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Baden Arena Kongress 1 – Tiefe Geothermie

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*Baden Arena Congress 1 – Deep Geothermal Energy*



## **New developments in scale and corrosion inhibitors for geothermal applications**

*Neue Entwicklungen bei Kesselstein- und Korrosionsinhibitoren für geothermische Anwendungen*

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Scale and corrosion inhibition is critical in operating effectively geothermal plants for power generation and heat production. Indeed, these phenomena are often responsible for loss of system efficiency and premature equipment failure or replacement. Scale is mainly related to the formation of insoluble inorganic salts like amorphous silica, calcite, barite and stibnite when temperature and pH conditions vary from reservoir. On the other hands, corrosion often happens due to high temperature and the presence of significant amount of chlorides in the liquid phase and CO<sub>2</sub> and H<sub>2</sub>S in the gas phase.

Among all the available methodologies that can be used to limit or avoid the side-effects of scale and corrosion, the use of inhibitors is probably the most cost-effective.

However, the development of proper inhibitors for geothermal plants is sometimes challenging due to the extremely high temperature impacting stability and compatibility with divalent cations and the use of other chemical that could negatively interact with the inhibitor.

In this work, two new developments are described. The first one is a NORMs inhibitor for a geothermal plant located in Europe. Although the facility is currently using two separate technics for controlling sulphate / sulfide deposition and corrosion issues, a manual hazardous (mostly due to the presence of NORMS) cleaning of the heat exchangers is required once a year. Scales have a significant impact on plant efficiency and power generation; therefore, it is necessary to develop a scale inhibitor with higher performance. Furthermore, this anti-scaling technology needs to be compatible with the current anti-corrosion agent. Therefore, both products would be injected close together before the heat exchanger where main scaling and corrosion issues are typically observed.

The second example is related to a novel corrosion inhibitor. Due to the high temperature, most of the film forming corrosion inhibitor can't be used as they rapidly degrade. In this work, to identify the most suitable solution, high temperature weight loss coupon test has been performed on several different technologies and the most promising was then evaluated under other different conditions. Also in this case, it is crucial check the interaction between scale and corrosion inhibitors.

For both, a detailed description of testing methodologies is provided and results are discussed and analyzed, highlighting improvements versus existing technologies and inhibitors.