

An Intensive Course

on

**THERMODYNAMICS OF HYDROCARBON RESERVOIRS,
PRODUCTION, AND ENVIRONMENTAL STEWARDSHIP**

(August 4 -7, 2008)

by

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REGISTRATION FORM

**THERMODYNAMICS OF HYDROCARBON RESERVOIRS,
PRODUCTION, AND ENVIRONMENTAL STEWARDSHIP**

Name_____

Company_____

Title_____

Mailing Address_____

Education and Brief Description of Experience

Business Phone_____

Business Fax_____

Email Address_____

Fees Enclosed \$_____

Please send completed registration forms to:

Sirma Pandev (spandev@rerinst.org)
Reservoir Engineering Research Institute (RERI)
385 Sherman Ave., Suite 5
Palo Alto, CA 94306

THERMODYNAMICS OF HYDROCARBON RESERVOIRS, PRODUCTION, AND ENVIRONMENTAL STEWARDSHIP

Scope

A number of topics relating to the conceptual, general physical aspects of equilibrium, nonequilibrium, and irreversible phenomena and computations in hydrocarbon reservoirs and production and environmental stewardship will be addressed in this four-day course. A unified approach will be used in theory to cover different problems. Field examples from failure and success will be discussed. Various aspects of oil recovery methods, especially heavy oil reservoirs, new features of CO₂ for injection and sequestration, gas condensate reservoirs, fractured reservoirs, abrupt past climate change calculations, deposition in flowlines from hydrates, waxes, and asphaltenes and deposition inhibition by modern methods, and reservoir fluids are integral parts of this course. Items of discussion include:

- Phase behavior and its importance in relation to heavy oil reservoirs (combined steam and additive injection), gas condensate reservoirs, and accurate modeling of CO₂-crudes, CO₂-water, and water-hydrocarbon mixtures through the association concept.
- Equations of state and their predictive capability.
- New concepts and new features of CO₂ injection and sequestration.
- Water blocking and condensate blocking in gas wells and production enhancement by wettability alteration.
- Kinetics of hydrate formation and delaying of hydrate formation process. Thermodynamics of microemulsion. Anti-agglomeration as the most effective approach in hydrate blockage inhibition. Use of green surfactants for effect hydrate inhibition.
- Efficient and robust modeling of phase and volumetric behavior in two-phase and three-phase.
- Molecular, thermal, and pressure diffusion processes, and their significance in gas injection in fractured oil reservoirs and recycling in fractured gas condensate reservoirs, wax deposition in pipelines and species distribution in hydrocarbon reservoirs. Computation of past abrupt climate changes from molecular, thermal, and pressure diffusion.
- Solution-gas drive in heavy oil reservoirs and the nature of non-equilibrium phenomena.

Location

The course will be held at the Reservoir Engineering Research Institute, 385 Sherman Ave., Suite 5, Palo Alto, CA 94306.

Schedule and Fee

The course will begin at 8:30 a.m. on Monday, August 4, and will end at 4:15 p.m. on Thursday, August 7. Daily sessions will be from 8:30 to 4:15 with a lunch break from 12:15 to 1:30. Part of the afternoon sessions will be devoted to discussion.

The fee for attendance is US \$2,200. For the staff members of those companies who are members of the Institute, the fee is U. S. \$1,800. The course fee includes a copy of "Thermodynamics of Hydrocarbon Reservoirs", a draft of a new book and a file containing relevant papers.

A deposit of US \$400 is required to reserve space. Full payment is due by July 1, 2008. Deposit will be refunded upon cancellation of reservation at least 30 days prior to the beginning of the course. A registration form can be found at the end of this brochure. Please make checks payable to: Reservoir Engineering Research Institute.

We request that participants make their own hotel reservations. Hotels nearby include the Stanford Terrace Inn in Palo Alto. (Ask for Reservations at 1-800-729-0332 or (650) 857-0333 and identify yourself as being in the RERI Group). The room rates are discounted.

