Gas Injection trial for Gas storage Potential – Bonanza CSG Field
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Simulation model input
Initial Pressure 647 Psia
and gas content of 210 scf/ton
is used from the analytical
model (The Plot on the left end)

Initialization and History Matching
The figure in the centre shows initial
pressure distribution before gas injection
commenced at the Argyle coal seams.
Field gas production rate from observed
data was used to validate the model
and the plot presented on the right
showing a good match.

Analytical model Plot
Gas Injection Point Plot (see figure 2)

Field data
The figure on the lower left shows
simulated and measured
pressures from Gas Injector
Gas Injector rate 20000 SCF/D is maintained
to the gas injector
End of 10 days gas injection, CH4 adsorbed
around gas injector
End of 10 days gas injection, CD4 released
 injection (plot on the right)

Simulation model with CH4 as main injected gas and CD4 as a tracer to determine how much CH4 gas re-adsorbed in the coal seams
as result of 20 MMSCF of gas injected into 3.1 m net coal seam.

Simulation model was built using BUILDER with 150 m grid size for global cells and 50 m for wells around the gas injector for more accurate modelling
of saturation and pressure changes during and after gas injection. Gas injection pressure was constrained to 2000 psia which is threshold pressure of fracturing and cap rock. However, in actual gas injection case, only gas injection rate of 20 MMSCF/D was attempted to achieve 20 MMSCF of cumulative gas injected into a target coal seam during 10 days.

Simulation model used CH4 as main injected gas and CD4 as a tracer to determine how much adsorption changes around wellbore of Gas Injector. The model was built with appropriate coal properties (1-3% porosity, 180 mD permeability) using GEM package to include PVT properties of CH4 and desorption data (Isotherms, Diffusion etc.)

The simulation results presented here are considered most important and appropriate to understanding gas injection trial results since not all results can be presented here, these are selected slides to present the gas injection trial results on one target coal seam (~3m) for 2 MMSCF/D continuous gas injection for 10 days.

Increased gas adsorption around the wellbore of GI is observed
Injection CH4 into corendum much faster than the model anticipated due to large fracture along maximum stress direction of 12 degrees N.

Two types of tracers (CD4 and SF6) were utilized to track injected methane movement as well as re-adsorbed methane to coal seams during injection process which is the main purpose of the pilot project to assess the potential of using depleted coal seams as a gas storage place in case of producing gas were not needed for LNG plant at a time (Ramp up production for 2nd LNG train before actual delivery date for example).