

Hydrodynamic Techniques to Assess Production-Induced Pressure Depletion and Aquifer Support

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Reservoir pressure decline within producing fields is often observed and accounted for in reservoir models. What is more difficult to detect are wells outside of the field but connected via the aquifer and being influenced by the production within the field. Aquifers are not infinite and in many cases the rate of recharge is not sufficient to maintain the original formation pressures as the volume of fluid removed increases. In addition, the virgin state of any compacting or mature sedimentary basin is unlikely to be hydrostatic and there may be significant hydraulic variation depending on the evolution of the basin. Only when this has been considered is it reasonable to attempt to quantify which pressure observations have been induced and which are part of the natural system.

A hydrodynamic approach to assessing the pre-production state of the sub-basin accounts for the natural variation of the flow system and serves as a calibration point for identifying and quantifying the long term effects of hydrocarbon production. As the basin matures and more fields are developed the risk of lost reserves or miscalculated recovery increases, particularly when there is a time lapse between discovery and the development of fields with separate accumulations, but supported via a single aquifer.

These are many areas within Australia, both onshore and offshore, where significant pressure depletion has been observed. The hydrodynamic approach to quantifying these effects can provide clear boundaries within which to judge observed pressure measurements and provide a basis for future management.