CONTENTS

FOREWORD 1

OPENING ADDRESS
World view of multiphase flow 3
Gert van Spronsen, Shell Projects and Technology, The Netherlands

KEYNOTE ADDRESS
Severe slugging revisited 5
Ole Jorgen Nydal, Norwegian University of Science and Technology, Norway

MODEL DEVELOPMENT
Validation of a physically-based model for slug initiation and evolution in hydrodynamic slug flow 9
C Lawrence, Z G Xu, P Andersson, H Eiding, L Hovden, J Henriksson, S Henriksen, S Dayaratna, T Haugset, T Ruden, Schlumberger; B Hu, Flow Capture, Norway

Modelling of liquid droplets concentration profiles in stratified-annular flows 25
A Shmuelli, O J Nydal, Norwegian University of Science and Technology, Norway; M Borregales, M Asuaje, Simón Bolívar University, Venezuela

INCLINATION EFFECTS
Experimental study on the onset of intermittent flow and pseudo-slug characteristics in upward inclined pipes 43
Y Fan, E Pereyra, T B Aydin, C Sarica, The University of Tulsa, USA; C F Torres-Monzón, University of Los Andes, Venezuela

Air-silicone oil flow around a vertical to horizontal 90° bend 59
R Omar, B Azzopardi, B Hewakandomby, University of Nottingham, UK

Inclination effect on stratified oil-water pipe flow 75
M Khattabi, R W Time, University of Stavanger; H Schümman, O J Nydal, Norwegian University of Science and Technology; Z Yang, Norwegian University of Science and Technology and Statoil ASA, Norway
COMPUTATIONAL FLUID DYNAMICS

Development of a new CFD-based unified closure relation for Taylor bubble velocity in two-phase slug flow in pipes
E Lizarraga-Garcia, J Buongiorno, MIT, USA; E Al-Safran, Kuwait University, Kuwait; D Lakehal, ASCOMP, Switzerland
93

CFD for the multiphase flow splitting from a single flowline into a dual riser
R A Worthen, Shell Projects & Technology; R A W M Henkes, Shell Projects & Technology and Delft University of Technology, The Netherlands
109

Improving boundary conditions for multiphase CFD predictions of slug flow induced forces
P Emmerson, M Lewis, N Barton, Xodus Group Limited, UK
125

CFD modelling of bypass pigs with a deflector disk
J E Azpiroz, M H W Hendrix, W-P Breugem, Delft University of Technology; R A W M Henkes, Delft University of Technology and Shell Projects & Technology, The Netherlands
141

FLOW REGIME TRANSITIONS

Effect of drag reducing polymer on pressure gradients of dispersed oil-water flow in horizontal and inclined pipes
A Abubakar, T Al-Wahaibi, A R Al-Hashmi, Y Al-Wahaibi, A Al-Ajmi, M Eshrati, Sultan Qaboos University, Oman
159

An experimental study of oil-water flows in horizontal pipes
R Ibarra, O K Matar, C N Markides, I Zadrazil, Imperial College London, UK
169

The experimental study of liquid holdup in gas-liquid pipe cyclonic separator using electrical resistance tomography and wire mesh sensor
S Kanshio, H Yeung, L Lao, Cranfield University, UK
185

Computational fluid dynamics (CFD) simulation of multiphase flow and validating using wire mesh sensor
M Parsi, R E Vieira, B S McLaury, S A Shirazi, The University of Tulsa; M Agrawal, BP; V Srinivasan, ANSYS Inc., USA; E Schleicher, U Hampel, Helmholtz-Zentrum Dresden-Rossendorf, Germany
197

EXPERIMENTAL (SLUGS AND WAVES)

Small scale experiments on surge waves in low liquid loaded pipes
S I Grødseth, O J Nydal, Norwegian University of Science and Technology; Z Yang, Norwegian University of Science and Technology and Statoil ASA, Norway
213

Wind-wave interaction in stratified gasliquid pipe flow
A A Ayati, A Jensen, University of Oslo, Norway
225

Measurement of mean velocity profiles in the slug and liquid film of gas-liquid slug flow
R J Belt, TOTAL E&P, France; P R Leinan, SINTEF Petroleum Research, Norway
233
HIGH VISCOSITY FLUIDS

