

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

VOLUME I, 1995

Offshore Technology & Resources, Gas Hydrates,
Deep-Ocean Mining, Ocean Energy, Environment Techniques,
TLP and Ringing, Floating Structures & Production,
Offshore Systems & Structures, Properties of Soil, Earth Anchors,
Soil Mechanics & Frozen Soil, Foundation

How to Use This Table of Contents

Click on a **blue paper title** you like to view.

This CD-ROM was created upon scanning the papers in the conference proceedings..

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)

LCCN 94-73796

Indexed by Engineering Index and Others

www.isopec.org: orders@isopec.org

Edited by:

Jin S. Chung, Colorado School of Mines, Golden, Colorado, USA

Braja M. Das, California State University, Sacramento, California, USA

Birger J. Natvig, Norwegian Contractors, Stabekk, Norway

Michelle Olgnon, IFREMER, Plouzané, France

Presented at:

The Fifth (1995) International Offshore and Polar Engineering Conference
held in The Hague, The Netherlands, June 11-16, 1995

Organized by:

International Society of Offshore and Polar Engineers

Sponsored by:

International Society of Offshore and Polar Engineers (ISOPE)

Offshore Mechanics and Polar Engineering Council (OMPEC)

with cooperating societies and associations

The publisher and the editors of its publications assume no responsibility for the statements or opinions expressed in papers or presentations by the contributors to this conference or proceedings.

International Society of Offshore and Polar Engineers (ISOPE)
P.O. Box 189, Cupertino, California 95015-0189 USA

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

The Hague, The Netherlands, June 11-16, 1995

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

www.iso-pe.org; meetings@iso-pe.org

ISBN 978-1-880653-16-6 (Set)
LCCN 94-73796

For set of 4 volumes; 2,543 pp.

VOLUME I

Offshore Mechanics and Technology
TLP and Ringing
Floating Structures and Production
Offshore Systems and Structures
Offshore Resources
Gas Hydrates
Deep-Ocean Mining
Ocean Energy
Environment Techniques
Properties of Soil
Earth Anchors
Soil Mechanics and Frozen Soil
Foundation

VOLUME II

Offshore and Arctic Pipelines
Marine Risers
Mechanics of Cables and Mooring
Ice Mechanics
Ice Cover Behavior
Ice-Structure Interactions
Ice Breakers and Transportation
Atmospheric Icing
Russian Arctic
Polar Engineering

VOLUME III

Numerical Waves
Wave Measurements
Wave Breaking and Statistics
Wave-Body Interactions
Hydrodynamic Forces
Dynamic Responses
Higher-Order Effects
Vortex and Vibrations
Coastal Hydrodynamics
Laboratory and Ocean Measurements

VOLUME IV

Tubular Structures
Metals, Welding and Corrosion
Composite Materials
Mechanics and Computational Mechanics
Reliability and Safety
Marine and Ship Technology
Double-Hull Tankers
LNG Carriers

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

The Hague, The Netherlands, June 11-16, 1995

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)
LCCN 94-73796

CONTENTS

VOLUME I, 1995

OFFSHORE RESOURCES AND TECHNOLOGY

Submarine Cable Route Survey

G. Herrouin and T. Sculler 1

Exploration and Development of Oil and Gas Field on the Shelf of Sakhalin

S.M. Bogdanchikov, V.N. Astafiev and E.K. Bojarshin 7

The Northumberland Strait Crossing Project

James A. Feltham 14

PLENARY PRESENTATION

Soil Parameters for Pile Foundations

A. Verruijt 19

ENVIRONMENT TECHNIQUES

Oil Combatting in a Cold Environment Using Bioremediation Techniques

*Jorma Rytkönen, Seppo Liukkonen, Alexei Levchenko, Thomas Worthington, Gennady Matishov
and Vladimir Petrov* 24

Putting the Environment First - Planning for Environmental Soundness: The Northumberland Strait Crossing Project

Randy Vallis 31

Ocean Environmental Change Due to an Offshore Airport in Ariake Bay

Yusaku Kyojuka and Kazutoyo Yokoyama 38

Metocean Input Data For Drift Models Application: Loustic Study

<i>P. Michon, Cdt. Bossart and M. Cabioc'h</i>	44
<u>The Tidal Wave Circulation and Water Quality in Harbor</u>	
<i>Wen-Hen Yang, Juin-Shin Juang and Da-Wei Li</i>	51
<u>Multipurpose ROV System for Underwater Monitoring</u>	
<i>T. Graczyk</i>	60
TLP AND RINGING	
<u>TLP Design Philosophy - Past, Present, Future</u>	
<i>B.J. Natvig and H. Vogel</i>	64
<u>Extreme Steepness of Numerical Model and Laboratory Waves</u>	
<i>Elzbieta M. Bitner-Gregersen, Kim J. Mørk and Carl T. Stansberg</i>	70
<u>Experimental Study of Non-Linear Loads on Vertical Cylinders in Steep Random Waves</u>	
<i>C.T. Stansberg, E. Huse, J.R. Krokstad and E. Lehn</i>	75
<u>Springing and Ringing Due to Nonlinear Waves on a Coupled TLP</u>	
<i>Cheung Hun Kim, Chuntian Zhao and Jun Zou</i>	83
<u>Springing Responses of a Taut-Moored Column-Footing Type Floating Body</u>	
<i>Koichi Masuda, Tomoki Ikoma and Takashi Nagai</i>	90
<u>Higher Order Forces on a Vertical Cylinder in Waves: Comparisons of Experimental and Numerical Results</u>	
<i>Y.-M. Scolan, M. Le Boulluec and D. Martigny</i>	99
<u>High Frequency Effects of Modifications to Morison's Equation on the Response of a TLP</u>	
<i>B.B. Mekha, C.P. Johnson and J.M. Roesset</i>	104
<u>Dynamic Response of Offshore Guyed Towers to Low Frequency Wind Induced Loads</u>	
<i>R.S. Bisht and A.K. Jain</i>	112
<u>Dynamic Behavior of Articulated Single Point Mooring System</u>	
<i>A.K. Jain</i>	119
FLOATING STRUCTURES AND PRODUCTION	
<u>Developments in Dynamic Positioning Systems for Offshore Stationkeeping and Offloading</u>	
<i>A.B. Aalbers, R.B.H.J. Jansen, R.J.P.E. Kuipers and F. Van Walree</i>	125
<u>Pressure Surge Analysis in Tanker Loading/Unloading Systems</u>	
<i>Z. El-Oun and P. Stephens</i>	132
<u>On the Performance of Large Floating Structures with Different Connectors in Waves</u>	
<i>Mikio Takaki, Xin Lin and Yasushi Higo</i>	139

<u>Hydroelastic-Response Analysis of a Box-Like Floating Airport of Shallow Draft</u>	
<i>S. Wang, R.C. Ertekin, A.T.F.M. van Stiphout and P.G.P. Ferier</i>	145
<u>Experimental Modal Analysis on Unit-Linked Large Floating Structure Models</u>	
<i>Ryuji Endo, Takuji Hamamoto, Takehiko Kato, Takayuki Hayashi and Nobuyoshi Tosaka</i>	153
<u>A New Original Approach to the Assessment of Marine Drilling Systems</u>	
<i>Raffaele Romagnoli</i>	159
<u>A Buoyant Leg Structure for the Development of Marginal Fields in Deep Water</u>	
<i>Robert W. Copple and Cuneyt C. Capanoglu</i>	163
 OFFSHORE SYSTEMS AND STRUCTURES	
<u>Deep Water Offshore Jacket Removal</u>	
<i>E.C.P. van Herel, A. Wijninckx and J. Wardenier</i>	169
<u>Experimentally Development of Underwater Abrasive Water Jet Cutting System Using a High-Polymer Mixed Abrasive</u>	
<i>Hitoshi Yamaguchi</i>	176
<u>Features of a Taut Leg Mooring System for Deep Water</u>	
<i>T. Løvstad, J. Namork and A.U. Nilsen</i>	180
<u>Simplified Evaluation of the Capacities of Template-Type Offshore Platforms</u>	
<i>R.G. Bea and M.M. Mortazavi</i>	185
<u>Analysis of Subsea Structure Installation</u>	
<i>I.E. Kopsov and P.C. Sandvik</i>	193
<u>Design and Analysis of SHW Living Quarter</u>	
<i>H.A. Moon, Y.C. Park and Y.S. Bae</i>	200
<u>A Study on the Correlation Between Structural and Environmental Data of an Offshore Platform</u>	
<i>Luciano Galano, Ostilio Spadaccini and Andrea Vignoli</i>	207
<u>Simplified Dynamic Assessment for Fixed Offshore Structures Under Extreme Waves</u>	
<i>W. Visser</i>	215
<u>Image Processing in Offshore Engineering</u>	
<i>Martius V.R. Rodriguez, Marcelo de A. Oliveira, Maria E.T. de Almeida, Celi Lorenzoni and A.J. Ferrante</i>	222
<u>A Network Planning Model for Offshore Structures</u>	
<i>Aysen Ergin, Can Elmar Balas and Engin Keyder</i>	227
<u>CO₂ Miscible Displacement Enhanced Oil Recovery in Dutch North Sea</u>	
<i>P.J.C. Alkemade</i>	231

GAS HYDRATES

Hydrate Formation in Pipelines

Frank Dorstewitz and Dieter Mewes 244

Gas Hydrate Nucleation and Growth Kinetics in Multiphase Transportation Systems

D. Lippmann, D. Kessel and I. Rahimian 250

Hydrate Problems in Pipelines: A Study from Norwegian Continental Waters

David Lysne, Roar Larsen, Åse K. Thomsen and Are Lund 257

Gas Solubility in Saline Water and Its Effect on Hydrate Equilibria

B. Tohidi, A. Danesh, R.W. Burgass and A.C. Todd 263

An Extended Absorption Theory for Hydrate Equilibrium

Bjørn Kvamme 269

How Does CO₂-Hydrate Influence Options for Deep Ocean Carbon Dioxide Deposition?

