Evidence for Reservoir Compartmentalisation by Pressure-Sensitive Fractures in the Cretaceous Second White Specks Formation, Western Alberta

Roland G. Dechesne*
Canadian Natural Resources Limited
2500, 855-2 Street S.W. Calgary, Alberta, T2P 4J8
RolandD@cnrl.com

Calcareous oil prone source beds of the Cretaceous Second White Specks Formation form a series of fractured oil reservoirs some 30 to 60 km east of the Foothills frontal structures. Second White Specks oil reservoirs lie within the domain of low-relief thrusts discussed by Skuce *et al.* (1992), Skuce (1994) and Dechesne (1994). Second White Specks fracture development most likely occurred during the formation of these thrusts.

Core examination and analyses indicate that the reservoir consists of calcareous, organic-rich shales, siltstones and fine-grained sandstones with little or no porosity. In most pools, production occurs entirely from fractured intervals. This reservoir is thus truly a fracture reservoir; most other reservoirs referred to as “fractured” are more properly characterised as fracture-enhanced.

Production histories of these wells point to formation fluid pressure control on fracture aperture, with clear evidence for fracture closure during reservoir depletion. Production cycling indicates that some key fractures can be reopened by pressure re-equilibration during well shut-in periods. Other cases show hysteresis where key fractures, once closed by pressure drawdown, do not reopen during shut-in.

As fractures close during production and pressure drawdown, the reservoir is compartmentalised into a series of subpools cut off from the wellbore. In effect, the remaining reserves shrink faster than the production volumes grow. Steep initial production declines normally ascribed to “flush” production from large, nearby fractures might, instead, reflect a rapid down-sizing of the connected reservoir as pressure-sensitive fractures close. Production practices such as pumping may exacerbate this problem by increasing pressure drawdown in the near-wellbore environment.

REFERENCES

Dechesne, R.G. 1994. Blind bedding-plane décollements in the Lower Cretaceous Second White Speckled Shales and their relationship to the triangle zone (Abstract). Canadian Society of Exploration Geophysicists / Canadian Society of Petroleum Geologists, Joint National Convention, Program, Expanded Abstracts and Biographies, p. 211-212.

Skuce, A.G. 1994. Blind duplexes under the foreland basin and the nature of the triangle zone upper detachment in west-central Alberta (Abstract). Canadian Society of Exploration Geophysicists / Canadian Society of Petroleum Geologists, Joint National Convention, Program, Expanded Abstracts and Biographies, p. 145.

Skuce, A.G., Goody, N.P. and Maloney, J. 1992. Passive-roof duplexes under the Rocky Mountain foreland basin, Alberta. The American Association of Petroleum Geologists, Bulletin, v. 76, p. 67-80.