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Deep geothermal energy

Super Duplex Rising Columns with Quick Couplings. Deep Geothermal Applications in the Dogger Aquifer, Île-de-France

Super-Duplex-Steigrohre mit Schnellkupplungen. Tiefengeothermische Anwendungen im Dogger-Aquifer, Île-de-France

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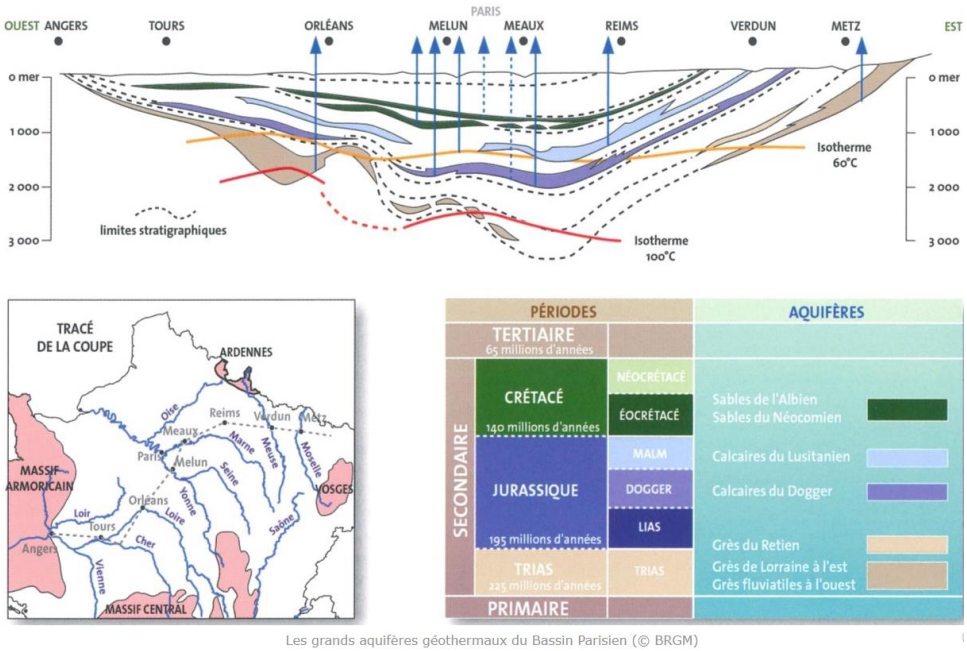
The decarbonization of energy systems has renewed interest in deep geothermal projects over the past decade. Operators seek innovative solutions to optimize resource exploitation while controlling costs. The use of Super Duplex rising columns with quick couplings in the Dogger aquifer addresses both corrosion and mechanical challenges while offering economic benefits through simplified maintenance.

The Dogger, a limestone aquifer located 1,500–2,000 m below the Paris region (Figure 1), delivers water at 60–80°C with high mineral content. Initially developed in the 1970s and expanded during the oil crises, its exploitation declined due to corrosion issues and falling oil prices. Following the 2008 environmental policy framework, the sector has since been revitalized, with more than 50 plants operating in 2025 and providing nearly 80% of France's geothermal heat production.



Les grands aquifères géothermaux du Bassin Parisien (© BRGM)

Figure 1 – Hydrogeologic setting of the Dogger geothermal basin

Geothermal doublets - comprising a production and an injection well - supply heat networks for residential, commercial, and public facilities.

Pumps and rising columns are critical to this process, as artesian pressure alone cannot sustain the required flow rates. These components face severe chemical and mechanical stresses, demanding regular pump maintenance and periodical well inspections. Corrosion resistance and efficient assembly and disassembly of rising column pipes are therefore key to cost control.

Initially, carbon steel polymer coating with threaded connection riser pipes were used, however, since 2016, Super Duplex stainless steel riser pipes equipped with quick-lock couplings have been used with success in Île-de-France for pumping water from the Dogger aquifer (Figure 2).

The Super Duplex alloy is a stainless steel of the austenitic-ferritic family. With far greater corrosion resistance than conventional austenitic grades such as 304 or 316L, it also offers superior mechanical properties (yield strength and tensile strength), making it an ideal material for rising columns exceeding 300 meters depth in corrosive water.

Furthermore, to mitigate the risk of galling commonly associated with stainless steel threaded connections, the Super Duplex columns are equipped with spline lock quick couplings. This proven connection, easy to assemble and disassemble reduces time of therefore cost of maintenance.

Figure 2 – Installation of DN175 diameter riser pipe

Compared to the traditional carbon steel polymer coating with threaded connection riser pipes solution, the Super Duplex spline lock quick couplings offers, for an equivalent initial cost, a high corrosion resistant, high strength and easy to assemble solution reducing maintenance cost resulting in reduced operational costs.