Per Christer Lund 277

Transport of Natural Gas as Frozen Hydrate

J.S. Gudmundsson, F. Hveding and A. Børrehaug 282

Kinetics of Gas Hydrate Formation and Kinetic Inhibition in Offshore Oil and Gas Operations

Peter Englezos 289

DEEP-OCEAN MINING AND DYNAMICS

Deep Seabed Mining? An Economic and Legal Ordeal

J.P. Lenoble 297

The Effects of Vibration Absorbers with Nonlinear Springs on the Longitudinal Vibration of a Pipe String for Mining Manganese Nodules

Kazuo Aso, Katsushige Kan, Hitoshi Doki and Tetsuya Natori 303

Model Test of Gravity Coring

Tetsuo Yamazaki, Tadaaki Ezawa, Kohei Maeda, Teteki Yoshida and Katsuya Tsurusaki 310

Dynamic Response of Deep-Sea Sediments to the Collector Touch-Down

Tetsuo Yamazaki, Katsuya Tsurusaki and Takahiko Inagaki 315

OCEAN ENERGY

An Experiment-Based Time-Domain Mathematical Model of OWC Power Plants

A.J.N.A. Sarmento and A. Brito-Melo 321

Wave Forces on an Array of Oscillating Water Column Type Free Standing Wave Energy Caissons

S. Neelamani and K. Thiruvenkatasamy 328

<u>Impulse Turbine with Self-Pitch-Controlled Guide Vanes for Wave Power Conversion (Guide Vanes Connected by Link Motion)</u>	
<i>T. Setoguchi, K. Kaneko, H. Taniyama, H. Maeda and M. Inoue</i>	337
<u>Asymmetrical and Fluctuating Performance of the Islay Wells Air Turbine</u>	
<i>R. Curran, S. Raghunathan and T.J.T. Whittaker</i>	343
<u>The Use of Dynamic Simulation as a Tool in the Design of Wells' Turbine</u>	
<i>S.J. McIlwaine, R. Curran, S. Raghunathan, T.P. Stewart and T.J.T. Whittaker</i>	349
<u>Performance of the Contra-Rotating Wells Turbine</u>	
<i>L.M.C. Gato and R. Curran</i>	355
<u>Aerodynamic Performance of Contra-Rotating Wells Turbine for Wave Energy Conversion</u>	
<i>S. Raghunathan and W.C. Beattie</i>	363
<u>Utilising Tidal Currents to Generate Electricity in Orkney and Shetland</u>	
<i>Ian G. Bryden, Colin Bullen and Oliver Paish</i>	370
PROPERTIES OF SOIL	
<u>Geotechnical Study of Marine Clays of Recent and Pleistocene Deposits in Osaka Bay</u>	
<i>Research Committee on Geotechnical Information of Osaka Bay Seabed Deposits, Chairman: Tamotsu Matsui</i>	377
<u>Physical Properties and Mechanical Behavior of Clays with Saline Pore Fluid</u>	
<i>Masayoshi Shimizu</i>	385
<u>Engineering Properties of the Hydraulic-Filled Sand</u>	
<i>John C. Li, C.J. Jeng, C.Y. Lin and C.J. Lee</i>	392
<u>Effect of Sample Disturbance on Undrained Strength Anisotropy</u>	
<i>Takaharu Shogaki, Hayato Moro and Misao Kaneko</i>	400
<u>Statistical Properties of Soil Data Within Thinwalled Samplers</u>	
<i>Takaharu Shogaki, Hayato Moro and Keiji Kogure</i>	406
EARTH ANCHORS	
<u>Holding Capacity of Plate Anchors in Sand: A Review</u>	
<i>B.M. Das and Gurdev Singh</i>	414
<u>Dynamic Response of Suction Pile Anchor in Poroelastic Seabed Due to Mooring Force</u>	
<i>Yoshi-hiko Maeno, Tomiya Takatani, Tetsuya Hiraishi and Tomotsuka Takayama</i>	420
<u>Effect of Jetting on Footing Penetration and Pullout</u>	
<i>Sheng S. Lin</i>	426

<u>Dynamic Response of Friction Anchor with End Bearing Plate for Mooring System of Floating Structure</u>	
<i>Tomiya Takatani, Yoshi-hiko Maeno, Tetsuya Hiraishi and Tomotsuka Takayama</i>	430
 SOIL MECHANICS	
<u>Geotechnical Investigation in New Seoul Metropolitan Airport Site</u>	
<i>Eun Chul Shin, Kyu-Jin Lee and Bang-Woong Shin</i>	436
<u>Improvement of Soft Sea Bed by Dewatering with Vertical Drain</u>	
<i>Tej B.S. Pradhan, Masaaki Kiyama, Masahiro Okamoto and Toshiroh Maida</i>	442
<u>Potential Causes for Slope Instabilities of Under-Consolidated Marine Sediments</u>	
<i>Ph. Quéménéur, P. Cochonat, J.-F. Bourillet, V. d'Oultremont, J.-P. Tisot, J.-L. Colliat and R. Tofani</i>	448
<u>A Practical Application of Two-Dimensional Finite Strain Consolidation Theory</u>	
<i>Robert Yun-Pin Chin and Guang-Yih Sheu</i>	454
 SOIL DYNAMICS AND FROZEN SOIL	
<u>Liquefaction of Soils</u>	
<i>Vijay K. Puri, Shamsher Prakash and Sanjeev Kumar</i>	461
<u>The Effects of Preshearing Stress on the Dynamic Behaviors on Saturated Sand</u>	
<i>Robert Yun-Pin Chin</i>	466
<u>Creep and Yield Model of Frozen Soil Under Triaxial Compression</u>	
<i>Anatoly M. Fish</i>	473
<u>Settlement of Breakwater on Submarine Soil Due to Wave-Induced Liquefaction</u>	
<i>F. Oka, A. Yashima, K. Miura, S. Ohmaki and A. Kamata</i>	482
<u>The Axial Loading of Foundations Embedded in Frozen Soils</u>	
<i>A.P.S. Selvadurai and J. Hu</i>	488
 FOUNDATION	
<u>A Simple Approach for Calculating Pile Skin Friction in Clays</u>	
<i>U.A.A. Mirza</i>	496
<u>Influence of Model Choice on the Calculated Reliability of a Single Pile</u>	
<i>W.T. Lai, B.M. Das and G. Singh</i>	505
<u>Behaviour of Instrumented Model Batter Piles in Clays</u>	
<i>S. Narasimha Rao and C. Veeresh</i>	511
<u>Finite Element Analysis of a Model Scale Footing on Clean and Oil Contaminated Sand</u>	
<i>E. Evgin, M. Boulon and B.M. Das</i>	517

<u>Numerical Simulation of Pipe Penetration in Non-Homogeneous Soil</u>	
<i>Y. Hu and M.F. Randolph</i>	522
<u>Analysis of Laterally Loaded Pile Groups in Clay</u>	
<i>S. Narasimha Rao and V.G.S.T. Ramakrishna</i>	527
<u>Simplifying Transformations for the Analysis of Shallow Foundations on Sand</u>	
<i>Roy Butterfield and Guido Gottardi</i>	534
<u>Instrumented Model Pile Tests on Sand Plugs</u>	
<i>L.J.C. van Haaren, H.J. Kolk and A. Verruijt</i>	539
<u>Effect of Void on Shallow Foundation on Geogrid-Reinforced Layered Soil</u>	
<i>Braja M. Das and K.H. Khing</i>	544
<u>Cyclic Load-Induced Settlement of a Square Shallow Foundation With and Without Geogrid Reinforcement</u>	
<i>B.W. Shin, B.C. Yeo, B.M. Das, S.U. Shin and S.W. Oh</i>	548
<u>Improvement Effects of Quicklime Pile on Soft Cohesive Soils</u>	
<i>Ming-jiu Hung, Huei-wen Chang and Hin-Chi Lei</i>	555
 ADDITIONAL PAPERS	
<u>Norwegian Petroleum Resources with Focus on Challenges and Opportunities in the Barents Sea</u>	
<i>Finn Roar Aamodt</i>	560
<u>Three-Dimensional Coupled Responses of a Vertical Deep-Ocean Pipe: Effect of Periodic Internal Flow on Shear Stress</u>	
<i>Peter D. Rogers and Jin S. Chung</i>	567
<u>Onshore Wave Energy Resource: Methodology and Tools for the Assessment</u>	
<i>M. T. Pontes</i>	575
<u>Strength Computation of Pin Connections Through Three-Dimensional Finite Element Idealisation</u>	
<i>Y.S. Choo, K.H. Lee, S.H. Wong and T. Zhuang</i>	580
<u>The First Controlled Descent of a Large Subsea Structure</u>	
<i>Kjell Arne Nyhus and Helge Røraas</i>	589
<u>Offshore Wave Energy Experiment</u>	
<i>Kim Nielsen, N. Christian Scholten and Kjeld Aaby Sørensen</i>	596
<u>Review of Probability Based Limit State Design</u>	
<i>Ton Vrouwenvelder</i>	603
<u>Extreme Response of Deep Water Structures in Directional Seas</u>	
<i>P. Teigen</i>	609

