

Geothermal Plant Online Well Cleaning Increases Injectivity by 33%

NALCO Water
An Ecolab Company

CASE STUDY - POWER

CH-2169



BACKGROUND

Geothermal plants are designed to operate at optimal brine withdrawal rates from production wells and maximum reinjection rates to injection wells. Any flow restriction in the well systems can result in lost production and increased operating costs. Geothermal customers commonly experience mineral deposit formation throughout injection wells due to the harsh operating conditions within a geothermal plant such as high temperatures, brine solubility, and the presence of non-condensable gases. Nalco Water keeps wells flowing at optimal capacity by removing existing deposits using proprietary on-line/off-line deposit-removal strategies and by maintaining the cleanliness of the system with advanced scale-inhibition technologies.

SITUATION

For several years, a large geothermal customer experienced problems with scale deposits in the injection piping. The scale reduced flow in the injection wells, causing decreased brine flow and lower overall MW output. In the past, the scaling problem was resolved by shutting the well down for a coil tube cleaning, acid job, or mechanical cleaning with associated costs ranging from \$250,000 to \$1,000,000—depending on the equipment used and the duration of the job.

This customer's specific challenge was with silica deposits, as silica precipitates with decreased temperatures. At silica levels above 160 ppm, amorphous silica and iron silicate will form. These scales rapidly decrease flow and performance of

CUSTOMER IMPACT

eROISM

ECONOMIC RESULTS

Minimized well downtime and improved well productivity



\$30k productivity savings with online cleaning MW generation (14 days online generating 3MW @ \$30/MW)

Improved asset protection of multi-million dollar assets



\$57k savings/year through prolonging Mechanical Cleaning by 2 years

Improved cleaning methods



\$100k savings in lower cleaning costs than acid cleaning

Enhanced safety for employees handling cleaning products



Safer handling than hazardous HF or HCl cleaning

eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.

the injection wells, resulting in the need for more frequent well cleaning. Nalco Water provided an online well-cleaning solution to remove the flow-restricting deposits.

SOLUTION

Nalco Water collected and analyzed deposit samples from the injection well to determine their composition. Based on field knowledge and results obtained from the Nalco Water research laboratory, the team recommended a proprietary Nalco Water cleaning product to remove the iron silicate and amorphous silica-based scales. The product dissolves the deposit and complexes with it to keep it in solution and prevent redeposition in the system. The product also contains a surfactant to allow the solution to better penetrate the deposit for quicker dissolution. The product has been used to clean silica-based deposits in injection wells, evaporators, and heat exchangers, with great flow improvement performance.

The solution consisted of feeding the chemical at the inlet of the well head at approximately 20 ppm for 14 continuous days. The product was fed to achieve a pH of 4.5-5.0, with pH monitored at the outlet of the well head. The leading indicators for measuring the performance were flow rate and well head pressure, which Nalco Water representatives monitored onsite daily.



Picture 1&2: Target area to setup the containment basin, totes, pump, and tubing (left). Target area to inject the quill for the chemical application point (right).

The online cleaning successfully removed deposit and increased injectivity to the injection well. The final result was a 33% injectivity increase from 850 kph normalized flow to 1100 kph normalized flow. Not only was injectivity recovered, but the well was also kept online and productive throughout the treatment, with no disruption to energy generation.

Online cleaning of the injection well casing piping and well prevents shutdown and lost production. Online cleaning is more cost-effective than typical mechanical cleaning, coil tube cleaning or acid jobs. The Nalco Water cleaning product is a less corrosive product, and thus decreases damage to piping and equipment. In addition, the product is safer to handle than acids (HF and HCl) typically used for cleaning. Through on-line cleaning, the Nalco program lowers the overall total cost of operation and provides a solution that can restore performance at any time without requiring the wells to be taken off-line.

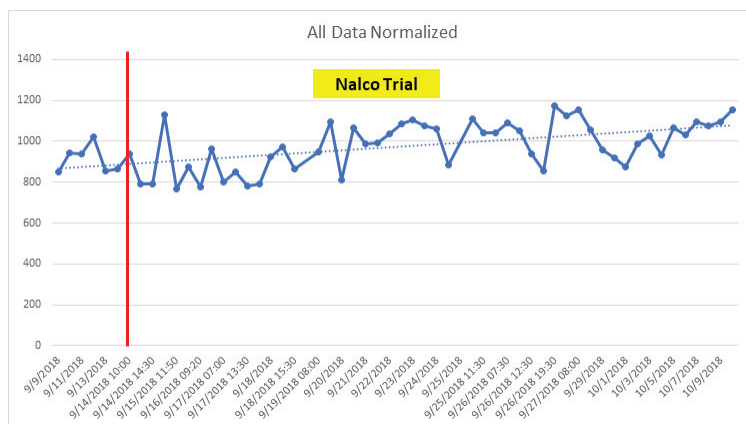


Figure 1: Normalized Injection Flow at customer site after Nalco Water Trial.

CONCLUSION

Nalco Water has developed an on-line chemical cleaning approach which avoids production interruption while effectively removing scale and deposits within the geothermal process, increasing process flow rates and increasing plant output and profits. This approach is also protective of process equipment with a safer, less corrosive product compared to conventional acid treatment.

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