

Connectivity, Rock Typing and Well Performance prediction for fluvial and fluvio-deltaic reservoirs: The Upper Carboniferous Reservoirs of NW Europe

A. Moscariello^{1,2}, E. Guasti¹, T. van Hoof¹, G. Kunakbayeva¹, J. ten Veen¹, F. van den Belt³, H. Williams⁴

1: TNO, Princetonlaan 6, 3564 CB, Utrecht, The Netherlands

2: Earth and Environmental Sciences, University of Geneva, Rue des Maraichers 13, CH-1205 Geneva, Switzerland

3: Vandebelt Consulting, Timmermeesterslaan 24, 8014 EL Zwolle

4: Reservoir Geology Consultant, Plas Newydd, Nant-y-Bai, Rhandirmwyn, Carmarthenshire, SA20 0PB, UK

Production efficiency from deep Carboniferous gas reservoir is largely controlled by understanding reservoir properties distribution and sand connectivity in a relative low net:gross environment. After more than 50 years of production, this play still mature represents a key target for further exploration and near field appraisal. Therefore developing a simple predictive model to assist the location and characterisation of reservoir quality and connected net-volumes is both of primary importance and challenging due to complex facies heterogeneity, internal reservoir architecture and diagenetic history. Past studies on fields developed in similar fluvial and fluvio-deltaic geological settings indicate that after few years from the start of production a large discrepancy between predicted vs. actual connected hydrocarbons is often observed (e.g. Schooner field, Brent field).

This project aims to develop a working method for defining the criteria to assess and predict connectivity and reservoir properties through the deployment of high-resolution geological 3D models of Carboniferous reservoirs.

Our approach consists of 4 major components:

- High-resolution reservoir correlation, sequence stratigraphic framework and 3D modelling based on outcrop analogues.
- Rock Typing on core and cuttings using high-resolution automatic petrography technology (QEMSCAN).
- Eco-grouping: vertical stacking of bio-facies can help in predicting lateral occurrence of channel belts.
- Integration and validation using production dynamic data

We test our approach in a number of fields in the Southern North Sea, and we compare our model to analogue outcrops from Eastern Kentucky (USA). This will enable focus on the understating of Carboniferous reservoir systems, to propose a predictive tool to drive the 3D reservoir modelling and to optimise production performance and locate potential undeveloped reserves. This approach can be applied to any fluvio-deltaic systems, and will have high potential to understand similar depositional system in North Africa and Middle East.