

TECHNICAL UNIVERSITY OF CRETE

Mineral Resources Engineering Department



PVT & Core Analysis Lab

Director : Professor Nikos Varotsis

Scientific Personnel :

- Associate Professor N. Pasadakis
- Dr. V. Gaganis, Dipl. Eng. In Mechanical Engin., Msc in Systems Control, PhD in Petroleum Engin.
- D. Marinakis , Dipl. Eng. in Chemical Engin., Msc in Production Engin. , PhD in Petroleum Engin. (submitted)
- E. Chamilaki, Chemist

PVT Experimentation



- Experimental studies of reservoir fluids phase behaviour at downhole conditions
- Asphaltenes deposition studies
- Slim tube minimum miscibility pressure determination

High Pressure & Temperature Experimentation



- Thermodynamic behaviour and dissociation kinetics of gas hydrate contained in sediments
- Catalytic processing of hydrocarbon mixtures

Core Analysis Experimentation



- Porosity
- Absolute and relative permeabilities
- Fluid saturations
- Capillary pressure
- Wettability of the rock-fluids system
- Assessment of formation damage in cores induced by drilling fluids

Compositional Characterisation of Gas and Liquid Petroleum Samples – Physical Properties Tests



- Detailed compositional analysis and fluid characterisation
- Geochemical analysis
- Measurements of physical properties of petroleum and its fractions
- Determination of oil pollutants

Pattern Recognition Methods for modelling petroleum engineering data

- Regression analysis for building Function Learning Tools (Artificial Neural Networks-ANNs, Kernel Systems, Support Vector Machines, etc)
 - Develop self adaptable models trained against databases to provide rapid and direct predictions
- Cluster Analysis (Classification, Clustering)
 - Classifier to provide direct answers for the phase stability problem during compositional reservoir simulations

Answer Products

developed by the PVT & Core Analysis Lab for the international petroleum industry

- Neural network (ANN) model for predicting a full PVT report based on simple measurements – PVT Expert Service *-
- Function learning tool for the GOR prediction of a reservoir fluid based on downhole measurements –MDT/DFA Tool * -
- Pattern recognition model for the automatic processing of oil and gas Gas Chromatograms” Funded by: Schlumberger
- Model to predict the shrinkage of petroleum reservoir samples when brought from downhole conditions to surface Funded by: Oilphase/Schlumberger
- US patent granted: US7966273 (2011)

* *Trademarks of Schlumberger*

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Direct Solution Models to solve Iterative Problems

- FLTs were built and are being used for solving directly :
 - The phase stability problem (Classifier)
 - The phase split problem (EoS Emulator)
 - In such way the phase equilibria problem during compositional reservoir simulation is solved directly instead of the tuned EoS model
- The models are currently under test by KAPPA Petroleum Software Group, France

PVT & Core Analysis Lab highlights

- The PVT experimental system is unique in Greece and has already been used to perform complete PVT studies on samples recovered from oil and gas condensate reservoirs
- All high pressure petroleum samples recovered in Greece since 1992 have been analyzed by the PVT & Core Analysis Lab
- State-of-the-art expertise for building Pattern Recognition tools for Reservoir & other Petroleum Engineering applications
- 23 research projects mainly funded by the oil industry and the E.U were conducted in the PVT & Core Analysis Lab