The Hydrodynamics of a Wave-Power Device in a Tapered Harbour

B.P.Ó Gallachóir, A.J.N.A. Sarmiento and G.P. Thomas615

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

VOLUME II, 1995

Offshore and Arctic Pipelines, Marine Risers,
Mechanics of Cables & Mooring, Ice Mechanics, Ice Cover Behavior,
Ice-Structure Interactions, Ice Breakers & Transportation, Atmospheric Icing,
Russian Arctic, Polar Engineering

How to Use This Table of Contents

Click on a **blue paper title** you like to view.

This CD-ROM was created upon scanning the papers in the conference proceedings..

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)
LCCN 94-73796

Indexed by Engineering Index and Others
www.isopec.org: orders@isopec.org

Edited by:

Jin S. Chung, Colorado School of Mines, Golden, Colorado, USA
Mohamed Sayed, National Research Council Canada, Ottawa, Canada
A.M. Gresnigt, Delft University of Technology, Delft, The Netherlands

Presented at:

The Fifth (1995) International Offshore and Polar Engineering Conference
held in The Hague, The Netherlands, June 11-16, 1995

Organized by:

International Society of Offshore and Polar Engineers

Sponsored by:

International Society of Offshore and Polar Engineers (ISOPE)
Offshore Mechanics and Polar Engineering Council (OMPEC)
with cooperating societies and associations

The publisher and the editors of its publications assume no responsibility for the statements or opinions expressed in papers or presentations by the contributors to this conference or proceedings.

International Society of Offshore and Polar Engineers (ISOPE)
P.O. Box 189, Cupertino, California 95015-0189 USA

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

The Hague, The Netherlands, June 11-16, 1995

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)
LCCN 94-73796

CONTENTS

VOLUME II, 1995

PLENARY PRESENTATION

<u>Engineering Repercussions of Ocean Wave Propagation in Ice-Infested Seas</u> <i>Vernon A. Squire</i>	1
--	---

OFFSHORE AND ARCTIC PIPELINES

<u>Seabed Irregularity in Subsea Pipeline Spanning</u> <i>Naum Y. Kershenbaum and Gary E. Harrison</i>	8
<u>Pipeline Cover Stability</u> <i>W.H.G. Klomp and P. Lomonaco Tonda</i>	15
<u>Abrasive Water Suspension Jet - A Multifunctional Working Tool for Underwater Applications</u> <i>C. Brandt, H. Louis, G. Meier and G. Tebbing</i>	23
<u>Design of In-line MFL Inspection Tools Using 2-D and 3-D Finite Element Calculation</u> <i>Poul Laursen, Jukka Mäki and David L. Atherton</i>	30
<u>The Geotechnical Design of the Baydaratskaya Bay Pipeline Crossing</u> <i>James M. Oswell, Alan J. Hanna, Jan Willem Leussink and J.F. (Derick) Nixon</i>	34
<u>Instrumentation and Monitoring of Large-Diameter Natural Gas Pipelines Operating at Sub-Zero Temperatures in the United Kingdom</u> <i>D.P. Greene, R.J. Kettle and E. Middleton</i>	41
<u>Theory and Practice of Installing Pipelines by the Pre-Snaking Method</u> <i>H.R. (Ed) Vermeulen</i>	47
<u>Numerical Analysis of Pipeline Dynamics in Seabed Laying</u> <i>V. Tikhonov, A. Safronov, M. Kamyshev and N. Figarov</i>	53

<u>High Temperature Snaking Behaviour of Pipelines</u> <i>Svein Sævik and Erik Levold</i>	63
<u>Intermittent Three-Phase Flow of Oil, Water and Gas in Horizontal Pipes</u> <i>M. Nädler and D. Mewes</i>	72
<u>Expansion Analysis of Offshore Pipelines Close to Restraints</u> <i>Han S. Choi</i>	81
<u>Upheaval Buckling Behaviour of Flexible Flowlines</u> <i>Elie Kodaissi</i>	89
<u>Buckling of Offshore Pipelines</u> <i>Shue-Yeong Chi and Yaw-Jeng Chiou</i>	95
<u>Transient Thermal Stresses in Pressure Vessel and Pipelines</u> <i>E.P. Russo, P.D. Herrington and W.W. St. Cyr</i>	102
<u>Three-Dimensional Nonlinear Responses to Impact Loads on Free-Span Pipeline: Torsional Coupling and Load Steps</u> <i>Jin S. Chung, Bao-rong Cheng and H.-P. Huttelmaier</i>	109
<u>Pipeline Seabed Interaction, Free Span Development</u> <i>W.H.G. Klomp, E.A. Hansen, Z. Chen, R. Bijker and M.B. Bryndum</i>	117
<u>Deep Sea Pipeline Collapse Under Combined Loads of External Pressure, Bending, and Tension</u> <i>Robin Li and Richard D. Haun</i>	123
<u>Review of Free Spanning Pipelines</u> <i>Kjell Arild Anfinsen</i>	129
<u>Evaluation of Fishing Gear Induced Pipeline Damage</u> <i>C.P. Ellinas, B. King and R. Davies</i>	134
<u>Hydrodynamic Forces on Piggyback Pipelines</u> <i>M.L. Jakobsen and P. Sayer</i>	142
<u>Wave Force Evaluation on the Kalstø Pipeline Concrete Tunnel</u> <i>Alf Tørum, Martin Mathiesen, Knut Waagaard and Henning Carlsen</i>	147
<u>Flow Field Along a Flat Surface with a Parallel Placed Cylinder</u> <i>Y. Yüksel, V. Atli and E. Özkan (Çevik)</i>	157
<u>The Irregular Wave Induced Seepage Force on the Bottom of a Circular Cylinder</u> <i>Dahong Qiu and Qilong Wang</i>	162
<u>Scale Effects When Investigating Wave-Induced In-Line Forces on a Cylinder Horizontally Placed Near the Bottom</u> <i>W. Dursthoff and A. Sakout</i>	170

<u>Forces on Pipelines in Oblique Attack: Steady Current and Waves</u>	
<i>Andrzej Kozakiewicz, Jørgen Fredsøe and B. Mutlu Sumer</i>	174

RISERS, CABLES AND MOORING

<u>A Design of Flexible Riser Pipe with Composite Material</u>	
<i>Y. Makino, T. Fuku, K. Ishii, M. Yoshizawa and H. Wada</i>	184

<u>Steel Catenary Risers for Deep Water Applications</u>	
<i>C.P. Pesce, J.A.P. Aranha, C.A. Martins and M.O. Pinto</i>	190

<u>Optimal Control of the Heave Motion of Marine Cable/Subsea-Unit Systems</u>	
<i>S. Huang and D. Vassalos</i>	203

<u>Importance of Nonlinearities in Static and Dynamic Analyses of Marine Risers</u>	
<i>YeongSoo Bae and Michael M. Bernitsas</i>	209

<u>Iterative Frequency Domain Solution for Nonlinear Riser Response</u>	
<i>Amiya Kumar Basu</i>	219

<u>Nonlinear Static and Dynamic Analysis of Three-Dimensional Flexible Risers</u>	
<i>Takashi Sakamoto and Roger E. Hobbs</i>	227

<u>Effects of Flexible Joints on the 3-D Nonlinear Coupled Responses of a Long Vertical Pipe</u>	
<i>Bao-Rong Cheng, Jin S. Chung and Zhao-Chang Zheng</i>	236

MECHANICS OF CABLES AND MOORING

<u>Effect of Axial Deformation on the Equilibrium Configurations of Marine Cables</u>	
<i>Somchai Chucheepsakul, Tseng Huang and Pichet Laohapotjanart</i>	244

<u>Model Experiments on Thruster Assisted Mooring System</u>	
<i>Masahiko Nakamura, Wataru Koterayama and Hiroyuki Kajiwara</i>	249

