"ADIABATIC" TEMPERATURE CHANGES IN AN OIL-FILLED CAVERN

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SUMMARY

Brine warming in a closed cavern generates an increase in brine pressure by approximately 1MPa per °C (80 psi per °F). The inverse also is true: An increase in pressure of any cavern liquid generates instantaneous warming of the liquid followed by gradual cooling, though the cooling starts off quickly for the first couple of weeks. This effect especially is significant in an oil-filled cavern, where a temperature increase of 0.2 °C per MPa (0.26 °F per 100 psi) is typical. In-situ tightness tests performed in an oil storage facility should take this effect into account when a comprehensive interpretation is needed. In this paper, the thermodynamic equations are discussed and an in-situ test performed at the Manosque oil storage, including continuous monitoring of downhole tubing pressure and temperature, is presented as an illustration of this phenomenon.