Oil Quality and Distribution in the Western Canadian Sedimentary Basin – A Hydrogeologist's Viewpoint

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Oil quality is highly variable in the Western Canada Sedimentary Basin (WCSD). The quality and distribution of oils in the WCSB is controlled by many different factors.

Maps of geochemical composition: oil API gravity, viscosity and sulphur content will be compared with hydrogeological maps of: freshwater head and water salinity for selected reservoir formations. Using this information potential controls on oil quality variations in selected areas will be examined. Examples will be chosen to demonstrate the various hydrogeologic controls.

From a hydrogeologist's perspective, degradation processes such as water washing, biodegradation and sulphurization are of particular interest, because they are strongly dependent on water chemistry and water flow patterns and may have significant control on local scale variations. Regional scale oil quality variations are controlled by source rock character, by differential migration distances and pathways and by regional scale hydrodynamics.

Water washing, the dissolution of light ends in an oil, requires exposure to large volumes of formation water because hydrocarbon solubilities are low. Water washing can occur during long distance secondary migration or else active water flow through the reservoir is required for the in-place alteration of an oil pool. Biodegradation requires the transportation of both bacteria and dissolved oxygen or sulphate into a formation which commonly occurs in shall meteoric water recharge areas.

Local scale examples will highlight areas that display both weak and strong correlations between oil gravity and viscosity and evaluate possible relationships between viscosity and sulphur content.

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