<u>Anchor Mooring Line Configuration Analysis</u>	
<i>S. Bang and R.J. Taylor</i>	255

<u>Axial Fatigue Characteristics of Large Diameter Spiral Strands</u>	
<i>Amir Alani and Mohammed Raouf</i>	260

<u>Behaviour of Large Diameter Wire Ropes</u>	
<i>Mohammed Raouf and Ivana Kraincanic</i>	266

<u>Modelling Axial Compression Fatigue in Fibre Ropes</u>	
<i>J.W.S. Hearle, R.E. Hobbs, M.S. Overington and S.J. Banfield</i>	273

AUV, ROV & ROBOTICS

<u>Map Based Navigation for Autonomous Underwater Vehicles</u>	
<i>S.T. Tuohy, J.J. Leonard, J.G. Bellingham, N.M. Patrikalakis and C. Chryssostomidis</i>	278
<u>Field Experiments on an Intelligent Towed Vehicle "Flying Fish"</u>	
<i>W. Koterayama, S. Yamaguchi and M. Nakamura</i>	287
<u>Numerical and Experimental Analysis of Flow Past X-35 Hull</u>	
<i>T. Sarkar, P.G. Sayer and S.M. Fraser</i>	292
<u>Study on the Control System of the Underwater Manipulator</u>	
<i>Eiji Shintaku and Yoichi Ogawara</i>	299
<u>Climbing Robot for Underwater Cleaning</u>	
<i>H. Haferkamp, Fr.-W. Bach, M. Rachkov and J. Seevers</i>	305
ICE TECHNOLOGY AND RUSSIAN ARCTIC	
<u>The Creep of Saline Ice at Low Stresses and High Temperatures</u>	
<i>Jacqueline A. Richter-Menge and Gordon F.N. Cox</i>	312
<u>On the Indentation of a Blunt Ice Wedge</u>	
<i>A.P.S. Selvadurai and K. Sepehr</i>	317
<u>Shear Strength of Ice Rubble in Laboratory Tests</u>	
<i>Eila Lehmus and Tuomo Kärnä</i>	323
<u>Yield Conditions of an Assembly of Discrete Ice Floes</u>	
<i>Mohamed Sayed, Venkata R. Neralla and Stuart B. Savage</i>	330
<u>Finite Element Analysis of the Creep of Debris Containing Thin Ice Bodies</u>	
<i>F. Azizi and W.B. Whalley</i>	336
<u>Satellite Remote Sensing Tools for Sea Ice Engineering</u>	
<i>Alain Cavanié, Robert Ezraty and Francis Gohin</i>	342
ICE COVER BEHAVIOR	
<u>Potential Resistance of the Kara Sea Ice Cover</u>	
<i>V.P. Gavrilov, S.M. Kovalev, G.A. Lebedev and O.A. Nedoshivin</i>	345
<u>Short Term Variations of Sea Ice Cover</u>	
<i>L.E. Chouinard, L. Garrigues, V.R. Neralla and V.R. Neralla</i>	349
<u>Interannual Variability of the Ice Cover in the Chukchi and Beaufort Seas</u>	
<i>L.E. Chouinard, L. Garrigues and V.R. Neralla</i>	357
<u>Seismic Activity of Landfast Ice</u>	
<i>V.A. Nikitin, V.N. Smirnov, A.I. Shushlebin and I.B. Sheikin</i>	364

<u>Seasonal Variability of Sea Ice Sizes and Thickness on the Northern Sakhalin Shelf</u>	
<i>A.M. Polomoshnov, P.A. Truskov and S.A. Pokrashenko</i>	369

ICE-STRUCTURE INTERACTIONS

<u>Simulation of the Ice-Structure Interaction Under the Parabolic Strength Criterion for Ice</u>	
<i>D.G. Matskevitch</i>	374

<u>Abrasion Mode of a Circular Cylindrical Concrete Structure Due to Sea Ice Movement</u>	
<i>Yoshishige Itoh, Yoshihiro Tanaka, Alberto Delgado and Hiroshi Saeki</i>	381

<u>Dynamic Responses of Highway Bridge Under Shock Forces of Icefloe</u>	
<i>Zhi-rui Cai, Jin-ji Li, Xiao-ming Sun, Xian-yi Men and De-yi Jin</i>	389

<u>The Structure of Internal Stresses in the Uncompacted Ice Cover</u>	
<i>K.K. Sukhorukov</i>	393

<u>Mechanisms of Ice Gouging</u>	
<i>Shinji Kioka and Hiroshi Saeki</i>	398

<u>Ice-Structure Dynamic Interaction: Failure Ice Model</u>	
<i>Alexander T. Bekker</i>	403

<u>Joint Probability of Environmental Loads on Marine Structures</u>	
<i>De Fu Liu, Yong Chun Yang, Chao Wang and Jian Gang Shi</i>	408

<u>Recent Advances in Ice Interaction and Force Estimation Processes for Vertical Structures</u>	
<i>A.V.M. Arunachalam</i>	412

ICE BREAKERS AND TRANSPORTATION

<u>Ice Conditions Along the North-East Passage in View of Ship Trafficability Studies</u>	
<i>Kaj Riska</i>	420

<u>Statistics of Ice-Structure Interaction</u>	
<i>Juri Kajaste-Rudnitski</i>	428

<u>Influence of Cavitation on the Performance of Canadian R-Class Icebreaker Propellers in Blocked Flows</u>	
<i>Dan Walker, Neil Bose, Hajime Yamaguchi and Stephen J. Jones</i>	434

<u>Investigation of Ice-Resistant Coatings Used to Protect Ice-Breaker Hull</u>	
<i>V.A. Babsev and G.P. Shemendjuk</i>	440

<u>Influence of Saline Frozen Ground on VLF and LF Radio Wave Propagation Parameters in the Arctic Shore Regions</u>	
<i>A.D. Frolov and I.V. Fediukine</i>	444

ATMOSPHERIC ICING

<u>New Ideas on Aircraft Icing Forecast: First Example and Experiences</u>	
<i>Werner Fuchs and Klaus-Peter Schickel</i>	451
<u>Video Monitoring of Atmospheric Icing</u>	
<i>J.B. Wareing and P.A. Chetwood</i>	456
<u>Cable Twisting Due to Atmospheric Icing</u>	
<i>Pierre McComber, Jacques Druetz and Konstantin Savadjiev</i>	461
<u>Experimental Verification of a Pendant Ice Formation Model</u>	
<i>Krzysztof Szilder, Tom Forest and Edward P. Lozowski</i>	469
<u>A Study of Surface Conductivity and Flashover Voltages of Ice Samples Formed Under Various Freezing Conditions</u>	
<i>M. Farzaneh, X. Chen and J. Zhang</i>	476
<u>Structure of Ice Grown on High Voltage Conductors</u>	
<i>M. Farzaneh, J. Bouillot, Y. Teisseyre, E.C. Svensson and R.L. Donaberger</i>	482

RUSSIAN ARCTIC

<u>Challenges for the Development of Hydrocarbon Fields in the Barents Sea</u>	
<i>Ove T. Gudmestad, Arnt Olufsen and Per Strass</i>	485
<u>Petroleum Exploration Opportunities on the U.S.-Russia Chukchi Sea Continental Shelf</u>	
<i>T. Warren, K.W. Sherwood, D.K. Thurston, V.F. Kruglyak, S.A. Zerwick, O.V. Shcherban and A.V. Grevtsev</i>	493
<u>Northern Gateway Oil Terminal Study: Phase 1</u>	
<i>Tor K. Vikhamar and Marsel Gubaydulin</i>	501
<u>New Challenges for the Pipeline Engineer in the Russian Arctic</u>	
<i>R.J. Brown</i>	507

POLAR ENGINEERING

<u>Observations of Sea Ice and Icebergs in the Western Barents Sea During the Winter of 1987</u>	
<i>Sveinung Løset and Torkild Carstens</i>	514
<u>A Method of Estimating Sea Ice Flexural Strength Based on Hydrometeorological Data</u>	
<i>V.P. Gavrilov, S.M. Kovalev, G.A. Lebedev and O.A. Nedoshivin</i>	521
<u>The Ocean Drilling Program in Fram Strait: A Case Study of the Use of Ice Charts to Predict the Probability of Ice-Free Conditions</u>	
<i>Peter Wadhams and Maria Pia Casarini</i>	529
<u>Operating Requirements for and Historical Operations of Arctic Offshore Drilling Systems</u>	

in the United States

Jim Regg, John Breitmeier and Jeff Walker537

ADDITIONAL PAPERS

Reliability Based Pipeline Design and Integrity Assessment: Pipeline Industry on the Verge

T. Bjornsen, O. Hagen and K.J. Mork 540

Pore-Pressure Gradients in the Proximity of a Submarine Buried Pipeline

W. Magda 548

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

VOLUME III, 1995

Numerical Waves, Wave Measurements,
Wave Breaking & Statistics, Wave Body Interactions, Hydrodynamic Forces,
Dynamic Responses, Higher-Order Effects, Vortex & Vibrations,
Coastal Hydrodynamics, Laboratory & Ocean Measurements

How to Use This Table of Contents

Click on a **blue paper title** you like to view.