Experimental studies on void fraction in slug of three-phase viscous oil flows in a near horizontal pipe
Z Yang, T K Kjeldby, Statoil ASA; B Hu, Flow Capture AS; M Langsholt, L Liu, Institute for Energy Technology, Norway

Flow pattern transition model for gas-highly viscous fluids in horizontal pipelines
A Brito, R Cabello, J Marquez, PDVSA Intevep, Venezuela; J Trujillo, GALP Energy, Portugal; N Guzmán, Lone Star College, USA

Viscous liquid-gas flow in horizontal pipelines: experiments and multiphase flow simulator assessment
A Archibong-Eso, Y Baba, S Kanshio, H Yeung, Cranfield University; W Yan, KW Subsea Limited, UK

New insights – impact of thermal cycling on the restart of waxy crude oil pipelines
V Khosla, M van Dijk, A Wesenhagen, X Petit, Shell Global Solutions International B.V., The Netherlands

SPECIAL REGIONAL FOCUS – TANZANIA

Tanzania gas development – flow assurance challenges
H Holm, Statoil ASA, Norway

Experiments for low liquid loading with liquid holdup discontinuities in two- and three-phase flows
J Kjølaas, T E Unander, M Wolden, SINTEF Petroleum AS; P S Johansson, H Holm, Statoil, Norway

Analysis of hydraulic gradients in large scale experiments
J Nossen, T Sira, Institute for Energy Technology; T Vanvik, Schlumberger; H T Holm, Statoil, Norway

Validation of OLGA HD against transient and pseudo-transient experiments from the SINTEF large diameter high pressure flow-loop
G Staff, D Biberg, T Vanvik, N Hoyer, Schlumberger; J Nossen, Institute for Energy Technology; H Holm, P S Johansson, Statoil, Norway

Accounting for flow model uncertainties in gas-condensate field design using the OLGA High Definition Stratified Flow Model
D Biberg, G Staff, N Hoyer, Schlumberger; H Holm, Statoil, Norway

MANAGEMENT OF SOLIDS

Quantitative risk assessment of downhole continuous chemical injection for subsea multiphase production system
D J Peng, A Low, INTECSEA (UK) Ltd, UK

Experiments and modelling of sand erosion in Gas-Liquid Cylindrical Cyclone separators under gas production and low-liquid loading conditions
R E Vieira, S Sajeev, S A Shirazi, B S McAuray, The University of Tulsa; G Kouba, Chevron Energy Technology Company, USA
Discussion of pipeline leakage and hydrate formation risks associated in deepwater natural gas pipelines
S Zhai, C Chauvet, R Azarinezhad, J Zeng, A Priyadarshi, Wood Group Kenny, UK

MODELLING APPLICATIONS

Operating envelope generation to extract maximum value from steady state modelling of multiphase pipelines
J Hinsley, Integrated Process Analysis Ltd; L Liebana, INTECSEA (UK) Ltd, UK

Exploring the potential of model-based optimization in oil production gathering networks with ESP-produced, high water cut wells
M Stanko, NTNU; M Golan, NTNU and MEGO A/S, Norway

Subsea multiphase boosting station system and controls optimization
G Becquin, R Castane Selga, S Abrol, A Busboom, GE Global Research, Germany; D Doder, A Jain, T Glomsaker, GE Oil & Gas; M Hyllseth, C Ruigrok, Kongsberg Oil & Gas Technologies, Norway

FIELD CASE STUDIES

Wax deposition in North Sea reservoir wells: field observations and simulations
P Bartolome, Mærsk Olie og Gas A/S; P Tybjerg, Calsep A/S, Denmark; A Pottayil, Calsep Asia Pacific Sdn Bhd, Malaysia

Performance evaluation of an online transient simulator used in deepwater operations
J M Canon, S Yau, M Fernandes, BP Angola, Angola; K E Lundsbakken, C Trudvang, M Espeland, Schlumberger Information Solutions, Norway

Comparisons between engineering software predictions and West of Africa deepwater field data including thermal performances
C Candelier, F Papot, TOTAL E&P, France

AUTHOR INDEX