Course Schedule

Day One

- 8:30 – 9:30 Introduction and Overview of the Type of Problems in Hydrocarbon Reservoirs and Production and Stewardship of the Environment from Equilibrium, Irreversible, and Non-equilibrium Phenomena
- 9:30 – 10:15 Review of Basic Concepts
- coffee break -
- 10:30 – 12:15 General Theory of Equilibrium
- lunch break -
- 1:30 – 2:30 General Theory of Irreversible Phenomena
- 2:30 – 3:00 Diffusion Flux from Concentration, Thermal, and Pressure Gradients.
- coffee break -
- 3:15 – 4:15 Natural Convection in CO₂ Lab Scale Experiments and in Hydrocarbon Reservoirs. Problems with Literature CO₂ Data. Combined Effect of Convection and Diffusion in Hydrocarbon Reservoirs and in Wax Precipitation in Pipelines. Discussion.

Day Two

- 8:30 – 9:00 Diffusion and Convection in Gas Injection and Recycling in Fractured Oil Reservoirs and Gas Condensate Reservoirs.
- 9:00 – 10:15 Phase Behavior and Volumetric Calculations from Equations of State. Nature of Delay in Various Processes from a P-V Plot.
- coffee break -
- 10:30 – 11:30 Effects of steam and H₂O on Phase Behavior of Heavy Crudes and Association Considerations
- 11:30 – 12:15 Peng-Robinson EOS and Need for Association Consideration. Characterization of Reservoir Fluids for Various Processes.
- lunch break -
- 1:30 – 2:15 Two-Phase Compressibility and Heating and Cooling Due to Expansion

2:15 – 3:00 Stability and Criticality Concepts.

- coffee break -

3:15 – 4:15 Application of Stability and Criticality Concepts to Various Equilibrium and Irreversible Problems. Discussion and Examples.

Day Three

8:30 – 9:15 Gibbs Free Energy Surface Analysis, Tangent Plane Distance Analysis

9:15– 10:15 Phase Behavior Computations by Conventional Methods in Two-Phase and in Three-Phase

- coffee break -

10:30 – 11:30 Phase Behavior Calculations by the Reduction Methods

11:30 – 12:15 Wax Precipitations and Nature of the Problem and Wax Precipitation Modeling

- lunch break -

1:30 – 2:30 Asphaltene Precipitation and Nature of the Problem and its Modeling

2:30 – 3:00 General Theory of Thermodynamics of Surfaces and General Theory of Non-Equilibrium Phenomena

- coffee break -

3:15 – 4:15 General Theory of Non-Equation Phenomena, Issues Related to New Phase Formation and Nucleation. Discussion.

Day Four

8:30 – 9:30 Kinetics of Hydrate Formation and Hydrate Inhibition. Induction Time

9:30 – 10:15 Growth Reduction in Hydrate Formation. Anti-agglomeration and Steric Effects. Thermodynamics of Microemulsion. Use of Chemical Surfactants and Bio-surfactants for effective Hydrate Anti-agglomeration.

- coffee break -

- 10:30 – 11:00 Water blocking and Hydrocarbon Blocking in Gas Condensate Reservoirs
- 11:00 – 12:15 Wettability Alteration to Intermediate Gas Wetting and Improvement in Well Deliverability.
- lunch break -
- 1:30 – 2:30 Soluble-Gas Drive in Light and Heavy Oil Reservoirs
- 2:30 – 3:00 Modeling of Solution Gas-Gas Drive Reservoirs
- coffee break -
- 3:30 – 4:15 General Discussion on Solution-Gas Drive in Heavy Oil Reservoirs, Hydrate Kinetics, and Fluid Characterization for Various Processes (Gas Injection, Waxes, Asphaltenes), Diffusion Processes, and CO₂ Injection in Improved Recovery and Sequestration.