This CD-ROM was created upon scanning the papers in the conference proceedings..

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)

LCCN 94-73796

Indexed by Engineering Index and Others

www.isopec.org: orders@isopec.org

Edited by:

Jin S. Chung, Colorado School of Mines, Golden, Colorado, USA

Hisaaki Maeda, University of Tokyo, Tokyo, Japan

C.H. Kim, Texas A & M University, College Station, Texas, USA

Presented at:

The Fifth (1995) International Offshore and Polar Engineering Conference
held in The Hague, The Netherlands, June 11-16, 1995

Organized by:

International Society of Offshore and Polar Engineers

Sponsored by:

International Society of Offshore and Polar Engineers (ISOPE)

Offshore Mechanics and Polar Engineering Council (OMPEC)

with cooperating societies and associations

The publisher and the editors of its publications assume no responsibility for the statements or opinions expressed in papers or presentations by the contributors to this conference or proceedings.

International Society of Offshore and Polar Engineers (ISOPE)
P.O. Box 189, Cupertino, California 95015-0189 USA

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

The Hague, The Netherlands, June 11-16, 1995

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)
LCCN 94-73796

CONTENTS

VOLUME III, 1995

PLENARY PRESENTATION

<u>Recent Progress in Numerical Wave Tank Research: A Review</u> <i>C.H. Kim</i>	1
---	---

NUMERICAL WAVES

<u>On the Generation and Propagation of Waves in 2D Numerical Wave Tanks</u> <i>Giorgio Contento and Sebastiano Casole</i>	10
<u>Weakly Nonlinear Diffraction Due to Vertical Cylinders in a 3-D Numerical Wave Tank</u> <i>S.Y. Boo and C.H. Kim</i>	19
<u>Development of Multi-Face Directional Random Wave Maker</u> <i>T. Hiraishi, T. Kanazawa and H. Fujisaku</i>	26
<u>Nonlinear Viscous Wavefields Generated by a Piston-Type Wavemaker</u> <i>Ching-Jer Huang, En-Cheng Zhang and Jaw-Fang Lee</i>	34
<u>A Unique Solvable Higher Order BEM for Wave Diffraction and Radiation</u> <i>B. Teng and Y.C. Li</i>	42
<u>Directional Random Wave Kinematics: Third Order of Approximation</u> <i>L. Rebaudengo Landò and G. Scarsi</i>	49
<u>The Characteristics of the Mean Velocity in the Turbulent Wave Boundary Layer Induced by Nonlinear Waves</u> <i>Shamsul Alam Chowdhury, Micho Sato and Masaaki Chaen</i>	57
<u>Numerical Study on the Energy Loss and the Wave Attenuation Over the Rippled Bed</u> <i>Yasunori Watanabe, Hiroshi Saeki and Ken-ichiro Hamanaka</i>	64

<u>Various Boussinesq Solitary Wave Solutions</u>	
<i>George T. Yates</i>	70
<u>Representation of Pierson-Moskowitz Type Spectrum in Time Domain</u>	
<i>Shigeru Naito and Munehiko Minoura</i>	77
<u>Numerical Simulation and Spectral Analysis of Irregular Sea Waves</u>	
<i>Celso K. Morooka and Irineu H. Yokoo</i>	82
 WAVE MEASUREMENTS	
<u>Wave Climate Assessment by Satellite Remote Sensing</u>	
<i>Stephen F. Barstow and Harald E. Krogstad</i>	90
<u>Combined Use of Satellite Data, Metocean and Prediction Models for a Site Study</u>	
<i>Patrick Charriez, Hafed Hajji and Vincent Thouvenin</i>	98
<u>Wave Measurements for the Design of the Hamidabad Natural Gas Pipeline System</u>	
<i>Adnan Akyarli</i>	105
<u>The Use of Bottom-Mounted Vertical Surface-Piercing Cylinders to Determine Wave Field Characteristics</u>	
<i>N. Haritos</i>	112
<u>GPS and GIS Integration in Cable Laying Applications</u>	
<i>B. Nakos, V. Balis and C. Liapakis</i>	120
 WAVE BREAKING AND STATISTICS	
<u>Breaking Wave and Void Fraction Statistics During Swade</u>	
<i>Ming-Yang Su</i>	126
<u>A Third-Order Random Wave Model</u>	
<i>Arne Nestegård and Trond Stokka</i>	136
<u>An Environmental Friendly Coastal Structure: Piled Breakwater</u>	
<i>M. Sedat Kapdasli and Yalcin Yuksel</i>	143
<u>Comparative Study of Wave Height Distributions</u>	
<i>John Z. Yim, S.-L. Shih and M.-Y. Lai</i>	148
 WAVE-BODY INTERACTIONS	
<u>Performance of Submerged Wave Focusing Structures in a Current</u>	
<i>J.W. Lee and K.F. Cheung</i>	154
<u>An Approximated Solution for Scattering of Oblique Waves by an Array of Piles of</u>	

<u>an Arbitrary Cross Section</u>	
<i>Shohachi Kakuno, Keiichi Yamano and Katsuhiko Kurata</i>	162
<u>Characteristics of Short-Crested Waves and Currents Behind Offshore Man-Made Island Type Power Plant</u>	
<i>Masaaki Ikeno, Ryoichi Kajima, Masafumi Matsuyama and Tsutomu Sakakiyama</i>	168
<u>A Study of Waterwave Motion Over the Elastic Structure</u>	
<i>Su-Liek Shih and Hui-Min Fang</i>	176
<u>Study of Interaction Among Artificial Island Skew Waves and Viscous Currents¹</u>	
<i>Decheng Wan, Yingzhong Liu and Guoping Miao</i>	182
 HYDRODYNAMIC FORCES	
<u>Wave Forces on Horizontal Cylinders at Low Keulegan-Carpenter and Reynolds Numbers</u>	
<i>Wataru Koterayama and Changhong Hu</i>	189
<u>Circular Cylinders Freely Oscillating in Both Waves and Slow Current</u>	
<i>Takeshi Kinoshita and Weiguang Bao</i>	196
<u>Vertical Hydrodynamic Forces on Truncated Hollow Cylinders</u>	
<i>David C. Weggel and Jose M. Roesset</i>	206
<u>Extreme Wave Kinematics and Impact Loads on a Fixed Truncated Circular Cylinder</u>	
<i>J. Zou and C.H. Kim</i>	216
<u>On the 3-D Pulsating Source of Michell's Type with Forward Speed</u>	
<i>G.P. Miao, Y.Z. Liu, Q.Z. Yang and Z.Y. Liu</i>	226
<u>Propagation of Numerical Errors in Hydrodynamic Coefficients to the Response of Floating Structures</u>	
<i>Shin-ichi Aoki</i>	234
<u>On Computing Nearly Singular Kernel Integral on Curved Surface Panels</u>	
<i>Shukai Wu</i>	240
<u>On the Vertical Distribution of Wave Impact Pressures</u>	
<i>G.U. Müller and T.J.T. Whittaker</i>	244
<u>Simulation of Nonlinear Waves and Forces Due to Transient and Steady Motion of Submerged Sphere</u>	
<i>C.C. Lee, Y.H. Liu and C.H. Kim</i>	249
<u>Wave Forces on a Submerged Sphere by Bichromatic Waves</u>	
<i>Norimi Mizutani and Koichiro Iwata</i>	258
<u>Wave Interaction with Two Vertical Cylinders</u>	
<i>Xian-Chu Zhou, Dong-Jiao Wang and Allen T. Chwang</i>	266

