Temperature and Pressure Ratings of Javelin® and Dart™ Logging Tools

2025-05-07

Temperature rating

In 2025, Vista Clara developed an electronics-based solution to improve the temperature rating of all Javelin and Dart downhole NMR logging tools, enabling reliable operation at borehole temperatures up to 85°C. This technical advancement significantly broadens the range of applications for Javelin and Dart tools, allowing them to accurately estimate hydraulic properties of subsurface formations under more demanding thermal conditions. This development supports stable performance in geothermal projects targeting shallow subsurface investigations, deep mining operations, and the evaluation of thermal energy storage systems.

Figure 1 below shows a heating experiment conducted on a Javelin Micro JPZ175D probe placed inside a custom-made oven. Silicon bags filled with vegetable oil were positioned around the sensitive zones of the NMR logging probe. NMR measurements were conducted while heating the probe to >100°C. Temperature along the length of the probe was monitored using electrodes positioned along its body.

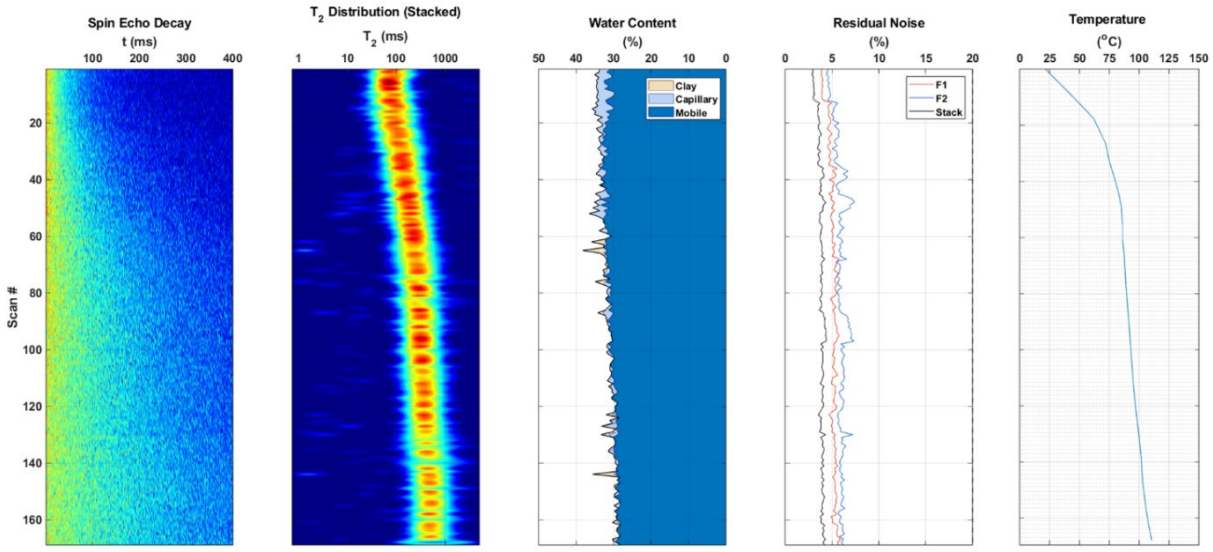

Figure 1. NMR monitoring results during heating of a JPZ175D probe.

This experiment reveals an expected decrease in NMR signal amplitude (e.g., decrease in total estimated water content) with increasing temperatures due to the inverse dependence of NMR magnetization and absolute temperature. The experiment also indicates an increase in T2 relaxation time with increasing temperatures, which is also expected due to the change in viscosity of vegetable oil at higher temperatures.

Pressure rating

The pressure ratings of Javelin probes range from 830 to 2,350 PSI, allowing for deployment in producing wells up to 1,600 meters (5,200 feet). These ratings were determined by experimentally measuring the collapse pressure of the fiberglass housing and then applying a safety factor of 2.0. The collapse pressure was measured by gradually increasing external pressure within a pressure chamber while continuously monitoring the structural integrity of the fiberglass tube until failure occurred.

Figure 2 shows test results in which the Javelin housing was tested to failure within the test pressure vessel. In this test failure occurred at ~ 6,300 PSI.

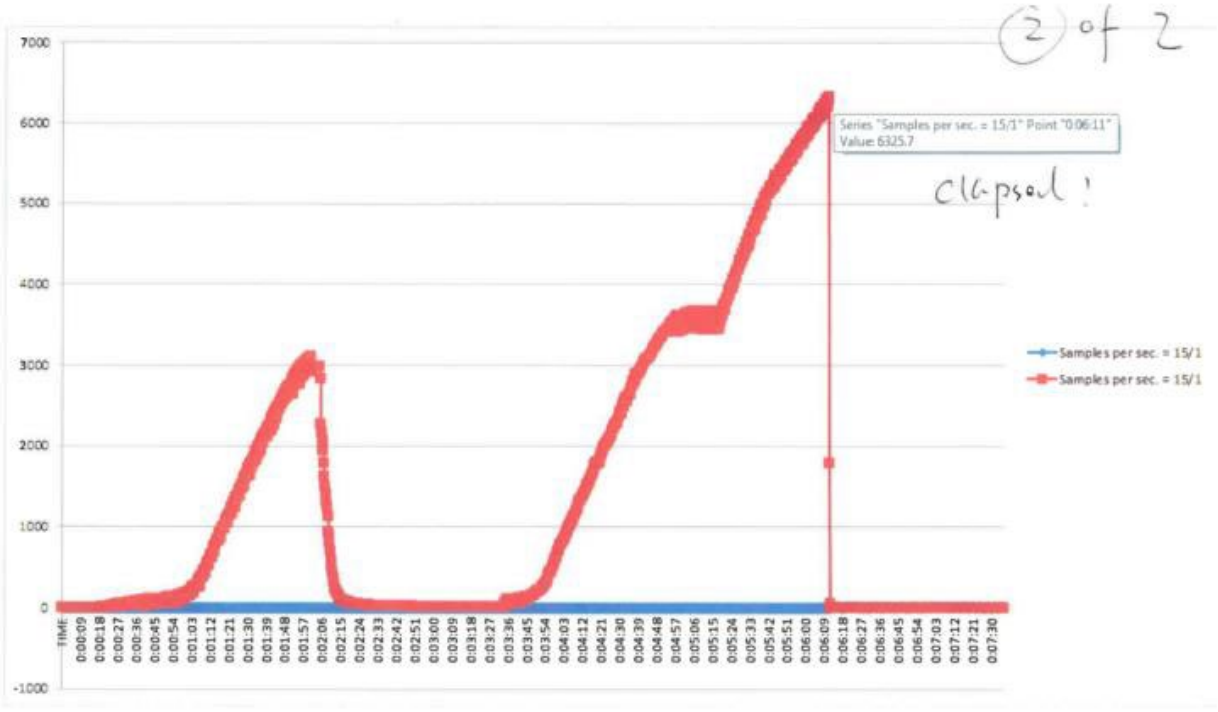

Figure 3 below shows an example of fiberglass housing of a Javelin JPX350N probe after collapse at the conclusion of the test.

Figure 3. A sacrificial Javelin fiberglass housing after destructive pressure testing.

Conclusion

Maximum temperature and pressure ratings for Javelin and Dart tools have been established through rigorous, instrumented physical testing, and our published temperature and pressure ratings are based on conservative interpretations of all available data. This rigorous and conservative approach ensures reliable and stable system operation and performance throughout the expected operating environments.