CONTENTS

PART A

6TH INTERNATIONAL SYMPOSIUM ON PUMPING MACHINERY

FEDSM2009-78021 ................................................................. 1
Investigation of Closed Valve Operation Using Computational Fluid Dynamics
G. Dyson and J. Teixeira

FEDSM2009-78023 ................................................................. 11
Evaluation of the Flow Inside a Side Channel Pump by the Application of an Analytical Model and CFD
Martin Böhle and Torsten Müller

FEDSM2009-78028 ................................................................. 19
Thermodynamic Effect on a Cavitating Inducer in Liquid Hydrogen
Eric Goncalvés, Julien Rolland, and Guillaume Challier

FEDSM2009-78050 ................................................................. 29
Advancing Suction Performance in Hydrocarbon Liquids
Kevin A. Kaupert and Keijun Kamio

FEDSM2009-78052 ................................................................. 35
Experimental Investigation of the Complete Characteristics of Rotodynamic Pumps
Erkan Ayder, Ayhan N. Ilikan, Mete Sen, Cahit Özgür, Levent Kavurmacıoğlu, and Kadir Kirikköprü

FEDSM2009-78061 ................................................................. 41
Effect of the Section Area of Volute in Low Specific Speed Centrifugal Pumps on Hydraulic Performance
Xiang Zhang, Yang Wang, Jianhui Fu, Cui Dai, and Caihong Wang

FEDSM2009-78064 ................................................................. 51
Effects of Blade Outlet Width on Flow Field and Characteristic of Centrifugal Pumps
Ming-gao Tan, Hou-lin Liu, Shou-qi Yuan, Yong Wang, and Kai Wang

FEDSM2009-78065 ................................................................. 61
Unsteady Flow Numerical Simulation in a Double Channel Pump and Measurements of Pressure Fluctuation at Volute Outlet
Hou-lin Liu, Ming-zhen Lu, Bin-bin Lu, Ming-gao Tan, Yong Wang, and Kai Wang

FEDSM2009-78078 ................................................................. 71
Research on Hydraulic Structure of Low Pressure Pulsations Double-Suction Pumps Based on Unsteady Flow Numerical Simulation
Hong Li, Zhenhua Shen, Liujiin Ji, Jianping Yuan, and Shouqi Yuan

FEDSM2009-78083 ................................................................. 77
Influence of Rotational Speed on Thermodynamic Effect in a Cavitating Inducer
Kengo Kikuta, Yoshiki Yoshida, Tomoyuki Hashimoto, Hideaki Nanri, Tsutomu Mizuno, and Noriyuki Shimiya
Research on Improving Efficiency of High-Pressure Pump in Seawater Reverse Osmosis Desalination
Xiao-yan Ye, Sun-sheng Yang, Jing-ning Hu, Xia-ping Xiao, and Guang-feng Zhou

Pump Sump CFD for Vertical Pump Design
Susanne Krueger, Youcef Ait Bouziad, and Wolfgang Maurer

Numerical Analysis of Airfoil NACA0015 and Centrifugal Pump's Cavitation Characteristic Based on the Thermodynamic Effects
Demin Liu, Shuhong Liu, Yulin Wu, and Hongyuan Xu

Centrifugal Pump Pressure Pulsation Prediction Accuracy Dependence Upon CFD Models and Boundary Conditions
Sang Hyun Park and Gerald L. Morrison

Analysis of the Flow Between the Impeller and Pump Casing Back Face for a Centrifugal Pump
Sang Hyun Park and Gerald L. Morrison

Research on the Design Process of Bellmouth Suction Passage of Vertical Pumping System
Li Cheng and Chao Liu

Dynamic Characteristics of the Radial Clearance Flow Between Axially Oscillating Rotational Disk and Stationary Disk
Hironori Horiguchi, Yoshinori Ueno, Koutaro Takahashi, Kazuyoshi Miyagawa, and Yoshinobu Tsujimoto

