FLOW CHARACTERISTICS OF THE NANUSHUK GROUP AT UMIAT FIELD

Obioma, Levi-johnson [1]

[1]Department of Petroleum Engineering, P. O. Box 750438, UAF Fairbanks AK 99775

Umiat field is situated in the folded and thrust faulted Cretaceous sedimentary rocks at the leading edge of the Brooks Range foothills of northern Alaska. It is close to the eastern boundary of the Naval Petroleum Reserve Alaska No 4.The Umiat anticline, 10 miles long and 3 miles wide was tested with 11 wells; 6 produced light oil in varying quantities with the main oil reservoirs less than 1,000 feet deep and in permafrost. The main oil producing zones in the Umiat field are sandstones in the Grandstand Formation of the Cretaceous Nanushuk group. The uppermost sandstone bed in the Grandstand Formation has an average thickness of 88 feet thick with good porosity and is separated from the lower sandstone by 300 feet or more of gray shale. The lower sandstone has a much thicker average of 198 feet but only the top 100 feet of the lower sand has good porosity.

Statistical analyses of the porosity and permeability of the upper and lower sandstones indicate that the sands have distinct statistical characteristics. The upper sand had a porosity range of 5%-20.4% and permeability range of 0.1md-480md, while the lower sand had a porosity range of 7.6% to 23.8% and permeability range of 0.1md - 400md. Both sandstones show a 100% probability of having porosities greater than or equal to 5%.The permeability of the sandstones is quite poor with 77% of the upper sand and 57% of the lower sand exhibiting permeabilities less than 50 millidarcies.

A plot of cumulative flow capacity versus cumulative storage capacity (aka Modified Lorenz plot) was used to define flow characteristics of the upper and lower sands in Umiat #9. The upper sand exhibited a good flow at the top of the sand. This however graded into a significant flow barrier with depth. The lower sandstone is more heterogeneous with 4 flow units with differing flow capacities at the top of the sand and a flow barrier at the base. The observed heterogeneities can be correlated with interbedded clay stones, clay shale and large quantities of siltstone observed in conventional core of the interval.

In the future, this information will be incorporated into a geologic model of the Umiat reservoir that will then be up-scaled into a reservoir model to test various methods of producing this light oil from the shallow, low pressure and frozen reservoir at Umiat field.