<u>Three-Dimensional Effects on Wave Forces on Horizontal Members of a Semisubmersible</u>	
<i>Koji Otsuka, Yoshiho Ikeda and Koki Ikeda</i>	273
<u>Time Domain Computation of Nonlinear Diffraction Loads Upon Three Dimensional Floating Bodies</u>	
<i>Pierre Ferrant</i>	280
<u>The In-Line Wave Forces on Small Square Cylinder</u>	
<i>Yu-cheng Li and Ming He</i>	289
<u>First Order Wave Loads in Beam Waves</u>	
<i>J.M.J. Journée and A.P. van 't Veer</i>	297
<u>Computation of Hydrodynamic Loads on a Bottom-Mounted Surface Piercing Cylinder</u>	
<i>P.C.A. de Haas, P.J.F. Berkvens, J. Broeze, E.F.G. van Daalen and P.J. Zandbergen</i>	304
<u>Hydrodynamic Force Computations on Yawed and Surface-Piercing Bodies</u>	
<i>B. Ponizy, M. Ba and M. Guilbaud</i>	308
<u>Nonlinear Diffraction Effects Around a Surface-Piercing Structure</u>	
<i>F. Lalli, A. Di Mascio and M. Landrini</i>	314
<u>Loading on a Vertical Cylinder Near Mean Water Level in Long- and Short-Crested Waves</u>	
<i>Kesavan Subbiah, John R. Chaplin and Mehernosh B. Irani</i>	324
<u>Wave Loads on Inclined Cylinders Due to Random Waves</u>	
<i>G. Anand Kumar, V. Sundar, K.U. Graw and H. Kaldenhoff</i>	332
<u>Hydrodynamic Forces Induced by a Solitary Wave on a Submerged Circular Cylinder</u>	
<i>A. Clément and S. Mas</i>	339
<u>Forces and Circulation of Horizontal Cylinders Submerged in Regular Waves</u>	
<i>Shinichi Arai</i>	348
<u>Evaluation of Capacities of Template-Type Gulf of Mexico Platforms</u>	
<i>R.G. Bea, K.J. Loch and P.L. Young</i>	356
<u>Responses of a Spar Platform in Random Waves and Currents (Experiment vs. Theory)</u>	
<i>Z. Ran, M.H. Kim, J.M. Niedzwecki and R.P. Johnson</i>	363
<u>Wave Radiation by a Submerged Elliptical Disk</u>	
<i>S. Zhang and A.N. Williams</i>	372
DYNAMIC RESPONSES	
<u>Far-Field Fluid-Structure Interaction: A Comparison Between the Doubly Asymptotic and Plane Wave Approximations</u>	
<i>F.H. Hamdan and R.E. Hobbs</i>	378
<u>Optimal Allocation of Multiple Flexible Modes for a Large Circular Floating Island with</u>	

<u>Ring-Shaped Breakwater</u>	
<i>Takuji Hamamoto, Tatsuro Asami, Masaki Tokubuchi and Yasuo Tanaka</i>	384
<u>Three Dimensional BEM-FEM Coupled Dynamic Analysis of Module-Linked Large Floating Structures</u>	
<i>Takuji Hamamoto and Ken-ichi Fujita</i>	392
<u>Wave Response Analysis of a Flexible Floating Structure by BE-FE Combination Method</u>	
<i>Tomoaki Utsunomiya, Eiichi Watanabe, Chong Wu, Nobuyuki Hayashi, Koji Nakai and Kinji Sekita</i>	400
<u>Dynamic Behaviors of a Floating Airport and Its Effects on Ocean Current</u>	
<i>Yoshiyuki Inoue, Makoto Arai, Shigeru Tabeta, Kazuhiro Nakazawa, Xuangang Zhang and Yasumasa Takei</i>	406
<u>Hydrodynamic Interaction Effects in Waves</u>	
<i>J.A. Pinkster</i>	414
<u>Dynamic Response of Moored Semi-Submersible Platforms to Non-Collinear Wave, Wind and Current Loading</u>	
<i>O. Yilmaz and A. Incecik</i>	420
<u>Numerical Prediction for Response Motion of Floating Structures Subjected to Seaquakes</u>	
<i>Tetsushi Kiyokawa</i>	429
<u>Sliding Analysis of Softly Installed Offshore Structures with Liquid Storage Tanks Due to Earthquake</u>	
<i>Yoshihiro Tanaka, Toshihiko Tsuka and Ajai Sulekh</i>	435
<u>Seismic Response Reductions of Offshore Platform</u>	
<i>Kenji Kawano, K. Venkataramana, Takahiro Komasa and Takeshi Iida</i>	443
<u>The Motion of a Floating Flexible Disk Under Wave Action</u>	
<i>Michael H. Meylan</i>	450
<u>Transient Survival Analysis of a Moored Floating Offshore Platform: Unbiased</u>	
<i>J.M. Falzarano, F. Zhang, S. Vishnubhotla and R. Kota</i>	456
<u>Nonlinear Response of a Spar in Deep Water: Different Hydrodynamic and Structural Models</u>	
<i>B.B. Mekha, C.P. Johnson and J.M. Roesset</i>	462
<u>Effect of Additive Noise on Parametrically Excited Ship Rolling</u>	
<i>C.Y. Liaw</i>	470
<u>Estimates of Eigen Periods of an Anti-Rolling Tank Using the Finite Difference Method</u>	
<i>Satoru Yamaguchi and Akiji Shinkai</i>	477
<u>The Simulation of the Swath Ship Motion with Fixed Fin in Longitudinal Waves</u>	
<i>Ming-Chung Fang and Bing-Nan Lin</i>	484
<u>Numerical Modeling of Wave Interaction with Two-Dimensional Floating Bodies in Shallow Water</u>	

<i>Wataru Kioka and Sinji Hiraoka</i>	492
<u>A Numerical Study of Moored Vessel Response to Beam Waves</u>	
<i>Michael Isaacson and Song-Ren Wu</i>	499
HIGHER-ORDER EFFECTS	
<u>Effects of Directional Waves on the Statistical Characteristics of Low-Frequency Motions of a Floating Offshore Structure</u>	
<i>S. Miyajima, H. Maeda and Hyo Jae Jo</i>	507
<u>The Effect of Cross-Flow Conditions on the Wave Drift Forces of a Ship Sailing in Waves</u>	
<i>R.H.M. Huijsmans</i>	516
<u>New Stochastic Approach for Extreme Response of Slow Drift Motion of Moored Floating Structures</u>	
<i>Shunji Kato and Takashi Okazaki</i>	526
<u>Viscous Mean Drift Forces on Moored Semi-Submersibles</u>	
<i>A.K. Dev and J.A. Pinkster</i>	535
<u>Mean Drift Loads on Multiple Vertical Axisymmetric Bodies in Regular Waves</u>	
<i>S.A. Mavrakos</i>	547
<u>Slow Drift Oscillation of a Barge Moored in the Vicinity of a Large Marine Structure</u>	
<i>Yukinobu Oda, Akio Kobayashi and Koichi Masuda</i>	556
<u>PC-Based Computation for Second-Order Wave Loads on Large Volume Multi-Column Structures</u>	
<i>M.H. Kim, B.J. Natvig, R.S. Mercier, G. Gu and C. Wu</i>	561
<u>Low Frequency Non-Linear Motions of a Moored Ship in Regular and Irregular Waves</u>	
<i>Tadeusz Szelangiewicz</i>	571
VORTEX AND VIBRATIONS	
<u>A Nonlinear Oscillator Model for Vortex Shedding From a Forced Cylinder. Part 1: Uniform Flow and Model Parameters</u>	
<i>Richard A. Skop</i>	578
<u>A Nonlinear Oscillator Model for Vortex Shedding From a Forced Cylinder. Part 2: Shear Flow and Axial Diffusion</u>	
<i>Richard A. Skop</i>	582
<u>Experimental/Numerical Mapping and Analysis of the Nearfield Flow Around a Cylinder in Planar Oscillatory Farfield Flow</u>	
<i>I.A. Sibetheros, R.W. Miksad and K.F. Lambrakos</i>	587
<u>Prediction of Transition Features in the Flow Past a Circular Cylinder in Three-Dimensions</u>	

<i>H. Persillon, M. Braza and G. Jin</i>	597
<u>Synchronization of Vortex Shedding from an Oscillating Cylinder in Uniform Flow</u>	
<i>Shigeru Nishio and Atilla Incecik</i>	603
<u>Impulsive Flow Around Cylinders by a Low-Order Panel Method</u>	
<i>Iskender Sahin and Noriaki Okita</i>	611
<u>Drag Reduction and Vibration Suppression of a D-Section Structural Member Through Momentum Injection</u>	
<i>S.R. Munshi, V.J. Modi and T. Yokomizo</i>	618
<u>Inline Forces Under Lock-In Conditions</u>	
<i>Zhijie Wu and Geir Moe</i>	626
<u>Forces on a Vibrating Cylinder in Current Under Lock-In Condition</u>	
<i>Zhijie Wu</i>	632
<u>Experimental Study on Development of Add-On Vortex Suppression Device</u>	
<i>Sun H. Kwon, Jin W. Cho and Junsoo Park</i>	639
<u>Visualization of an Unconfined Vortical Flow</u>	
<i>B.C. Khoo, K.S. Yeo and D.F. Lim</i>	645
<u>Toroidal Bubbles Near a Rigid Boundary</u>	
<i>Q.X. Wang, K.S. Yeo, B.C. Khoo and K.Y. Lam</i>	653
<u>Fluid-Structure Interactions Behind a Curved Cylinder with a Great Bend</u>	
<i>Marc Aubrée, Michel BÉlorgey and Michel Lebey</i>	661
COASTAL HYDRODYNAMICS	
<u>Interaction of Sediment Flux with Breakwater Constructions</u>	
<i>S.I. Rogachko and T.G. Smirnova</i>	667
<u>Hydrodynamic Actions on the Crest Element of a Rubble Mound Submerged Structure</u>	
<i>Edoardo Benassai, Alberto Bracci Laudiero, Giuseppe Paoletta and Stefano Corsini</i>	670
<u>A Hybrid Movement Grid System for Simulation of Storm Surge</u>	
<i>Jiemin Zhan, Y.S. Li and Diming Zhang</i>	676
<u>Vortical Flow and Material Transport in a Rectangular Basin with a Straight Breakwater</u>	
<i>Yong Kweon Suh and Jong Choon Moon</i>	680
<u>Solitary Wave Action on a Vertical Wall</u>	
<i>Zhao-Chen Sun</i>	685
<u>An Investigation on Random Wave Breaking</u>	
<i>M.S. Kapdasli, M. Bayazit and I. Duranyildiz</i>	690

