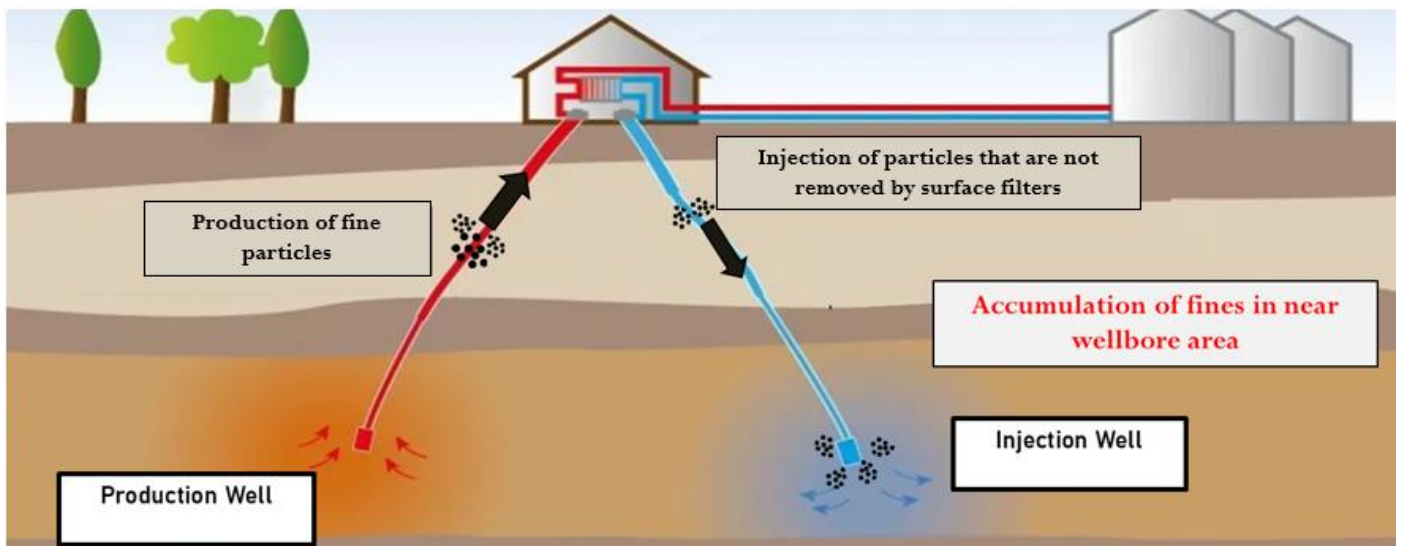


# POWELSAND

## Sand Control by polymers

**POWELTEC**

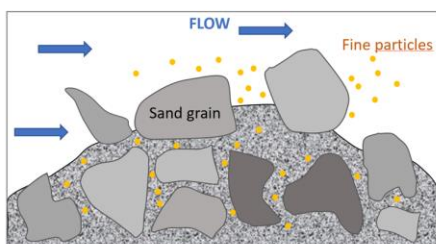


Geothermal technologies are part of the portfolio of renewable energies. Deep geothermal applications (depth > 500 m) using producer-injector doublets were developed since several decades to generate heat, cold or electricity. Geothermal developments made in sandstone reservoirs can face severe injectivity losses due to fine migration, which compromise the deliverability and the sustainability of these doublets. Actually, the fine particles produced at the production well are suspected to be one of the main origins of the observed injectivity loss. Current remediation techniques consist in reducing the cut-off size of the filters, and/or cleaning the injector on regular basis through backflow production periods at high flow rates. Although these approaches usually provide positive results, they do not guarantee a complete restoration of the injectivity of the well and do not induce long-term effects.

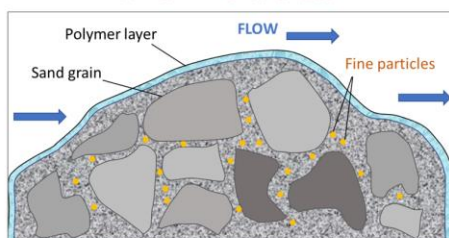
Powelsand treatment consists in injecting a water-soluble polymer which coats the surface of the rock by a thin gel-like adsorbed layer. The polymer film protects the rock from erosion and fine particles movements. The technology has been successfully applied in oil and gas wells and in gas storage wells, and is robust enough to withstand high flow rates in geothermal wells.

