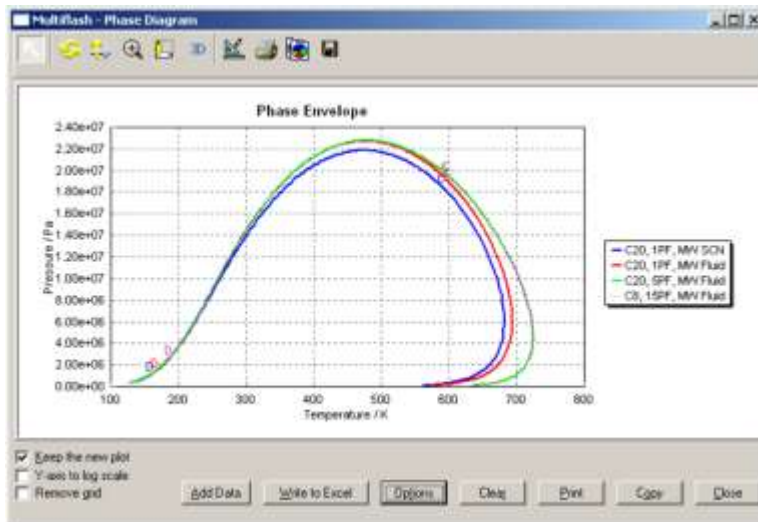


PVT SIMULATION SOFTWARE



FLUIDWORKS

General overview of Fluidworks®

With years of reservoir and flow assurance analysis and software engineering experience, Vinci Technologies has developed the most efficient and ergonomic program to predict and validate fluid behavior by inputting critical parameters: Fluidworks®. For example, the operator can enter and characterize fluid composition which can be obtained from Hydrocarbon Analysis experiments. The software will then compare these to its built-in database and report any statistical anomalies. Furthermore, PVT experiment results such as Bubble Point and fluid properties, e.g. viscosity can be inputted to refine the model. The latter may be tuned so that the outputs match the inputs and vice-versa. Another great feature is the Fluid Mixing module, where different composition hydrocarbons are inputted, and the software computes the composition of the mixture. PVT simulations (Constant Mass Expansion, Constant Volume Depletion, Differential Liberation, Multi-Stage Separator Test...) are performed by virtue of an adequately selected Equation of State (Peng-Robinson, Redlich-Kwong...).

The Fluidworks PVT software can be upgraded with optional solid precipitation modules (Asphaltene, Wax, Hydrates) which are available for users focusing on Flow Assurance studies.

Benefits:

Fluidworks® covers an ample range of fluid behaviour experiments such as:

- ❖ Characterization of fluid composition
- ❖ Fluid Mixing module to compute the composition of a mixture
- ❖ PVT simulations for Black oils, Gas, Gas condensates, Wet gases, Dry gases and Heavy oils and other reservoir fluids
- ❖ Flow Assurance studies (Asphaltenes module, Wax module and Hydrates module)

Fluidworks® comprises three modules which can be optionally selected for the treatment of solid precipitation experimental data.

ASPHALTENE MODULE

Asphaltene is a highly viscous hydrocarbon deposition solid whose precipitation results from a drop in pressure which can occur in the well or pipeline during normal production or as a result of gas injection. This highly undesirable phenomenon can cause major clogs leading to dangerous pressure build-ups, severe equipment damage and costly repairs. By inputting the necessary parameters (composition of the live oil, reservoir temperature, bubble point,...) this module can predict the asphaltene onset pressure (AOP).

WAX MODULE

Wax is a highly viscous hydrocarbon deposition solid whose precipitation results from a drop in temperature which can occur in the well or pipeline during normal production. Solid wax particles may increase the oil viscosity by many orders of magnitude and wax layers may build up over time on pipe walls and inside process units. This highly undesirable phenomenon can cause major clogs leading to dangerous pressure build-ups, severe equipment damage and costly repairs. By inputting the necessary parameters (composition of the live oil including n-paraffin, reservoir pressure,...), this module can predict the Wax Appearance Temperature (WAT).

HYDRATES MODULE

Natural Gas Hydrates are a solid compound formed by the combination of free water and natural gas at high pressures and low temperatures. This phenomenon can occur in both gas and oil wells. Hydrates can be responsible for major flow assurance hazards including pipeline degradation. By inputting the necessary parameters (composition of the live oil or gas, reservoir pressure,...), this module can predict Hydrate formation and dissociation temperature. It can also simulate the effects of the most common hydrate inhibitors as well as water salinity.

