

## **Effect of Fluid Properties on Imbibition Relative Permeability Behavior in Gharif Formation**

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### **Abstract**

Relative permeability is a principal property that controls the simultaneous flow of fluids in porous media. It helps in making engineering estimates of productivity and ultimate recovery from reservoirs. Obtaining experimental relative permeability is expensive and time consuming. As such, models for relative permeability are developed. Relative permeability behavior is controlled by several factors including pore geometry, saturation, wettability and fluid viscosity. Wettability is a major controlling factor of fluid location, flow and distributions within reservoirs. Different fields have different conditions that influence the relative permeability, hence different relative permeability models are proposed.

In this study, a comprehensive investigation aiming to explore similarities and differences in oil properties within Gharif formation with objective of understanding the effect of oil properties on experimental relative permeability behavior. To do this, 98 relative permeability and capillary pressure data sets were considered. Checked and qualified relative permeability data were corrected for capillary end effects using capillary pressure data using MoRes simulator. Then principal component analysis was used to map out similarities and differences in crude oils from different fields. C6+ was found to be a controlling factor of data variance. Three distinct groups for Gharif fields (light, intermediate and mixture of light and heavy) were identified. However, due to insufficient experimental data (oil composition and relative permeability) and lack of other data (PVT and wettability), no conclusive observations were possible from studying relative permeability behavior as a function of oil properties. As a final step, the 22 relative permeability data sets from numerical simulation were used to generate a reference model for Gharif formation