

ScaleSOLV Dissolver Saves USD 13 Million by Eliminating Workovers and ESP Damage, Iraq

Engineered solution eliminates scale in ESPs, eliminating production deferrals of 10.6 million bbl of oil for workover delays

CHALLENGE

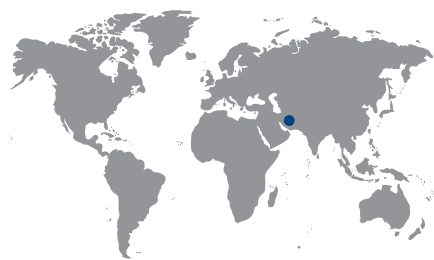
Restore production to wells with scale-plugged electrical submersible pumps (ESPs)—without inducing corrosion damage in the ESPs or formation damage in the reservoir.

SOLUTION

- Identify the major scale components with laboratory testing.
- Tailor an effective treatment using ScaleSOLV* carbonate scale dissolver.

RESULTS

- Permanently restored ESP-lifted production in 90% of treated wells.
- Saved USD 13 million across the field by eliminating workovers to pull scale-plugged ESPs and freed the workover rigs for more valuable services.
- Enabled oil production increment of 10.6 million bbl that would have been deferred while waiting for workovers.



Acid treatment damages ESPs and formation but does not dissolve scale

When ESP performance declined in a southern Iraq field earlier this year, analysis of ESP intake and discharge pressures indicated that scale was depositing in the ESPs. The problem was widespread in the field, where 35% of the daily production was from ESP-lifted wells. Workover rigs were assigned to replace the ESPs, but the problem rapidly resurfaced in the new ESPs.

To restore production, a third-party service company recommended removing the scale with a conventional hydrochloric acid (HCl) flush. After the acid was pumped in several wells, 27% of the ESPs were unable to restart. Furthermore, in the 64% of wells that did initially restart, the acid severely corroded ESP components, requiring subsequent workovers to replace the ESPs—and then the new ESPs failed again. In addition, leakoff from the HCl treatment reached the sensitive sandstone formation, resulting in permeability damage.

Although the field held great promise, the overall economics were compromised by workover costs and production deferrals for up to 6 months while waiting for rig availability. The problem was so severe across the field that the operator had to dedicate workover rigs to replacing ESPs rather than performing more valuable work.

Laboratory testing finds unusual scale—and a better solution

Schlumberger recommended a more thorough understanding of the problem to create an engineered solution. X-ray diffraction analysis of samples from a retrieved ESP determined that the scale was calcium sulfate (CaSO_4 or anhydrite), which is insoluble in HCl. An investigation into the source of this unusual scale also found that the third-party completion brine had a high sulfate content, which the

operator was able to curtail for subsequent wells with new quality assurance requirements.

The limited solubility of the scale required a targeted chemical treatment. Laboratory testing determined that nondamaging, chelating ScaleSOLV dissolver could efficiently eliminate the material, and then the engineers developed a plan to manage the formation impact.



After a third-party service company failed to remediate the scaling problem and damaged the ESPs, Schlumberger tested scale samples to understand the problem and create an engineered solution.

CASE STUDY: ScaleSOLV dissolver saves USD 13 million by eliminating ESP failures from unusual scale plugging, Iraq

Engineered treatment mitigates damage, eliminating workovers

For each well, the field team first spotted a viscous pill across the formation to retain the treatment fluid in the ESP and prevent potentially damaging fluid loss to the formation. The ScaleSOLV dissolver treatment was then spotted in batches to ensure a total of 12 h of contact time in the ESP. After the waiting time, the ESP was restarted to flow back the treatment fluid.

The engineered solution eliminated the plugging, restored production, and was repeated in affected wells across the field. In 90% of the plugged wells, ESPs were restarted immediately after treatment without additional workovers. In the remainder, the ESPs were too damaged to restart and had to be replaced.

The success saved the operator approximately USD 13 million on workovers and eliminated 10.6 million bbl of production deferral across the field.

ScaleSolv Dissolver Improves Well Economics

	Well Treatment	
	HCl	ScaleSOLV dissolver
Wells treated	15	65
ESPs that restarted after treatment	11	59
ESPs replaced after treatment (including ESPs with post-treatment corrosion damage)	15	6
Workover cost to replace failed ESPs, USD	3,300,000	1,320,000
Savings from eliminated workovers, USD	0	12,980,000
Deferred production while awaiting workovers, bbl	2,700,000	1,080,000
Production increment enabled by preventing deferral, bbl	0	10,620,000

The ScaleSOLV dissolver restored production in 90% of wells treated, saving the operator USD 13 million on workover costs and eliminating production deferrals of up to 6 months.

slb.com/stimulation