SPE 123788 CO2 Injection into Depleted Gas Reservoirs

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This paper presents the challenges associated with modelling CO2 injection into depleted reservoirs and the application of IPM in planning CO2 injection into depleted reservoirs.

An IPM model was built for CO2 injection into the UK southern North Sea depleted gas field. This allowed various scenarios to be run as well as capturing the CO2 behaviour issues. The tools in use were:

- PVTP to characterise reservoir fluids and CO2
- REVEAL to model the reservoir
- PROSPER to model the well performance
- GAP to model the injection system
- RESOLVE as the overall controller and integrator

PROJECT OBJECTIVES:

1. Understand CO2 injectivity and storage potential of the asset
2. Identify any additions or modifications required to the existing infrastructures for C02 service
3. Test different injection scenarios to maintain the plateau injection rate governed by the CO2 delivery schedule
4. Understand what operational issues might pertain, particularly during the early period of injection

CONCLUSION:

1. A dynamically linked system is essential to the modelling of dense phase CO2 injection into a depleted gas field. Capturing the delivery pipeline through the injection facility and wells to reservoir allows the full system to analysed providing reliable results as well as the benefits and constraints in the system being more evident.
2. The IPM approach provides a toolkit and workflow to help understand some of the flow assurance problems and potential operational issues related to injecting CO2 into a depleted gas field.
3. The philosophy of applying an integrated modelling package and the capability of the software were key tools in evaluating the CO2 storage asset. This approach provides essential information concerning the maintenance of the plateau injection rate governed by the CO2 delivery schedule.
4. The thermal 3D numerical simulator, REVEAL, was used to link the behaviour of the wells and surface network to achieve far more detailed data regarding the reservoir itself such as the CO2 saturation over time or possible under-used or non-contacted pore space. These results could then be easily and effectively communicated to the project stakeholders.