LABORATORY AND OCEAN MEASUREMENTS

<u>Parametric Decomposition of Velocity Components on the Basis of Irregular Wave Data</u> <i>L. Zhan and W. Dursthoff</i>	695
<u>The Application of Particle Image Velocimetry (PIV) to Offshore Engineering</u> <i>C. Gray and T. Bruce</i>	701
<u>Experimental Study of Internal Waves Using Particle Image Velocimetry</u> <i>A.J. Martin and W.J. Easson</i>	709
<u>Wave Kinematics Measurements with a Surface Following Velocity Probe</u> <i>Stefan Woltering and Karl F. Daemrich</i>	715
<u>Numerical Modelling of Pore-Pressure Measurements in Saturated Sandy Seabed Sediments</u> <i>W. Magda</i>	721

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

VOLUME IV, 1995

**Tubular Structures,
Metals, Welding & Corrosion, Composite Materials,
Mechanics & Computational Mechanics, Reliability & Safety,
Marine & Ship Technology, Double-Hull Tankers, LNG Carriers**

How to Use This Table of Contents

Click on a **blue paper title** you like to view.

This CD-ROM was created upon scanning the papers in the conference proceedings..

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)

LCCN 94-73796

Indexed by Engineering Index and Others

www.isopec.org: orders@isopec.org

Edited by:

J.F. Dos Santos, GKSS Forschungszentrum Geesthacht, Geesthacht, Germany

Ivar Langen, Hogskole i Stavanger, Stavanger, Norway

Charles P. Ellinas, Advanced Mechanics & Engineering, Croydon, United Kingdom

Yukio Ueda, Welding Research Institute, Osaka University, Osaka, Japan

Presented at:

The Fifth (1995) International Offshore and Polar Engineering Conference
held in The Hague, The Netherlands, June 11-16, 1995

Organized by:

International Society of Offshore and Polar Engineers

Sponsored by:

International Society of Offshore and Polar Engineers (ISOPE)

Offshore Mechanics and Polar Engineering Council (OMPEC)

with cooperating societies and associations

The publisher and the editors of its publications assume no responsibility for the statements or opinions expressed in papers or presentations by the contributors to this conference or proceedings.

International Society of Offshore and Polar Engineers (ISOPE)
P.O. Box 189, Cupertino, California 95015-0189 USA

The Proceedings of The Fifth (1995) International OFFSHORE AND POLAR ENGINEERING CONFERENCE

The Hague, The Netherlands, June 11-16, 1995

Copyright © 1995 by International Society of Offshore and Polar Engineers,
Golden, Colorado, USA. All Rights Reserved.

ISBN 978-1-880653-16-6 (Set)
LCCN 94-73796

CONTENTS

VOLUME IV, 1995

TUBULAR STRUCTURES

Tensile and Shear Behavior of Undermatched Welded Joints

M. Ferrel and R.J. Dexter 1

Proposed Ultimate Capacity Equations for CHS KK-Joints Under Anti-Symmetrical Loads

Y. Makino, Y. Kurobane, S.R. Wilmshurst and M.M.K. Lee 6

The Static Behaviour of Multiplanar Tubular Steel TT-Joints Excluding the Effects of Chord Bending

G.J. van der Vegte and J. Wardenier 12

Parametric Study on the Static Strength of Uniplanar and Multiplanar Plate to RHS Column Connections

L.H. Lu and J. Wardenier 21

Behaviour of Plate Trunnions Subjected to Shear Loads

Y.S. Choo, K. Padmanaban, N.E. Shanmugam and J.Y. Richard Liew 29

Influence of the Chord Bending on the Ultimate Capacity of RHS T-joint

Y. Yu and J. Wardenier 37

Prediction of Elastic-Elastoplastic Deformation and Bend Radius at Top Roll Contact in Multipass Plate Bending Using a Continuous Four-Roll Plate Bending Process for Forming Tubular Sections

M. Hua, K. Baines, D.H. Sansome and W.L. Xu 45

Corrosion Fatigue of Welded High-Strength Cast and Structural Steel Joints Under Constant and Variable Amplitude Loading

C.M. Sonsino, K. Lipp and E. Lachmann 53

Fatigue Crack Growth of Tubular Joints Under Stochastic and Complex Loadings

<i>A. Abel, S. Wu and X. Yu</i>	59
<u>Performance of Tubular Members Under Cyclic Axial Loads</u>	
<i>Raafat E. Shaker, Hidekazu Murakawa and Yukio Ueda</i>	66
<u>Fatigue Strength of Boxing Fillet Welded Joints for TMCP Type 490 MPa-Class High Tensile Steel Plates</u>	
<i>H. Yajima, M. Iwata, Y. Huang, M. Yamamoto, D. Sakai, E. Watanabe, K. Inoue and A. Fushimi</i>	75
<u>Stress Intensity Factors for Small Fatigue Cracks in Tubular Joints</u>	
<i>C.C. Monahan and W.D. Dover</i>	83
<u>A Computational Strategy to Assess the Safety Conditions of Cracked Tubular Joints</u>	
<i>L.A. Souza, L.V.S. Sagrilo, E.C.P. de Lima and N.F.F. Ebecken</i>	91
<u>Parametric Study on the Static Strength of Axially Loaded Multiplanar Plate to Circular Column Connections</u>	
<i>G.D. de Winkel and J. Wardenier</i>	96
<u>The Stress and Strain State in the Base Area of Wind-Loaded Steel Chimneys</u>	
<i>W. Schneider and R. Thiele</i>	104
<u>Ultimate Capacity of Multi-Planar Double X-Joints</u>	
<i>C.Y. Chong, C.K. Soh, A.K. Soh, T.C. Fung and S.P. Chiew</i>	109
<u>Grouted Sleeve Tubular Splices</u>	
<i>Paul Grundy</i>	116
 MATERIALS, WELDING AND CORROSION	
<u>Effect of Some Image Processing on the Seam Tracking by a Welding Robot with Visual Sensor</u>	
<i>Yasuo Suga</i>	121
<u>Arc Spot Welding Technique for Underwater Use</u>	
<i>H. Koga, Y. Ide and Y. Ogawa</i>	127
<u>Analysis of Acoustic Signals on CO₂ Arc Welding</u>	
<i>Y. Ogawa, H. Koga, T. Morita and T. Sumitomo</i>	131
<u>Approach for Laser Beam Welding Under Hyperbaric Conditions</u>	
<i>T. Franz, E. Schubert and G. Sepold</i>	137
<u>Underwater Plasma-MIG Arc Welding: Shielding Technique and Pressure Reduction by a Centrifugal Pump</u>	
<i>M. Creutz, J. Bartzsch, D. Mewes and U. Draugelates</i>	141
<u>Evaluation of Thermal Sprayed Coating by Ultrasonic Method</u>	
<i>Yasuo Suga and Derming Lian</i>	147
<u>Influence of Inevitable Uncertainties on Inspection Planning for Deteriorating Structures</u>	

<i>Yukio Fujimoto, Eiji Shintaku and Sung Chan Kim</i>	153
<u>Development of Real-Time Quality Evaluation of Friction Welding by Acoustic Emission: Report 1</u>	
<i>S.K. Oh, J.H. Oh, T.E. Jeon and S.W. Oh</i>	163
<u>Simulation Model of Fatigue Crack Opening/Closing Phenomena for Predicting RPG Load Under Arbitrary Stress Distribution Field</u>	
<i>M. Toyosada and T. Niwa</i>	169
<u>Dual-Phase Ferritic Martensitic Steel for Concrete Reinforcement</u>	
<i>David Trejo, Paulo Monteiro and Gareth Thomas</i>	177
<u>X-Mas Trees: A New Application for Duplex Stainless Steels</u>	
<i>G. Hochörtler, G. Zeiler and K. Haberfellner</i>	183
<u>Modern Structural Steels with Improved Properties Through Accelerated Cooling</u>	
<i>H.J. Tschersich, U. Schriever, J. Bobbert and Ch. Kuntze</i>	187
<u>Study on Fatigue Strength of Boxing Fillet Weldments: 1st Report</u>	
<i>Yasumitsu Tomita, Kiyoshi Hashimoto, Kuniteru Ishikawa, Hiroshi Yamamoto and Tetsuji Fukuoka</i>	197
<u>Probabilistic Modelling of Marine Corrosion of Steel Specimens</u>	
<i>Robert E. Melchers</i>	204
<u>X-Ray Fractographic Study on Fracture Surface of New Light Metal</u>	
<i>Hideaki Matsuoka, Yukio Hirose, Shigenobu Takahashi, Zenjiro Yajima and Yoichi Kishi</i>	211
<u>Corrosion-Fatigue Crack Growth Behavior of Surface Crack on AH36 TMCP Steel Weld in Seawater</u>	
<i>Young Gak Kweon, Hee Don Jeong and Rae Woong Chang</i>	216
<u>Probabilistic Residual Strength Assessment of Corroded Pipelines</u>	
<i>I.R.(Wally) Orisamolu, Q. Liu and M.W. Chernuka</i>	221
 COMPOSITE MATERIALS	
<u>Beryl Bravo - Blast Walls Conversion: Development and Testing of Steel/Carbon Fibre Composite</u>	
<i>D.N. Galbraith and F. Barnes</i>	229
<u>Beryl Bravo - Blast Walls Conversion: Explicit Dynamic FE Analysis of Steel/Carbon Fibre Composite Wall</u>	
<i>P.H.L. Groenenboom, D.N. Galbraith, P.G. Jay and P.J. van der Weijde</i>	237
<u>Fatigue Crack Propagation Characteristics of Alumina Ceramics</u>	
<i>Hiroshi Noguchi and Kazuya Mori</i>	243
<u>Dynamic Toughness of Composite Steel-Concrete Structure of Sandwich System</u>	
<i>Setsuo Iwata and Yoichi Hattori</i>	248