Pressure Fluctuations Reduction in Centrifugal Pumps: Influence of Impeller Geometry and Radial Gap
Moisés Solis, Farid Bakir, and Sofiane Khelladi

A Study on Back Flow Structure in a 2-Bladed Helical Inducer at a Partial Flow Rate
Satoshi Watanabe, Naoki Inoue, Koichi Ishizaka, Akinori Furukawa, and Jun-Ho Kim

Demonstration and Validation of a 3-D CFD Simulation Tool Predicting Pump Performance and Cavitation for Industrial Applications
H. Ding, F. C. Visser, Y. Jiang, and M. Furmanczyk

Boyko Tchavdarov, Denairic Hardersen, and Arnie Sdano
Investigation of Hydraulic Design for High Performance Multi-Stage Pump Using CFD
Takahide Nagahara and Yasuhiro Inoue

A Fast 3D Inverse Design Based Multi-Objective Optimization Strategy for Design of Pumps
M. Zangeneh and K. Daneshkhah

Optimization of a Centrifugal Pump Impeller: Coupling a Hybrid Stochastic Method to a Potential Flow Solver
Nikolas Antonakis

Simulated Helical Gear Pump Analysis Using a New CFD Approach
Aaron S. Heisler, John J. Moskwa, and Frank J. Fronczak

CFD Modeling Inside an Electrical Submersible Pump in Two-Phase Flow Condition
Lissett Barrios, Mauricio Gargaglione Prado, and Frank Kenery

Experimental and Numerical Investigation of a Centrifugal Pump Working as a Turbine
Joaquin Fernández, Raúl Barrio, Eduardo Blanco, Jorge Parrondo, and Alfonso Marcos

The Inner Structure and Turbulent Evolution of the Tip Leakage Vortex in an Axial Pump
Part I: Instantaneous Results — Part II: Phase-Averaged Results
Rinaldo L. Miorini, Huixuan Wu, and Joseph Katz

A Modern Pump Design Process for Higher Efficiency and Product Accuracy
Michael Cugal, Stuart Bloomfield, Bo Møller Jensen, and Christian Brix Jacobsen

Experimental Investigation of Flow Instabilities and Rotating Stall in a High-Energy Centrifugal Pump Stage
Stefan Berten, Philippe Dupont, Laurent Fabre, Maher Kayal, Francois Avellan, and Mohamed Farhat

Slurry Pump Casing Wear Prediction Using Numerical Multi-Phase Flow Simulation
Aleksander S. Roudnev, Ronald J. Bourgeois, and Randy J. Kosmicki

Eulerian-Eulerian Modeling of Non-Newtonian Slurries Flow in Horizontal Pipes
Boris M. Bossio, Armando J. Blanco, and Franz H. Hernández
FEDSM2009-78029 ................................................................. 535
Design Curves Utilized for Production Levels Associated With an Ultrafiltration Process
Henry Foust and Malay Ghosehajra

FEDSM2009-78040 ................................................................. 545
Pilot-Scale Hydraulic Testing of Resorcinol Formaldehyde Ion Exchange Resin
Duane J. Adamson

FEDSM2009-78051 ................................................................. 555
Localized Particle Concentration Measurement in Slurry Flows Using A-Scan
Ultrasound Technique
John M. Furlan, Venkat Mundla, Jaikrishnan Kadambi, Nathaniel Hoyt,
Robert Visintainer, and Greame Addie

FEDSM2009-78093 ................................................................. 567
Carrier Phase Turbulence in Fluid-Particle Flows (Plenary)
Clayton T. Crowe and John D. Schwarzkopf

FEDSM2009-78122 ................................................................. 575
Effect of Carbon Nanotube Additives on Drag Reduction in Pipe Flows
Adam Steele, Ilker Bayer, Kenneth Allen, and Eric Loth

