

Dr NIKOS VAROTSIS

**PROFESSOR of the
Department of Mineral Resources Engineering
THE TECHNICAL UNIVERSITY OF CRETE**

Director of the PVT and Core Analysis Laboratory

**FORMER HEAD OF THE PVT AND FLUID ANALYSIS
RESEARCH AND DEVELOPMENT GROUP
OF SCHLUMBERGER**

Doctorate and M.Eng awarded by HERIOT-WATT UNIVERSITY

**Graduate of the Chemical Engineering Department
of the NATIONAL TECHNICAL UNIVERSITY OF ATHENS**

CURRICULUM VITAE

Degrees-Studies

Publications Research and Industrial Experience

CURRICULUM VITAE

NAME : **NIKOS VAROTSIS**

DATE OF BIRTH : 13 March 1953

PLACE OF BIRTH : Corfu, Greece

ADDRESS : Kondylaki 3, Akrotiri, Chania, Crete, Greece

OCCUPATION : Professor, Director of the Fluid Analysis Laboratory of the
Technical University of Crete

ADDRESS AT WORK : The Technical University of Crete, 73100 Chania, Crete

STUDIES : 1971-1976 Dipl. of Chemical Engineering, National Technical
University of Athens

- 1976-1977 MEng in Petroleum Engineering at Heriot-Watt
University, Edinburgh, Scotland

- 1980-1984 PhD in Petroleum Engineering at Heriot-Watt
University, Edinburgh, Scotland

PhD Thesis Title: "Laboratory and Theoretical Investigation of the Near Critical Phase
Behaviour of Hydrocarbon-Injection Gas Systems"

RESEARCH AND INDUSTRIAL EXPERIENCE

1984-1990 : Head for PVT and Fluid Analysis, Research and Development, of Schlumberger in
Paris, France

1980-1984 : Head of the Phase Behaviour Research Group at Heriot-Watt University

1978-1980 : Production Engineer at the Military Rubber Factory, Athens

OTHER PROFESSIONAL ACTIVITIES

- Acting Consultant since 1990 on Phase Behaviour and Fluid Analysis topics for Schumberger Research & Development and Oilphase
- Acting Consultant since 1990 on Reservoir Engineering and Fluid Analysis topics for the North Aegean Petroleum Corporation plc
- Taught Petroleum Engineering, Phase Behaviour and Fluid Characterisation related topics in the Schools for Professional Development for Schlumberger's Field Engineers in Paris.
- Delivered series of seminars, lectures and technical presentations in Europe (U.K, France, Norway, Italy, Greece), the Middle East (Egypt, Pakistan, Dubai, Abu-Dhabi, Qatar, North Yemen, the Far East (Indonesia, Malaysia, Brunei) and Africa (Gabon, Gabinda) to petroleum engineers of several oil companies and government officials on Reservoir Fluid Sampling, PVT and Phase Behavior and Fluid Characterization related subjects.
- Delivered a 3-days intensive PVT Training course for Woodside, Australia, November 8-11, 1999 in Perth , Australia
- Invited Speaker to the 1990 SPE Forum-Advances in the Field of Fluid Flow and Phase Behaviour" to deliver a lecture with subject "EOS Approach in Compositional Simulation", Austria, 1990
- Invited Speaker to the Middle East Section of the Society of Petroleum Engineers, Dubai, November 30, 1988 where he gave a presentation with subject " New Developments in Simulating the Phase Behavior of Reservoir Fluids"
- Invited Speaker to the West Africa Section of the Society of Petroleum Engineers, Port Gentil, Gabon, October 2, 1989 where he delivered a talk with subject "Methods for determining the Properties of Reservoir Fluids"
- Invited Speaker to the Far East Section of the Society of Petroleum Engineers, Jakarta, Indonesia, February 2, 1990 where he gave a lecture with subject " State of the art in PVT Analysis"
- Invited Speaker to the "Fluid Sampling and Analysis" Conference organized by Phillips 66, Hagensund, Norway, September 29-30, 1989
- Invited Speaker to the "Sampling and PVT Meeting" organized by the U.K Section of the Society of Petroleum Engineers, London, April 24, 1991
- *PRINCIPAL Contributor* to the Edition of the Well Evaluation Conference Volume, 1991

Main Professional and Research Tasks undertaken for the period 1980-today

1980-1984

The main task during that period was to create and guide a research group sponsored jointly by the British Department of Energy and the oil industry, to study the phase behaviour and the physical chemical processes and the engineering of miscible gas (CO₂, N₂, hydrocarbon gas) flooding and the characterisation of the resulting phases at high pressures and temperatures.

