Ain Shams University
Faculty of Science

Experimental Studies on Constant Volume Depletion of Gas-Condensate Systems

A thesis submitted for the fulfillment of Master Degree of Science in Analytical Chemistry

BY

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ABBRIVIATION

List of Symbols	Description
API	American Petroleum Institute
bbl/d	Barrels per day
CMD	Constant Mass Depletion
CVD	Constant Volume Depletion
FID	Flame ionization detector
GOR	Total Gas to Oil Ratio , SCF/STB
GOR_{diss}	Dissolved Gas to Oil Ratio , SCF/STB
GOR_{sep}	Separator Gas to Oil Ratio , SCF/STB
IDS	Interface Detection System
LDO	Liquid Drop Out
Ln	Natural logarithm (base e)
M_{C7+}	The Molecular Weight of heptanes plus
P	Pressure
P_{ci}	Critical pressure of component i, psia
P_{pc}	Pseudocritical pressure, psia
P_d	Dew point pressure , psia
PIONA	Paraffin , Isoparaffin , Olefin , Naphthine and Aromatic
P_{pr}	Pseudoreduced pressure of the gas mixture, psia
P_{sep}	Separator Pressure ,psia
PR-EOS	Peng-Robinson Equation Of State
PVT	Pressure-Volume- Temperature
R	Universal gas constant
R_{sep}	Separator producing gas/oil ratio , SCF/SP bbl
SCF/STB	Standard Cubic Feet / Stock Tank Barrels
SRK-EOS	Soave-Redlich-Kwong Equation Of State
T	Temperature
T_{ci}	Critical temperature of component i , ^oR
T_{pc}	Pseudocritical temperature, ^oR
T_{pr}	Pseudoreduced temperature of the gas mixture, ^oR
T_R	Reservoir temperature ,^oR
T_{sep}	Separator temperature, ^oR
TCD	Thermal conductivity detector
Tcf	Trillion cubic feet
V	Molar volume
$(Vg)_{sep}$	Volume of separator gas at separator condition ,cc
$(Vg)_{sc}$	Volume of separator gas at standard condition ,cc
Y_i	Mole fraction of component i in the gas mixture
Z_{sep}	Super compressibility factor of separator gas
γ_{C7+}	Specific gravity of heptanes-plus fraction (air =1.0)

γ_{diss}	**Average specific gravity of dissolved gas (air = 1.0)**
γ_{sep}	**Average specific gravity of separator gas (air = 1.0)**
γ_g	**Specific gravity of reservoir gas**
β_g	**Separator gas formation volume factor**
β_o	**Shrinkage Volume Factor**
ω	**Acentric Factor**
List of Subscript	
C_{7+}	**Property of heptanes plus fraction**
i	**Mole fraction of component i; in gas mixture**
diss	**Dissolved Gas**
g	**Gas**
P_c	**Pseudocritical**
Pr	**Pseudoreduced**
Sc	**Standard condition**
Sep	**Separator**

ABSTRACT

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Name: Mohamed Abd El-Moniem Mohamed El-Aily
Title: Experimental Studies on Constant Volume Depletion of Gas-Condensate Systems

This study presents new empirical models to estimate dewpoint pressure P_d and condensate recovery for gas condensate reservoirs as a function of routinely measured gas analysis and reservoir temperature. The proposed models were developed based on field and laboratory PVT analysis data of 202 gas-condensate fluid samples representing different gas reservoirs and wide range of gas properties and reservoir temperatures. Statistical error analysis was used to determine the accuracy of the models. The evaluation shows that the correlation coefficient of P_d correlation is 0.9896 and of condensate recovery (Liquid Drop Out) is 0.9878 In addition, results of the proposed models were compared with those published in the literature and ensured its success for capturing the physical trend of gas-condensate systems, and consequently is considered as the most reliable one for petroleum industry. The accuracy of the models has been also compared to Soave Redlich Kwong equation of state (SRK-EOS) and Peng Robinson equation of state (PR-EOS). Gas condensate samples not included in the development of the new correlations have been used to check the validity of the proposed models.

Keywords:

Dew Point Pressure, Condensate Recovery, Gas Condensate, Empirical Correlation, Equation of State.