### Principle of Powelsand

#### Without Powelsand



#### With Powelsand



The technology is based on the adsorption of an «environmentally friendly» water-based polymeric film onto the pore walls, which can efficiently prevent the erosion of the cement of the rock under high flow rates.

POWELSAND™ polymers are specifically designed to stick onto the pore walls and prevent the erosion of the rock with almost no impact on oil or gas flow.

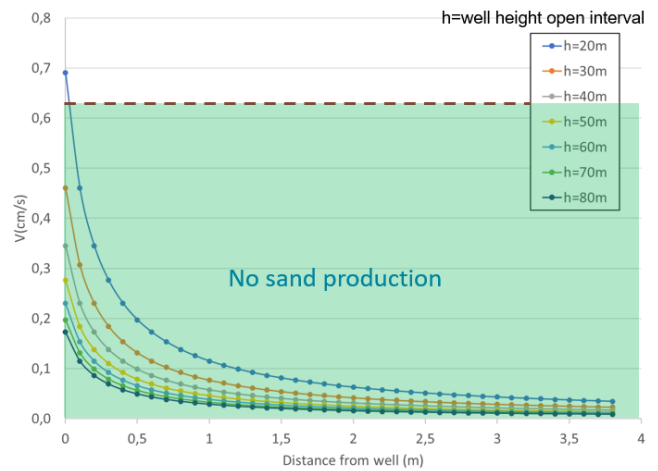
During the past 10 years, remarkable results have been obtained in the treatment of Underground Gas Storage wells. Treatment efficiency lasts at least 4 years, saving the cost of regular well interventions such as coil tubing sand cleaning jobs. Re-treatments have also been performed successfully.

## Treatment mechanism

On the contrary of resin-based sand control treatments which consist of the formation of solid material in the rock over 1-2 feet, POWELTEC technology is based on the formation of a soft polymeric film over a depth of 3 to 6 meters.

POWELSAND™ products can be bullheaded into the whole open interval of the well, without specific tools for placement. Powelsand™ can sustain high flow rates of injection and production wells for geothermal application.

*The risk of well impairment is minimized with permeability reduction not exceeding  $Rk = 1,5$*



## POWELSAND™ Applications

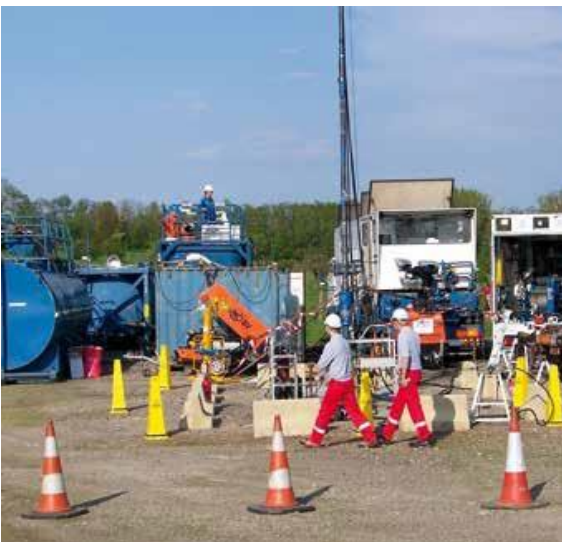
- Water injection wells
- Water production wells

### Powelsand specifications

Temperature (°C)	Up to 120
Salinity (g/l)	Up to 300
Permeability range (mD)	10 - 10 000
Shut in time after polymer injection (hours)	6
Regained permeability %	> 80 %

## Treatment design

Treatment design consists of laboratory flocculation tests to screen out the polymer having the highest adsorption on produced sand. A full range of product is already available that have been evaluated through flocculation tests and coreflood experiments. Injectivity, dynamic adsorption, mobility reduction and water return permeability are the main parameters to optimize.



## Product delivery and field assistance

POWELTEC delivers the products and sends a technical team to assist the operation manager, supervise the chemicals preparation and check the quality of the solutions prepared on site.

POWELTEC can also assist the operator in post-treatment monitoring.

### CONTACT

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**POWELTEC**

An Independent Service Company