The goal of the scientific team was to support the research programmes of the British Department of Energy with thermodynamic equilibrium and fluid characterization laboratory data of the injected gas and hydrocarbon phases and to develop theoretical models. In 1984, the team had a total research budget of over 1,000,000 pounds sterling financed by the industry and by the British government.

1984-1990

In charge of the PVT and Fluid Analysis Research and Development group of SCHLUMBERGER in Paris. The group specialises in hydrocarbon phase separation, analytical chemistry, chromatographic (GC, GC-MS and HPLC) topics as well in the theoretical study of the thermodynamic equilibrium of gas and liquid mixtures. Some of its tasks are :

- (a) the design and development of new tools and services to be used onsite during oil and gas well testing to characterise the phase behaviour and the properties of the formation fluids
- (b) the invention and development of novel laboratory methods for the measurement of the physico-chemical properties of hydrocarbon mixtures in order to create new services.
- (c) the development of characterisation methods using Mass spectrometry and optical detectors for the detailed analysis of complex hydrocarbon mixtures.

For the above work one U.S Patent (US Patent No 4864843) and one European Patent (87401151.8) have been filed. The former covers a unique method for the chromatographic analysis of petroleum liquids.

1990-

In charge of setting-up a new laboratory at the Technical University of Crete for the study of the :

- (a) PVT and phase behaviour of gas and liquid mixtures at high pressures and temperatures

(b) properties of the reservoir rocks.

The PVT and Core Analysis Laboratory is now adequately equipped to cover the need for measurements of the physical chemical properties of the fluid and rock samples recovered during a test of a oil or gas well. Several research projects as well as studies of industrial interest have been conducted including the detailed characterisation of the reservoir fluid and of the rock which comprise the Prinos field in Northern Greece. Among the equipment which are now operational are Gas Chromatographs (FID, TCD, NPD detectors), Gas Chromatograph-Mass Spectrometer, FT-IR, HPLC (Photo Diode Array, Refractive Index detectors), Gel Permeation Chromatograph, PVT visual cells (1000 bar, 250°C), Relative Permeability apparatus, etc

