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## CLEANING AND STIMULATION OF GEOTHERMAL WELLS

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### ABSTRACT

Mineral deposition (scaling) occurs in some geothermal wells that requires periodic cleaning. The deposition products are mainly of three types: calcium carbonate (calcite or aragonite), silicates and sulfides. The deposits accumulate over time inside the well casing but can also be deposited out in the formation. The main factors that contribute to the scaling is the onset of boiling and where the boiling front is, the temperature of the fluid and also if there is mixing of incompatible fluids. There are several ways of controlling the scaling such as how the wells are operated (e.g. wellhead pressure, WHP) the temperature of reinjected fluid and whether a chemical scale inhibitor is used or not. In some cases the most economical solution is simply to allow the scales to accumulate and then periodically ream the deposits with a drilling rig or by acid washing. This lecture will describe the reaming of calcite deposits from geothermal wells with a truck mounted rig and equipment developed in Iceland that allows the wells to flow during the workover operation. This reduces the thermal stress on the casing as the well does not have to be killed with cold water and the well can be online in a couple of days. Such cleaning operations have been carried out annually in Hveragerði Iceland, up to 40 times in a single well, where the original output is fully regained each time. There the calcite “plug” starts up in the cemented production casing and has run its course before the fluid reaches the wellhead. There are other methods to stimulate geothermal wells that have become partially clogged, based on hydraulic stimulation, acidizing, thermal cracking, jetting of screens and recently by slow burning explosives (deflagration). Such workover operations are mainly carried out on reinjection wells where the injectivity has declined due to scaling.

Workover cleaning operations by reaming are also made to repair casing damage. Such damage can usually be traced to wells drilled with improper practices or bad cementing jobs. Then the obstructing metal is reamed away with a junk mill, or the casing or liner is removed totally. There are cases where the production or original injection can not be recovered and then one option is to mill a window in the casing and drill a new sidetrack. In the worst possible case damaged wells will have to be plugged and abandoned. The lecture describes these cleaning and stimulation methods to the extent that those faced with declining performance of their wells will have an idea of what can be done.