

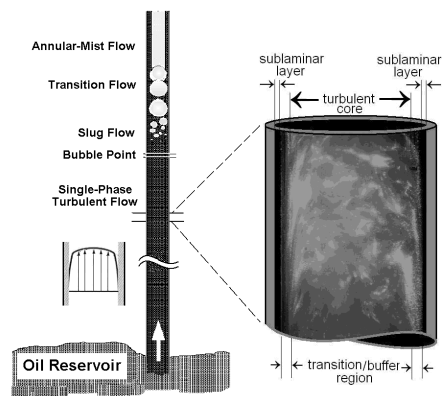
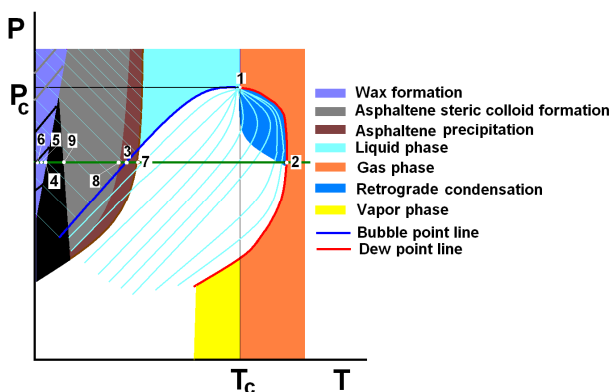
# FLOW ASSURANCE PRINCIPLES

Prediction, Prevention and Remediation of Heavy Organics Depositions in Petroleum Production, Transportation and Processing Industries

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## Flow Assurance Course Content

1. Introduction – Arterial Blockage due to Heavy Organic Deposition from Petroleum Fluids
2. The nature of asphaltene, resin, wax and other heavy compounds in petroleum  
Various phases and phase transitions of asphaltene (asphaltene molecule, asphaltene steric colloids, asphaltene micelles)
3. Field and experimental observations regarding asphaltene, resin, wax and other heavy organic depositions from petroleum fluids, formation damage.
4. Mechanisms of asphaltene, resin, wax and other heavy organic depositions
  - 4.1 Wax deposition - cloud point, pour point, pp suppressants
  - 4.2 Asphaltene deposition - Roles of resin, aromatics and paraffins
  - 4.3 Diamondoids and their role in fouling of oil and gas arteries
  - 4.3 Dilemma of asphaltene/diamondoids/wax/resin/aromatic interactions
5. Experimental Methods in Characterizing Petroleum Fluids and Heavy Organics
  - 5.1 Field and Laboratory Techniques
6. Mathematical modeling of asphaltene and other organic depositions:
  - 6.1 Equations of state models
  - 6.2 Polymer solution models
  - 6.3 Colloidal - thermodynamic models
  - 6.4 Kinetic and aggregation models
  - 6.5 A comprehensive model for flow assurance
7. Applications and predictions:
  - 7.1 Supercritical Fluid Extraction and Retrograde Condensation and Applications in petroleum systems
  - 7.2 Effects of state variables (T, P, X) and flow conditions on Deposition
  - 7.3 Depositions in the reservoir / Miscible gas injection, enhanced oil recovery
  - 7.4 Wellhead and pipeline depositions
  - 7.5 Depositions in processing equipment
  - 7.6 Controlled deposition / refining purposes/formation damage control
  - 7.7 Development of pour-point and deposition suppressants
8. Recent Developments
  - 8.1 Different Company field and laboratory experiences with flow assurance
  - 8.2 Instructor's recent experiences
  - 8.3 Nanotechnology implications of flow assurance
9. Concluding remarks