SELECTED PUBLISHED PAPERS IN PEER REVIEWED JOURNALS/CONFERENCES

- ***N. Varotsis, V. Gaganis, J. Nighswander*** “Quality Assurance Tool for PVT Simulator Predictions”, SPE Reservoir Evaluation and Engineering Journal, December 2002, pp 499-506
- ***N. Varotsis, V. Gaganis, J. Nighswander*** : “Quality assurance tool for PVT simulator predictions” SPE 68235, SPE Middle East Oil Show, Bahrain, 17-20 March 2001
- ***T. J. Broad, N. Varotsis, N. Pasadakis*** : “the compositional characterisation of gas condensate fluids-A review featuring the impact of the analysis data quality on the accuracy of equation of state based PVT predictions”. SPE Middle East Oil Show, Bahrain, 17-20 March 2001
- ***N. Pasadakis, V. Gaganis, N. Varotsis*** : “An improved method for the separation of aromatic groups in heavy petroleum fractions by HPLC analysis”, Proceedings of the International Conference on Instrumental Methods of Analysis-Modern Trends and Applications, Chalkidiki, Greece, 1999, p.472-476
- ***N. Pasadakis, C. Yiokari, N. Varotsis, C. Vayenas*** : “Characterization of hydrotreating catalysts using the principal components analysis”, Applied Catalysis A: General 207 (2001), 333-341
- ***N. Pasadakis, N. Varotsis, N. Kalithrakas*** : “The influence of pressure on the asphaltenes content and composition in oils”, Petroleum Science and Technology, accepted for publication, Jan. 2001
- ***N. Pasadakis, V. Gaganis, N. Varotsis*** : “Accurate determination of aromatic groups in heavy petroleum fractions using HPLC-UV-DAD”, Fuel 80(2001), 147-153
- ***N. Pasadakis, N. Varotsis***. “A novel approach for the quantitation of the hydrocarbon groups in heavy petroleum fractions using HPLC-RI analysis”, Energy and Fuels, 14-6(2000), 1184-1187
- ***N. Varotsis, V. Gaganis, J. Nighswander, P. Guieze*** : “A Novel Accurate Non-Iterative Method for the Prediction of the PVT Behavior of Reservoir fluids” presented at the 1999 SPE Annual Technical Conference and Exhibition, 3-5 October 1999, Houston, TX
- ***N. Pasadakis, E. Chamilaki, N. Varotsis*** “Rapid and accurate determination of the volumetric cuts of Commingled Reservoirs and Pipelines”, Oil & Gas Journal, January 3rd, 2000, pp.46-47
- ***N. Pasadakis, N. Varotsis***: “Optimization of the HPLC separation of aromatic groups in petroleum fractions” accepted for publication in Fuel, 2000.
- ***N. Varotsis, N. Pasadakis***: “Determination of Commingled Crude Oil Streams by HPLC with UV and IR detection”, Journal of Liquid Chromatography and Related Technologies, 21(5),657-667(1998).
- ***N. Varotsis, N. Pasadakis, V. Gaganis***: “A Novel Approach for the Characterization of Aromatics in Petroleum Fractions Using HPLC-UV-DAD and Evolving Factor Analysis”, Fuel, 3032, vol 77, pp 1495-1502, (1998)
- ***N. Pasadakis, V. Gaganis, N. Varotsis***: “An improved method for the separation of aromatic groups in heavy petroleum fractions by HPLC analysis”, International Conference on “Instrumental Methods of Analysis-Modern Trends and Applications” Chalkidiki, Greece, 1999

- **X. Triantos, N. Pasadakis, N. Varotsis, X. Foteinopoulos, P. Kotsokolos**: “Prediction of the octane number of gasoils using FT-IR Neural Networks, Proceedings of the 2nd Panhellenic Chemical Engineering Conference, Salonica, (1999), pp. 645-648.
- **F. Giannoulis, N. Pasadakis, N. Varotsis, X. Foteinopoulos, P. Kotsokolos**: “Comparative evaluation of different types of crude oils for the production of base lube oils”. Proceedings of the 2nd Panhellenic Chemical Engineering Conference, Salonica, (1999), pp. 649-652
- **N. Varotsis, N. Pasadakis**: “Determination of the chemical composition of spent lube oils during catalytic hydrogenation”, Proceedings of the 1st Panhellenic Chemical Engineering Conference, Patras, (1997), pp. 503-508.
- **N. Varotsis, N. Pasadakis**: “Quantitative determination of aromatic component groups in lubricant oils using HPLC-SEC and UV-Diode Array Detection”, Journal of Industrial and Engineering Chemistry Research, 36, 3915-3919 (1997)
- **N. Varotsis, N. Pasadakis** : “An Analytical Method for Rapid Monitoring of the Degree of Hydrogenation of Recycled Lubricating Motor Oils”, 1997, Journal of Industrial and Engineering Chemistry Research, American Chemical Society, Vol. 36, No.9, pp 3915-3919, 1997
- **N. Varotsis** : “ Prediction of Gas Phase Volumetric Variations in Diphasic Reservoir Oils”, 1997, Journal of Canadian Petroleum Technology, Vol .36, No.8, pp 56-60, September 1997
- **N. Varotsis, N. Pasadakis** : “Determination of Chemical Composition of spent lube oils during the process of catalytic hydrogenation” Proceedings of the 1st National Chemical Engineering Congress, Patras, Greece, 29-31 May 1997, pp.503-508
- **D. Avlonitis, N. Varotsis** : “Modelling Gas Hydrate Thermodynamic Behaviour: Theoretical Basis and Computational Methods”, Fluid Phase Equilibria, 123 (1996) 107-130
- **N. Varotsis, P. Guieze** : “ Reservoir Fluid Characterisation using Gas Chromatography-Mass Spectrometry”, Journal of Petroleum Science and Engineering, 15 (1996) 81-89
- **S. Zervas, N. Varotsis** : “ Rapid Minimum Miscibility Pressure Prediction Condensing Gas Drive Processes” Proceedings of the 2nd National Congress on Computational Mechanics, Chania, Greece, 26-28 June 1996
- **N. Varotsis, N. Pasadakis** : “ Calibration Prerequisite for accurate PVT Measurements”, Oil & Gas Journal, Jan 29, 1996, 93-96
- **N. Varotsis, N. Pasadakis** : “ An Integrated Method for the Gas Chromatographic Analysis of Natural Gases and Liquid Petroleum Mixtures”, Chimika Chronika, New Series, 25, 287-300 (1995)
- **N. Varotsis** "Phase Behaviour Models to be used for the Simulation of Petroleum Reservoirs. Proceedings of the 1st National Congress on Computational Mechanics, Athens 3-4 September 1992 pp.971-979
- **N. Varotsis, P. Guieze** "Onsite Reservoir Fluid Properties Evaluation", Journal of Petroleum Technology (JPT) of the American Society of Petroleum Engineers (SPE), August 1990
- **N. Varotsis** "A Robust Calculation Method for Rapid Phase Behaviour Calculations", Reservoir Engineering Journal of the American Society of Petroleum Engineers (SPE), May 1989, p.237-243
- **N. Varotsis** “Modern Trends in Reservoir Fluid Characterisation” key-note contribution to the International Symposium “Enhanced Oil Recovery in Albania” organised by the