FEDSM2009-78125 ................................................................. 579
Liquid-Solid Flows Above Deposit in Pipe: Prediction of Hydraulic Gradient and
Deposit Thickness
Václav Matoušek and Jan Krupička

FEDSM2009-78127 ................................................................. 585
Self-Organization of Fibers in a Suspension Between Two Counter-Rotating Discs
Charlotte Ahlberg, Fredrik Lundell, and Daniel Söderberg

FEDSM2009-78202 ................................................................. 593
Analysis of Physical Properties and Experimental Behaviour of High Turbulent Flow in
Cross-Flow Microfiltration of Acai Juice
Renata Natsumi Haneda and Sérgio Rodrigues Fontes

FEDSM2009-78247 ................................................................. 603
Irradiation and Temperature Effects on Anti-Foam Agent Performance in a Non-Newtonian
Waste Slurry Simulant
Hector N. Guerrero, Mark D. Fowley, and David J. Sherwood

FEDSM2009-78274 ................................................................. 611
Solid-Liquid Flow-Induced Erosion Prediction in Three-Dimensional Pump Casing
Krishnan V. Pagalthivarthi and Robert J. Visintainer

FEDSM2009-78310 ................................................................. 619
Lateral Migration of Neutrally-Buoyant Particles in a Square Microchannel at
Low Reynolds Numbers
Byung Rae Cho, Young Won Kim, and Jung Yul Yoo
FEDSM2009-78333 .......................... 625
CFD Prediction and LDV Validation of Liquid and Particle Velocities in a Submerged Jet
Impinging a Flat Surface for Different Viscosities and Particle Sizes
Yongli Zhang, Risa Okita, Stephen Miska, Brenton S. McLaury, Siamack A. Shirazi, and
Edmund F. Rybicki

FEDSM2009-78580 .......................... 637
Predicting Solid Particle Erosion in Multiphase Flow: Challenges and Success Stories
(Keynote Paper)
Siamack A. Shirazi and Brenton S. McLaury

16TH SYMPOSIUM ON INDUSTRIAL AND ENVIRONMENTAL
APPLICATIONS OF FLUID MECHANICS

FEDSM2009-78138 .......................... 639
Modeling of Immiscible, Two-Phase Flows in a Natural Rock Fracture
Dustin Crandall, Goodarz Ahmadi, and Duane H. Smith

FEDSM2009-78224 .......................... 649
Near-Field Characteristics of a Turbulent Jet With Ring Injectors
Hamid R. Rahai and Shahab Moayedian

FEDSM2009-78225 .......................... 659
Subsonic Venturi Interaction With Free-Stream Flow
Hamid R. Rahai, Huy T. Hoang, Jeremy Bonifacio, and Raymond H. Horstman

FEDSM2009-78253 .......................... 667
Micro Particle Detachment in Turbulent Flows With Electrostatic and Capillary Effects and
Surface Deformation
Xinyu Zhang and Goodarz Ahmadi

FEDSM2009-78335 .......................... 675
Study of Internal Flow and Emulsification Process in a Homogenizer
Takashi Sumitomo, Junichiro Fukutomi, Toru Shigemitsu, Naoki Ishida, and
Yoshio Yoshimura

FEDSM2009-78336 .......................... 685
The Flow Phenomena and the Non-Uniform Filling of the Unvulcanized Rubber in
Process of Filling
Shintarou Sakai, Toru Shigemitsu, Junichiro Fukutomi, and Tukasa Matsuoka

FEDSM2009-78438 .......................... 693
CFD Modeling of Two-Phase Gas-Liquid Slug Flow Using VOF Method in Microchannels
A. Mehdizadeh, S. A. Sherif, and W. E. Lear

FEDSM2009-78547 .......................... 705
Influence of Longitudinal Fluctuation in Long Corridor Surge Tank on Hydraulic Transients
Jian Zhang, Weihua Lu, Xiaodong Yu, and Yu Zheng