<u>Influence of Boundary Conditions and Plate Geometries on Buckling Optimization of Symmetric Laminate Plates</u>	
<i>Hsuan-Teh Hu</i>	256
<u>An Inverse Problem of Estimating Temperature Dependent Thermal Conductivity in Composite Material</u>	
<i>Cheng-Hung Huang and Jan-Yuan Yan</i>	264
<u>Durability Issues of FRP Composites in Offshore Structures</u>	
<i>Piyush K. Dutta</i>	271
<u>Fabrication of Ceramic Matrix Composites from Preceramic Polymers</u>	
<i>H. Jao, N. Masuda, A. Chin and J. Don</i>	277
<u>Carbon-Carbon Composites Reinforced with SiC by Using Chemical Vapor Infiltration Technique</u>	
<i>Arthur Chin, Jarlen Don and Hsuehchung Jao</i>	280
 MECHANICS AND COMPUTATIONAL MECHANICS	
<u>An Automated Method for Accomplishing Shape Optimization of Cylindrical Composite Structures</u>	
<i>A.A. Gates and J.H. Clark</i>	283
<u>Effect of Specimen Configuration for Caustics Method</u>	
<i>Masayuki Shozu, Yuichi Kawagishi, Toshihiko Sasaki and Yukio Hirose</i>	289
<u>An Improved Spectral Method for Vibration of a Tubular Structure: Theory and Application</u>	
<i>A.M. Horr</i>	294
<u>Vibration Analysis of a Large Underwater Shell of Revolution</u>	
<i>Y. Yasuzawa, K. Kagawa and H. Takahashi</i>	300
<u>A New Approach for Bending of Rectangular Plates with Mixed Boundary Conditions</u>	
<i>T. Mifune, R. Masuo and M. Hamada</i>	308
<u>Analysis of the Cracking and Strength of the Pile Caps of the High-Pile Wharf</u>	
<i>Yu-pu Song and Guo-fan Zhao</i>	314
<u>Optimization of Steel and Titanium Stressjoints for Marine Risers</u>	
<i>Carl M. Larsen and Allard van Hoeken</i>	320
<u>An Automatic Data Generation Procedure for Finite Element Structural Analysis of Ships</u>	
<i>J.G. Shin and S.W. Park</i>	327
<u>Damage Detection Accuracy as a Function of Model Uncertainty in Offshore Jacket Platforms</u>	
<i>Jeong-Tae Kim and Norris Stubbs</i>	333

RELIABILITY AND SAFETY

<u>Optimal Reliability-Based Planning of Experiments for POD Curves</u>	
<i>J.D. Sørensen, M.H. Faber and I.B. Kroon</i>	339
<u>Reliability Based Inspection Scheduling of Floaters</u>	
<i>T. Onoufriou, R.J. Simpson and M. Protopapas</i>	346
<u>Environmental Description for Long-Term Load Response of Ship Structures</u>	
<i>Elzbieta M. Bitner-Gregersen, Espen H. Cramer and Florus Korbijn</i>	353
<u>Reliability Updating Based on Equality Constraints</u>	
<i>Ø. Hagen, G. Sigurdsson, L. Tvedt and E.H. Cramer</i>	361
<u>Reliability Analysis of a Deep Water Flexible Riser System</u>	
<i>Daniel Karunakaran, Arnt Olufsen, Nils T. Nordsve and Bernt J. Leira</i>	365
<u>Reliability Based Design of a 15" Dynamic Flexible Gas Export Riser</u>	
<i>A.U. Nilsen and T.D. Hanson</i>	373
<u>Structural Safety Assessment of Floating Bridge System</u>	
<i>I.S. Nho, B.C. Shin and J.B. Kim</i>	383
<u>Effects of Wave-Current and Fluid-Structure Interactions on Fatigue Damages of Offshore Structures</u>	
<i>H. Karadeniz</i>	389
<u>Fatigue Reliability Calculation for Structure Members of Offshore Fixed Platform</u>	
<i>Huacan Fang and Fayan Xu</i>	394
<u>A Risk Based Approach to Re-Assessment of Existing North Sea Installations</u>	
<i>J.V. Sharp, J.C. Kam and M. Birkinshaw</i>	399
<u>Risk Management</u>	
<i>M. Visser</i>	405
<u>A Methodology for Assessing and Managing Fire and Life Safety for Offshore Production Platforms</u>	
<i>William E. Gale, Jr., William H. Moore, Robert G. Bea and Robert B. Williamson</i>	409
<u>PARLOC - Pipeline and Riser Loss of Containment: North Sea Experience</u>	
<i>C.P. Ellinas, D.T. Smart, J. Robertson and T. Al-Hassan</i>	420
<u>Assessment of Fire Pump Caisson Integrity</u>	
<i>C.P. Ellinas and T. Weir</i>	428
<u>Reassessment of Mining Installations on the Dutch Continental Shelf: A Rational Approach</u>	
<i>M.J.J. Rottier and E.M. Hofstee</i>	437

MARINE AND SHIP TECHNOLOGY

<u>Double Hull Grounding Experiments</u> <i>James L. Rodd and Jerome P. Sikora</i>	446
<u>Damage and Collapse of Double Hull Tankers in Groundings</u> <i>J.K. Paik and T.K. Lee</i>	457
<u>Dynamic Loading and Strength of a Stranded Double Hull Tanker in Waves</u> <i>J.O. de Kat, P. Lemmen, C.S. Moore and A.W. Vredeveldt</i>	465
<u>Experimental Study on Control of Autopilot System</u> <i>Bong Joo Han, Kyoung Soo Bae, Sang Bong Kim and Seoung Gun Kim</i>	471
<u>A Revolutionary Design of Double Hull Oil Tanker</u> <i>Takehiko Akiba, Kimio Kitano, Yutaka Sumikama, Hiroyuki Tsukuda, Masatsugu Toyofuku, Kohta Shibasaki, Joe Hah and Koichi Furukawa</i>	478
<u>Theoretical and Experimental Study of the Bending Propulsion Mechanism</u> <i>K. Ono and M. Nakashima</i>	486
<u>Design and Commissioning of a Computer Controlled Dynamometer for Testing Oscillating Hydrofoils</u> <i>David Greening and Neil Bose</i>	495
<u>Introduction of Energy Estimations in the Linear Wave Theory for Calculations of Ship Wave Resistance</u> <i>E.L. Amromin, O.P. Orlov and Yu.S. Timoshin</i>	502
<u>Force and Free Surface Elevation Measurements on a Series 60 $C_B=0.6$ Ship Model in Forced Oscillations</u> <i>F. Guyot and M. Guilbaud</i>	507
<u>Investigation of Towing Resistance of Rectangular Platform Lower Base</u> <i>A.V. Poustoshniy</i>	515
<u>Simulation of Three-Dimensional Finite-Depth Wave Phenomenon for Moving Pressure Distributions</u> <i>Iskender Sahin and Mark C. Hyman</i>	521
<u>The Rankine Source Method Applied to the Determination of the Potential Flow Around a Submerged Body with Constant Forward Velocity</u> <i>M. Szajn bok and M. de Conti</i>	528
<u>The Rankine Source Method Applied to the Determination of the Potential Flow Around an Oscillating Submerged Body with Constant Mean Forward Velocity</u> <i>M. de Conti and M. Szajn bok</i>	536

ADDITIONAL PAPERS

Multidiscipline Dynamic Simulation of the New Veslefrikk Personnel Transfer Bridge

Terje Rølvåg, Ole Ivar Sivertsen, Hans Petter Hildre and Åge Ø Waløen 545

PROC-95-CONTENT