- Directorate General for Energy of the European Commission, with subject “Modern Trends in Reservoir Fluid Characterisation”, Fier Albania, 1997
- **N. Varotsis, A.C. Todd** “Phase Equilibria Predictions for Multicomponent Hydrocarbon systems for Application in CO₂ Enhanced Oil Recovery Schemes”, Proceedings of the 8th Annual Research Meeting of the Institution of Chemical Engineers, Edinburgh, UK, 27-28 April 1981, pp.95-100
 - **N. Varotsis, A.C. Todd, G. Stewart** “An Iterative Method for Phase Equilibria Calculations with particular application to Multicomponent Miscible Systems”, Proceedings of the 1st European Conference of Enhanced Oil Recovery, Bornemouth, UK, September 1981, pp.313-328
 - **M. Clancy, W. Laidlaw, G. Stewart, A.C. Todd, N. Varotsis** “Hydrocarbon Mixtures at High Pressures-Data and Methods available”, Proceedings of “ Estimating the Properties of the Offshore Gas Technology Seminar organised by the Institution of Chemical Engineers, London, November 1983 pp. 7-1,7-28
 - **N. Varotsis, G. Stewart, A. Todd, M. Clancy** "Phase Behaviour of systems comprising North Sea Oils and Injection gases", SPE Journal of Petroleum Technology (JPT), Νοέμβριος 1986, pp. 1221-1233.
 - **M. Clancy, G. Stewart, A. Thompson, A.C.Todd, N. Varotsis** “Optimised Compositional Models for Simulation of EOR Processes”, Proceedings of the 3rd European Meeting on Improved Oil Recovery, Rome, Italy, 16-18 April 1985
 - **P. Guieze, J.M. Williams, N. Varotsis** " Equations determine PVT curves", Oil and Gas Journal, October 1985, 83, No 42.
 - **N. Varotsis, P. Guieze** " Microdistillation : A method that combines Gas and Liquid Chromatography for the Characterisation of Petroleum Liquids", Journal of Chromatography, 403, 1987, σελ. 159-170
 - **H. Freyss, N. Varotsis, P.Guieze** "PVT Analysis for Petroleum Reservoirs"
 - Technical Review, January 1989, p.4-15
 - **N. Varotsis** “On-Site Fluid Characterisation”, presented at the 8th Annual Wireline, Seismic & Testing Interpretation Symposium, Ridgefield, Connecticut, October 2-5, 1988
 - **N. Varotsis, P. Guieze** “ A Robust Phase Behaviour Predictor for Onsite Reservoir Fluid Properties Evaluation” Proceedings of the 7th Annual Wireline, Seismic & Testing Interpretation Symposium, Ridgefield, Connecticut, June 24-26, 1987

