



Outcrop-based reservoir geology – Ardennes (Belgium) Introductory level

Course format: field seminar

Trainer: Dr. W.J.E. van de Graaff

Evert van de Graaff was awarded his Ph.D. in sedimentary geology by Leiden University in 1971. He worked as a field geologist on sedimentary basin studies in Australia till 1978. After joining Shell in 1978 he held operational assignments as reservoir geologist / production geologist / petroleum engineering team leader with Brunei Shell Petroleum, Shell Expro and the NAM (Shell's Dutch operating company). Whilst based in Shell's headquarters in The Hague he worked on a wide range of reservoir characterisation / modelling projects covering both clastic and carbonate reservoirs in many parts of the world (North Sea, South America, Africa, Middle East, Far East, Australasia). Following a 5-year stint as senior lecturer in Geosciences at Shell's EP training department he was senior technical advisor /team leader for static reservoir modelling technology. In this capacity he also carried out numerous QC reviews on the subsurface aspects (including reserves estimates) of field development plans and A & D opportunities. After retiring from Shell in 2003 he started his own consultancy in parallel with working ad hoc for PanTerra.

Business Context

Static reservoir models are the starting point for all subsurface volumetric estimates and for field development planning. To build fit-for-purpose static models requires integration of the available geological, geophysical, petrophysical and reservoir engineering information as well as a clear statement of the business decision for which the reservoir model is to be used. For example: is it a gas field or an oil field that is to be developed, or in the case of an oil field development will water injection be required or is significant aquifer drive to be expected.

Key in this is the ability to integrate reservoir data acquired at different spatial scales (e.g. low resolution seismic data vs high resolution log or core data), as well as a good understanding of the technical limitations of different data sources (e.g. a gamma ray [GR] log does not reliably differentiate reservoir from non-reservoir if the reservoir sands contain radioactive minerals). Vital in the model building process is the identification of relevant geological analogue data to guide the interpretation of geophysical, petrophysical and reservoir engineering data.

This field course will provide participants with an awareness of how reservoir heterogeneity impacts on recovery mechanisms and the strengths and weaknesses of various data sources such as cores, logs, seismic, and well tests.

Course content

- Verifying the depositional setting of outcropping reservoir analogues
- Identifying key reservoir features in an analogue and how these impact recovery mechanisms
- Evaluating limitations of different data sources (cores / logs / seismic / well tests)
- Identifying key uncertainties in the analogue model
- Assessing optimum well positions and trajectories for a given analogue
- Volumetric estimation and notional reservoir development strategies

Outcrop analogues include unconsolidated Tertiary sandstones, low porosity Devonian sandstones, low porosity Devonian carbonates and karstified carbonates. The Devonian sandstones and carbonates are also good analogues for fractured reservoirs.

Learning objectives

This introductory level course is outcrop based and a variety of well-exposed reservoir analogues of both clastics and carbonates are visited. At each outcrop the course participants are presented with a structured set of questions that conceptually guides them through the process of gathering reservoir data, interpreting the various data sources, and identifying key uncertainties in the data set. Last but not least they will predict how reservoir heterogeneity is likely to impact on different recovery mechanisms.

Duration & location

Three days. Depending on the size of the class, transport will be arranged by car or by coach and overnight stay will be in a hotel in the Namur area.