

Germany

# GeoESP® Intake allowed operator to triple geothermal runtimes

Innovative inflow pattern, extended length and coatings, reduced scale and debris, contributing to potential reduction in input power costs of over 15%

## CHALLENGE

Scale buildup in geothermal operations can cause equipment damage and shorter run times, potentially costing up to €500,000

## SOLUTION

Innovative GeoESP Intake design features include:

- 5x increase in intake area over the standard intake design
- Perforated modular housing(s) with varying hole shapes and sizes to minimize internal pressure drop
- DuraHard® 3 non-stick coatings to repel buildup of scale
- Sturdy, corrosion-resistant stainless-steel housing

## RESULT

- Mitigation of scale buildup within the inlet base bushing
- Protect the pump from solids
- Avoid plugging conditions and flow rate drop due to sand, solids, or scale
- Intelevate tracked scale plugging, enabling proactive mitigation by the operator
- Successful field installations, tripling run life in some instances

## Overview

Scale formation poses a significant challenge in geothermal electric submersible pump (ESP) operations. If extreme or left unaddressed, scale buildup can damage equipment and shorten run life. This issue is particularly critical for ESPs with up to 450-m<sup>3</sup>/h flow rates.

## Challenge

A German operator experienced three ESP failures due to scale buildup, resulting in runtimes of less than 60 days. The scale formed at the base of the bushing caused the systems to seize up, resulting in broken shafts. As a result, the operator had to replace the damaged ESPs at a significant expense, which, for some operators, can reach up to €500k in pull expenses, equipment replacement, and downtime.

## Solution

Based on historical experience and thorough analysis, Summit ESP — A Halliburton Service created an innovative GeoESP Intake that significantly differs from traditional intakes used for decades.

By drawing inspiration from various industries, including medicine, engineers developed a design to mitigate extreme pressure differentials frequently encountered around the intake, which may partially contribute to scale formation.



GeoESP Intake modular design provides protection against solids and debris.

### Solution

This solution not only protects against solids but also can reduce power consumption.

GeoESP® Intake design features include:

- A screened housing protects against solids
- A longer intake section of approximately 2 to 3-ft versus the standard intake length of 2 to 3-in. yields a 5x increase in the intake area, reducing pressure differentials across the intake
- Unique hole pattern with multiple shapes and variable outer diameters (OD), ranging from 65 – 100% total aperture, reduces losses while generating a uniform velocity pattern across the inlet section
- DuraHard® 3 chemical and heat-resistant non-stick coating helps prevent the buildup of scale

### Result

Computational fluid dynamics (CFD) analysis reveals improved efficiency, with as much as a 70% reduction in pressure drop in some cases. This reduction can result in lower input power costs and a smaller carbon footprint. Monitoring through the Intelevate platform indicates an overall decrease in power consumption with the GeoESP® Intake. When the team detected the initial signs of scale formation, the operator received notifications to implement mitigation techniques.

In a well with a 125 L/s flow rate target, 123° C fluid temperature, 570 m intake depth, and previous scale plugging issues that led to failure, the implemented GeoESP Intake tripled the run time and reduced power consumption by 18%. When considering the potential expenses operators may incur—up to €500,000 per well for workover and equipment costs, downtime, and potential cost efficiency gains—the GeoESP Intake proves itself a welcome innovation for geothermal operators.

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