Dynamic characterization of fractured carbonates at the Hontomín CO₂ storage site

Y. Le Gallo¹, I.C. de Dios², J. Salvador³, T. Acosta-Carballeira³
¹Geogreen (France), ²CIUDEN (Spain), ³Geostock (France)

Abstract

The geological storage of CO₂ is investigated at the Technology Development Plant (TDP) at Hontomín (Burgos, Spain) into a deep saline aquifer, formed by fractured carbonates with poor matrix porosity. During the hydraulic characterization tests, 2300 tons of liquid CO₂ and 14000 m³ of synthetic brine were co-injected on site in various sequences to determine the pressure and temperature responses of the facture network.

The pressure and temperature responses of the storage formation were history-matched mainly through the petrophysical and geometrical characteristics of the facture network. This dynamic characterization of the fracture network controls the CO₂ migration while the matrix does not appear to significantly contribute to the storage capacity. Consequently, the hydrodynamic behavior of the aquifer is one of the main challenges of the modeling workflow.

Objectives

1) Demonstrate the CO₂ injection potential of the Hontomín pilot in fractured carbonates with poor matrix porosity;
2) Estimate the hydraulic characteristics of the formation;
3) History matched the field response to forecast the CO₂ and pressure potential footprints of the pilot

Liquid CO₂ Injection

Injection conducted according transport conditions "OXYCFB300 Project"

CIUDEN National Patent nº201500151

Tubing choke installed at 1000 m depth to avoid high bottom hole overpressure

Hydraulic characterization of the Sopeña formation

Water injection to determine the transmissivities (K*h) of Limestone and Dolomite formations

Dynamic Characterization

The 3-D model of the injection zone was elaborated assuming homogenous characteristics for the Limestone and Dolomite formation. Two scenarios of boundary conditions are investigated depending on the hydraulic connectivity of the aquifer

Conclusions

1. The liquid CO₂ injection was performed at Hontomín TDP plant despite the low initial transmissivity of the fractured carbonate formation.
2. During the hydraulic tests, the transmissivity improved as more and more fractures were in hydraulic communication with the injection well.
3. The dual medium model satisfactorily matches the field measurements despite for the two scenario investigated for the aquifer extension and hydraulic connectivity.

Several parameters are still not clearly determine and further investigations are required