Research Projects and Technical Studies performed for the Petroleum Industry

- **“Evaluation of the miscible gas injection in oil reservoirs by monitoring the asphaltenes concentration”**, research project funded by the E.U under the 5th Framework Energy, Environment and Sustainable Development. Total Budget over 2,000,000 €
- **“Exploration and Evaluation of the Eastern Mediterranean Sea Gas hydrates and the Associated Deep Biosphere”**, research project funded by the E.U under the 5th Framework Energy, Environment and Sustainable Development. Total Budget over 2,600.000 €
- **“Feasibility study for the Determination of the Mud Filtrate Contamination of Reservoir Fluid Samples”**, performed for Oilphase plc
- **“Biodegradation of Organic substances in soil and underground waters”**, funded by the Greek Secretariat for Technology and Research, 1998

- ***Laboratory study and evaluation of the PVT properties of the Epsilon-1 petroleum fluids*** funded by KAVALA OIL
- ***Increase in the Hellenic Capacity for Recycling of Spent Lube Oils***, Research project funded by Motoroil and the Greek Secretariat for Technology and Research, 1995-1998. Total Budget over 3,600,000 €
- ***N. Varotsis*** “Generation of Black Oil Tables for Use in Reservoir Simulation”, July 1991 performed for Schlumberger
- ***N. Varotsis*** “The Role of Organic Geochemistry in Optimising Petroleum Exploration”, August 1991, performed for Schlumberger
- ***N. Varotsis*** “The Effect of Differential Pressure on Void Fraction”, April 1993, performed for Schlumberger
- ***N. Varotsis*** “Derivation of the Oil and Gas Flowrates at Standard Conditions using Flowrate Measurements at Separator Conditions and PVT Properties”, September 1992, performed for Schlumberger
- ***N. Varotsis, P. Guieze*** “Microdistillation of Petroleum Liquids”, January 1986, performed for Schlumberger
- ***N. Varotsis*** “The Effect of Composition on the Accuracy of Flowrate Measurements Performed at Wellhead Conditions”, August 1990, performed for Schlumberger
- ***N. Varotsis*** “Evaluation of Prinos PVT Data”, January 1991, performed for the North Aegean Petroleum Corporation
- ***N. Varotsis*** “Sampling Marketing Survey”, March 1995, performed for Schlumberger
- ***N. Varotsis, N. Pasadakis*** “PVT Study of Wellhead and Surface Samples from Well Prinos North PN-2”, May 1994, performed for the North Aegean Petroleum Corporation
- ***N. Varotsis, N. Pasadakis*** “Core Analysis from Well Prinos North PN-2”, August 1994, performed for the North Aegean Petroleum Corporation
- ***N. Varotsis, N. Pasadakis*** “PVT Study of Wellhead Sample WHS#3 from Well Prinos North PN-2”, July 1994, performed for the North Aegean Petroleum Corporation
- ***N. Varotsis, N. Pasadakis*** “Compositional Analysis of North Prinos Crude Oil”, September 1994, performed for the North Aegean Petroleum Corporation
- ***N. Varotsis, N. Pasadakis, P. Sanger*** “Phase Behaviour study of Synthetic Gas-Condensate Mixtures”, June 1994, performed for the Delft University, The Netherlands
- ***N. Varotsis, N. Pasadakis*** “PVT Study of Wellhead and Surface Samples from Well Prinos North PNA-H1”, February 1997, performed for the North Aegean Petroleum Corporation
- ***N. Varotsis, N. Pasadakis*** “PVT Study of Wellhead and Surface Samples from Well Prinos North PNA-H1”, November 1996, performed for the North Aegean Petroleum Corporation
- ***N. Varotsis*** “Interpretation of PVT tests performed on-site at the Prinos Field”, March 1992, performed for the North Aegean Petroleum Corporation