Petroleum Technology Transfer Council
APPALACHIAN BASIN

Heterogeneity of Fluvial-Deltaic Reservoirs in the Appalachian Basin: A Case Study from a Lower Mississippian Oil Field in Central West Virginia

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ABSTRACT :

Since discovery in 1924, Granny Creek field in central West Virginia has experienced several periods of renewed drilling for oil in a fluvial-deltaic sandstone in the Lower Mississippian Price Formation. Depositional and diagenetic features leading to reservoir heterogeneity include highly variable grain size, thin shale and siltstone beds, and zones containing large quantities of calcite, siderite, or quartz cement.

Electrofacies defined through cluster analysis of wireline log responses corresponded approximately

to facics observed in core. Three-dimensional models of porosity computed from density logs showed that zones of relatively high porosity were discontinuous across the field. The regression of core permeability on core porosity is statistically significant, and differs for each electrofacies. Zones of high permeability estimated from porosity and electrofacies tend to be discontinuous and aligned roughly north-south.

Cumulative oil production varies considerably between adjacent wells, and corresponds very poorly with trends in porosity and permeability. Original oil in place, estimated for each well from reservoir thickness, porosity, water saturation, and an assumed value for drainage radius, is highly variable in the southern part of the field, which is characterized by relatively complex interfingering of electrofacies and similar variability in porosity and permeability.

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