STRATEGIC APPROACH TO PREVENT NATURAL GAS HYDRATE OBTURATIONS IN DEEPWATER OPERATIONS:
THE USE OF RESERVOIR FLUID CHARACTERISTICS AND OPERATIONAL CONDITIONS

Douglas Estanga*, Jefferson Creek and Sivakumar Subramanian
Chevron Energy Technology Company
Houston, TX 77002
UNITED STATES OF AMERICA

ABSTRACT
Safe management of hydrate formation, without expensive chemical inhibitors or exotic insulation systems would enable the development of currently “marginal” deepwater fields. The present philosophy for hydrate management is to eliminate hydrate formation altogether and thus avoid line blockages. Research to enable strategies to allow hydrate formation, while not forming hydrate blockages, is actively being pursued in many quarters. This paper discusses how the combination of certain fluid properties, such as gas oil ratio (GOR) and brine salinity, might allow tolerating limited formation of hydrates without formation of hydrate plugs. Results from flow loop tests that demonstrate the feasibility of managing the formation of natural gas hydrate in multiphase pipelines while preventing hydrate restrictions are presented in this paper. The different conditions tested suggest that water cuts up to 50% can be operationally viable under a managed risk approach. A paradigm shift from “risk avoidance” to “risk management” has the potential to enable the commercialization of smaller and economically challenged deepwater assets.

Keywords: gas hydrates, hydrate transportability, hydrate management, hydrate slurry

NOMENCLATURE

GOR   Gas oil ratio [scf/stb]  ID   Internal diameter
WC    Water cut [vol%]          LHC  Liquid hydrocarbon
\(v_{mix}\)  Mixture velocity   TDS  Total dissolved solids
LI    Liquid loading [vol%]     MWP  Maximum working pressure
WAT   Wax appearance temperature, [°F]  INTRODUCTION
rpm   Revolutions per minute  The characterization and successful long distance transportation of gas hydrate slurries in offshore systems has been receiving growing attention in the flow assurance community. The need for this technology has become more acute as the industry moves towards deeper offshore developments with longer offsets at higher pressures and lower ambient temperatures. So far, the lack of
STO   Stock tank oil
wt%   weight percent
ppm   part per million
\(\Delta P\)  Pressure drop
Lw    Liquid Water
H     Hydrate

* Corresponding author: Phone: +1 713 372 2649 Fax +1 713 372 5991 E-mail: Estanga@Chevron.com