLT) run performed before the RPM treatment. Although the PLT clearly identified the intervals contributing to most of the water production, the same intervals were also producing a significant amount of oil.

The treatment consisted of pumping 180-bbl of WaterWeb service. After the treatment, the well began producing at 2400-BFPD, 1560-BOPD, 840-BWPD, and 35 percent water cut. Production had stabilized to 850-BFPD, 510-BOPD, 340-BWPD, and 60 percent water cut.

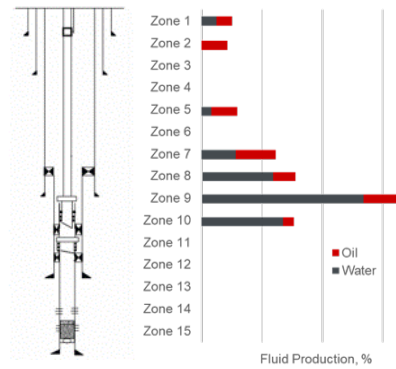


Figure A - wellbore schematic and PLT before WaterWeb service treatment.



Winner – Hart’s Meritorious Engineering Innovation Award

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