Evesham Field West Central Saskatchewan, Canada
Plurigaussian Lithofacies Modelling of the Sparky Member, Lower Cretaceous Mannville Group

Anthony S. Wain

ABSTRACT

A partial data set was provided for a geostatistical study of the Lower Cretaceous clastic reservoir of the Evesham field in West Central Saskatchewan. The study was conducted as a thesis towards a diploma in geostatistics (CFSG) at the Centre Geostatistique, Ecole des Mines de Paris, France.

The field is a complex stratigraphic trap comprising several discrete pools hosted in thin estuarine sands of the lower Cretaceous, Sparky Formation. Facies flags were used to define a zone of interest (ZOI) about 18m thick and to generate a reservoir simulation volume. Bounding surfaces and well data were analysed using ISATIS^{TM} geostatistical software. Errors between well tops and surfaces were corrected by kriging the well data with the surfaces used as an external drift function.

Facies models were developed from a preliminary study of 135m of core. Facies were interpreted to reflect deposition under estuarine to fluviatile conditions and a possible modern day analogue having a similar size and spatial facies distribution was proposed from the Tillamook Bay Estuary in Oregon, USA. Preliminary mapping implied the existence of channel systems or facies belts that trended approximately NNW-SSE and it was thought that these facies belts migrated eastwards (landwards) with time above an intra-Sparky flooding event.

The depositional models provided an “a priori” deterministic foundation to the geostatisitical study. However, final simulation results only partly concurred with the “a priori” concepts. A coherent, albeit more complex model, emerged in which a distinct depositional shift, but not necessarily a flooding event, was shown to exist in the upper part of the simulation volume.

The top Sparky Coal was used as the reference horizon for all simulation work. Other coals within the Sparky Sand interval were considered to be discontinuous and their chronostratigraphic significance was poorly understood prior to the geostatistical simulation results. The simulation results show that, whilst slightly diachronous, the discontinuous, intra-Sparky coals are time restricted and can be considered a further reference level within the simulation volume. The spatial distribution of the intra-Sparky coals is now

better understood and this contributes significantly to our understanding of the paleogeography of the Sparky depositional system.

A truncated, plurigaussian simulation, using HERESIM™ reservoir modelling software, was used to model lithotype variability within the reservoir volume. Three simulations were run. The final simulation used a combined exponential and gaussian model input. This successfully modelled facies variation particularly at the intra-Sparky coal level. The simulation results indicate certain areas may be favourable for further development.