

## **Innovative Fluid System for Dissolving Lead Scales in Geothermal Wells**

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Scale formation may decrease flow potential or injectivity of geothermal wells reducing project profitability. For premium results, remedial treatments as well as fluid recipes should be diverse and optimized according to the respective reservoir conditions. Nonetheless, it is often common practice to employ standard HCl-based solutions, even for persistent and more complex precipitates. This paper presents the development of an innovative fluid system specially customized for dissolving lead ( $Pb^{2+}$ ) scales and highlights its field trial in a geothermal well. The first component of this new fluid is a salt dissolved in water providing clay control and pH-adjustment. The second part is an organic acid, which shows low environmental impact. Lab research regarding the solubility of actual lead scale samples, the compatibility with elastomers and synthetic formation water, as well as the corrosion tendency of metal coupons preceded the first application. The following results were observed: In HCl, dissolved lead ions form  $PbCl_2$ -precipitates at lower temperature. In contrast,  $Pb^{2+}$  remains highly soluble in the new system rendering it most preferable for descaling purposes. This innovative fluid provides compatibility with elastomers and synthetic formation water. Additionally, it is extremely low corrosive. Chemical injection via tubing targeted eight different zones in the perforated liner section of the Bunter sandstone formation (TVD: 2500 m – 2600 m; BHT: 60 °C). In the course of the three treatment steps planned for this application, cup tools provided fluid separation and diversion. The superior chemical properties of this treatment fluid combined with an optimized pumping schedule resulted into a highly improved injectivity of the geothermal well. Laboratory and field results impressively manifested this innovative system as a supreme alternative to commonly used HCl-based solutions.