

AAPG HEDBERG CONFERENCE
“APPLICATIONS OF RESERVOIR FLUID GEOCHEMISTRY”
JUNE 8-11, 2010 – VAIL, COLORADO

Origin of the Gypsum in Production Wells in New Mexico

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Between 1989 and 1995 approximately 42 BCF of CO₂ gas was injected into the Grayburg and San Andres formation in order to improve production. The MCA 387H produced for 3 years and was eventually shut-down due to its declining production. In 2007 the well was re-entered to run an image log. During the clean up of the wells it became obvious that the well was completely plugged in with gypsum crystals.

In order to understand the water-rock interaction processes that have taken place in the MCA field, groundwaters from the 393, 295, and 407 wells were analyzed using Nethpath and the Geochemist workbench. The results from the geochemical analyses revealed that all the waters are oversaturated with respect to gypsum, anhydrite, calcite, and pyrite. The oversaturation with respect to gypsum can be observed in figure 1. The degree of oversaturation with respect to gypsum for well 393 increases from January to March and subsequently decreases from April to December. Additionally, the concentration of the groundwaters decreases as the saturation with respect to gypsum increases suggesting that gypsum is precipitating out of solution.

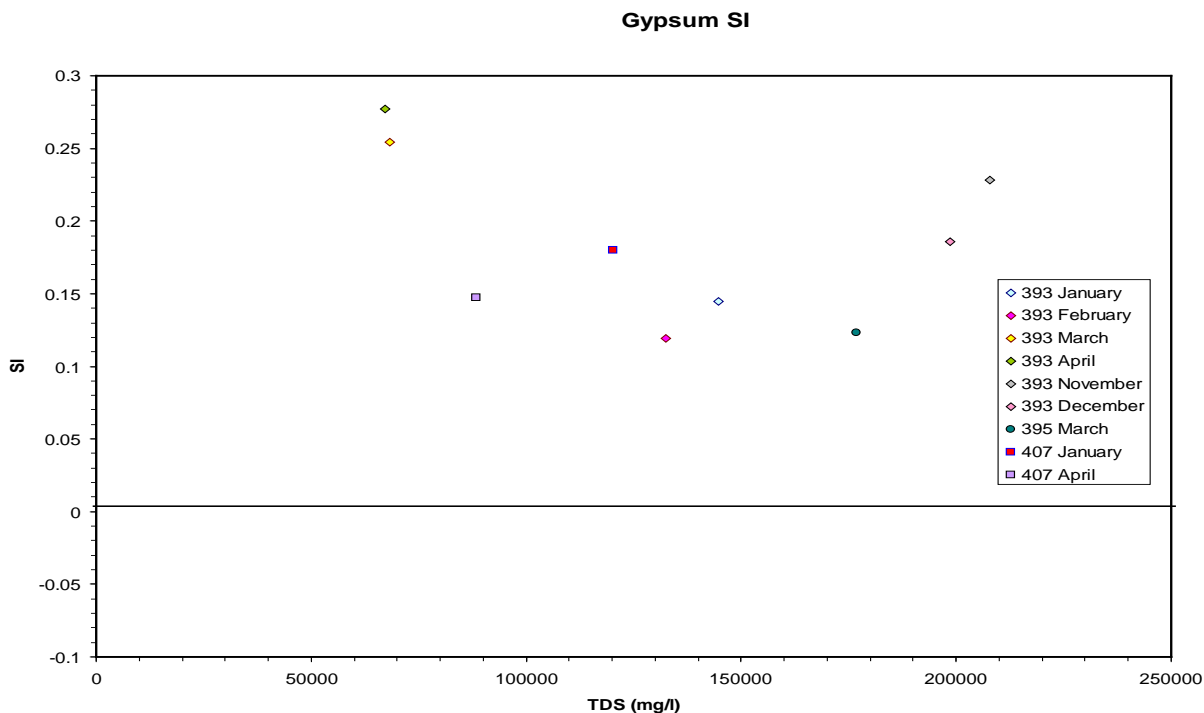


Fig. 1 Plot of saturation state vs total dissolved solids for wells in the MCA field.

The two main chemical reactions controlling the precipitation/dissolution of these minerals are dolomitization and gypsum precipitation/anhydrite dissolution. These processes are controlled by the concentration of the chemical species in solution, the temperature and pressure of the reservoir. Studies from the Vacuum East revealed also that calcium sulfate scaling was occurring in the wells.