

CASE STUDY

CLEARWELL PROTECTS ROD PUMP OIL WELL AND DOWNHOLE EQUIPMENT FROM CALCITE SCALING.

LOCATION: Tunisia

APPLICATION: Rod Pump Oil Well



BEFORE CLEARWELL™

An oil and gas operator in Tunisia was experiencing a severe build-up of calcite scale in a rod pump oil well. The scale had been plugging the well's sand screen and affecting the pump, causing the downhole equipment to fail on average every three months.

Continuous injection of scale inhibitor was proving ineffective because scale was forming upstream of the injection line. The low water cut of the well also made it more difficult for chemicals to disperse fully within the water phase.

The operator's objective for this well was to reduce the use of chemicals and protect the sand screen and pump from failure, extending the run time from three to six months.

WELL ASSESSMENT

As part of our review process, we carried out an assessment of the candidate well. This included radio frequency signal and EMF modelling, plus scale prediction modelling to assess the scale risk of the well.

Saturation index (SI) and excess saturation (XS) can be used to estimate the potential amount of scale deposition. We predicted that there was a high risk of calcite deposition along the entire length of the well, particularly at the pump depth and wellhead. The table opposite shows excess saturation was approximately 450mg/l for calcite at the pump depth of 2110m.

Based on the water production rate, there was therefore a potential for 13kg of scale to form every three months at the sand screen.

Following our well assessment, we provided a treatment recommendation to the operator for a six-month trial to meet their objectives.

| AHD m | temp °F | press psi | pH | SI | | XS | |
|----------|------------|--------------|------|-------|--------|---------------|---------------|
| | | | | CaCO3 | BaSO4 | CaCO3 mg/L | BaSO4 mg/L |
| 5 | 112 | 50 | 6.33 | 1.875 | 0.31 | 508.1 | 3.5 |
| 35.9 | 113.5 | 64.7 | 6.23 | 1.784 | 0.299 | 500.6 | 3.4 |
| 97.8 | 116.4 | 98.2 | 6.08 | 1.643 | 0.277 | 487.4 | 3.2 |
| 159.7 | 119.4 | 139.6 | 5.95 | 1.528 | 0.255 | 474.9 | 3 |
| 221.6 | 122.4 | 187.6 | 5.84 | 1.435 | 0.233 | 463.6 | 2.8 |
| 283.5 | 125.3 | 240.7 | 5.75 | 1.358 | 0.212 | 453.3 | 2.6 |
| 345.4 | 128.3 | 297.4 | 5.68 | 1.294 | 0.191 | 444 | 2.4 |
| 407.2 | 131.2 | 356.5 | 5.61 | 1.24 | 0.171 | 435.6 | 2.2 |
| 469.1 | 134.2 | 417.6 | 5.55 | 1.191 | 0.151 | 427.6 | 2 |
| 531 | 137.2 | 480.7 | 5.5 | 1.146 | 0.131 | 419.8 | 1.8 |
| 2016.2 | 208.2 | 2084 | 5.5 | 1.351 | -0.226 | 452.3 | 0 |
| 2078.1 | 211.2 | 2150.5 | 5.5 | 1.362 | -0.237 | 454 | 0 |
| 2109 | 212.6 | 683.8 | 5.53 | 1.45 | -0.176 | 465.5 | 0 |
| 2128.5 | 213.6 | 703.5 | 5.52 | 1.439 | -0.179 | 464.1 | 0 |
| 2176.8 | 215.9 | 752.9 | 5.48 | 1.411 | -0.187 | 460.5 | 0 |
| 2234.3 | 218.6 | 812.5 | 5.44 | 1.379 | -0.197 | 456.2 | 0 |
| 2263 | 220 | 842.3 | 5.45 | 1.384 | -0.202 | 456.9 | 0 |
| 2263 | 220 | 1000 | 5.44 | 1.376 | -0.209 | 455.8 | 0 |

Table 1: Saturation index (SI) and excess saturation (XS) can be used to estimate the potential amount of scale deposition at different well depths.

AFTER CLEARWELL™

The ClearWELL™ unit was calibrated and installed at the wellhead with on-site testing to verify performance. Once installed, ongoing treatment of the well was monitored remotely via our secure satellite-enabled web portal.

After nearly six months of trouble-free production and excellent pump performance, the operator pulled the sand screen to inspect it for signs of scale. The photos overleaf demonstrate the outstanding performance of the ClearWELL™ technology, showing a sand screen that had been in the well for five months prior to using ClearWELL™ and one which had been in the well for the same period of time but operating under the protection of our technology.

The photos opposite show the calcite scale deposition on a sand screen after 5 months of operation in this well, **before** ClearWELL™ was installed (left) and a sand screen from the same well, 5 months **after** ClearWELL™ was installed (right).

Our ClearWELL™ technology effectively eliminated the scale deposition in this well and the need for remedial intervention to treat the scale and replace compromised downhole equipment.

OPEX was reduced and well performance was increased.

Based on these impressive results, the operator was satisfied that the trial had been a success and committed long-term to the use of the technology.



BEFORE CLEARWELL™



AFTER CLEARWELL™

QUICK FACTS

- Severe calcite scaling caused sand screen and pump failures requiring replacement, remedial intervention and production downtime every three months.
- Continuous injection of scale inhibitor could not reach the near-wellbore equipment, upstream of the injection line.
- ClearWELL™ eliminated scaling, the use of chemicals and the need for remedial well intervention.
- OPEX was significantly reduced and well performance was optimised.
- The operator is now a repeat customer after experiencing ClearWELL's benefits first-hand.

THE PROCESS

- The ClearWELL™ unit is connected to production equipment at the surface wellhead – no intervention required, no loss of production.
- The unit transmits a pulsed radio frequency signal down into the wellbore or along flowlines and equipment. The pulsed signal delivers energy to the scaling ions, controlling precipitation, keeping the liquid below saturation and minimising scale growth on production equipment.
- ClearWELL use satellite monitoring to ensure optimum unit performance. Where required personnel perform regular non-intrusive equipment checks.
- ClearWELL systems are low power consumption and supplied as a certified Class 1, Zone 1. The AC signal system is corrosion neutral, no reported gauge signal interference.