Geothermal Well Integrity and Prediction of Remaining Lifetime

WellPerform Aps

Once operational, the casing integrity of geothermal wells must be monitored to ensure original design life is safely achieved. This is particularly important where early warning signs indicate the well may not deliver its planned life and therefore not deliver its predicted economic return. Through advanced well engineering, WellPerform has developed a methodology for the prediction of the remaining lifetime in geothermal wells. This allows Operators to make informed decisions regarding the integrity of their wells, and implement cost-effective solutions to deliver overall business objectives.

The following points are key to developing the remaining lifetime model:

1. Allowable casing wear varies throughout the well: this depends upon the original well design and production factors, typically being higher at the top of each casing string, decreasing towards the shoe.

2. Corrosion rates are not uniform throughout the well: rates can vary significantly throughout the well, typically being lower at the bottom of the production well, gradually increasing towards surface, with a further increase in the injection well.

The remaining lifetime prediction model is based on quantification of these two points. The allowable casing wear is modelled for each individual section to provide the maximum allowable values over the full string. This is necessary since the forces in the well are not uniform; utilisation of a linear allowable wear coefficient gives misleading results – e.g. significantly more wear is typically allowable in the top of a casing string compared to the shoe.

Examination of the original log and all available re-log data is carried out to identify changes. It is often a challenge to correlate these accurately due to raw data error in terms of length and/or ID, and may require dynamic depth shift and/or ID calibration to correct. In addition, the number of caliper arms and/or logging increments can pose challenges where different parameters are used between logging runs.

Ultimately the WellPerform methodology compares the current state of the casing to the allowable casing wear. Corrosion rates over the length of the well are used to extrapolate the casing wear, thereby delivering the remaining lifetime of the well.

WellPerform can also support in cases involving localised pitting corrosion or areas of wear, as well as deformities/irregular geometries. Logging companies often highlight these areas but do not investigate the root causes, nor provide guidance regarding the need for corrective action. With our broad skill set in all aspects of well engineering, WellPerform are able to inform Clients if these are cause for concern and if so, provide cost-effective solutions to address.

This includes immediate actions, regulatory liaison, potential workover/well repair, corrosion inhibition system modifications and other information to assist our Clients in evaluation of what to do next.