

ExHFT-5

5th World Conference on Experimental Heat Transfer, Fluid Mechanics, and Thermodynamics

Thessaloniki, 24-28 September 2001



Organized by

THE ASSEMBLY OF WORLD CONFERENCES
ON EXPERIMENTAL HEAT TRANSFER, FLUID MECHANICS AND THERMODYNAMICS

and

ENEA INSTITUTE OF THERMAL-FLUID DYNAMICS
DEPARTMENT OF MECHANICAL ENGINEERING, ARISTOTLE UNIVERSITY OF THESSALONIKI
DEPARTMENT OF ENERGETICS, UNIVERSITY OF PISA

with participation of the

INTERNATIONAL CENTRE FOR HEAT AND MASS TRANSFER (ICHMT)

and

ITALIAN UNION OF THERMAL-FLUID-DYNAMICS (UIT)

FINAL PROGRAM

SCIENTIFIC COMMITTEE

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LEAD SCIENTISTS

F. Arinç, Middle East Technical University, Ankara, Turkey
H. Auracher, Technische Universität Berlin, Berlin, Germany
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L. Maroti, KFKI Atomic Energy Research Institute, Budapest, Hungary
L.F. Melo, University of Porto, Porto, Portugal
D. Mewes, University of Hannover, Hannover, Germany
J. Meyer, Rand Afrikaans University, Auckland Park, South Africa
A.S. Mujumdar, National University of Singapore, Singapore
V.E. Nakoryakov, Siberian Branch of Russian Academy of Sciences, Novosibirsk, Russia
T. Niioka, Tohoku University, Sendai, Japan
O-J. Nydal, Norwegian University of Science and Technology, Trondheim, Norway
D.D. Papailiou, University of Patras, Patras-Rio, Greece
S. Petrescu, Bucharest, Romania
C. Pisoni, Università di Genova, Genova, Italy
A.T. Prata, Federal University de Santa Catarina, Florianopolis, Brazil
R. Radermacher, University of Maryland, College Park, USA
U. Renz, RWTH Aachen, Aachen, Germany
N. Selçuk, Middle East Technical University, Ankara, Turkey
M. Shoukri, Mc Master University, Hamilton, Canada
T. Skiepko, Bialystok Technical University, Bialystok, Poland
B. Sunden, Lund Institute of Technology, Lund, Sweden
P. Tartarini, Università di Modena e Reggio Emilia, Modena, Italy
A. Taylor, Imperial College, London, UK
C.W.M. van der Geld, Technische Universiteit Eindhoven, Eindhoven, The Netherlands
V.V. Wadekar, AEA Technology Engineering Software, Harwell, UK
G. Yadigaroglu, Institut für Energietechnik ETH, Zurich, Switzerland
J.Y. Yoo, Seoul National University, Seoul, Korea
S.M. Zubair, King Fahd University of Petroleum & Minerals, Dhahran, Saudi Arabia
I. Zun, University of Ljubljana, Ljubljana, Slovenia

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We are happy to welcome you to ExHFT-5, the 5th World Conference on Experimental Heat Transfer, Fluid Mechanics, and Thermodynamics. Authors from over 40 countries have contributed to this Conference.

The objectives of ExHFT-5 are to bring together again experimental researchers and those in industry who are active in the areas of thermal and fluid science and engineering, to exchange their expertise, experiences and insights in many research areas in a spirit of cooperation and friendship, and to further stimulate their research activities. All participants will have an opportunity to become informed on:

- advances in the understanding of basic phenomena of heat transfer and fluid flow through conventional and sophisticated experiments
- the state-of-the-art in experimental techniques and instrumentation
- innovative applications of research results in an interdisciplinary environment
- validity of experimental results in many fields
- definition and needs for further measurements
- experience gained and lessons learned from new measuring techniques and design of research facilities

VENUE

Location

The Conference will be held in Thessaloniki, Greece. Thessaloniki, the second largest city in Greece with a population of 1.000.000, is one of the oldest cities in Europe. It stretches over twelve kilometres in a bowl formed by low hills facing a bay that opens into the Gulf of Thermaikos. Founded about 315 B.C., on a site of old prehistoric settlements going back to 2300 B.C., by Cassander, king of Macedonia, it was named after his wife, Thessaloniki, the sister of Alexander the Great. Since then, Thessaloniki has become the main city of Macedonia and its most important commercial port.

Among the numerous monuments from Roman and Byzantine times are those from the Roman period, the Triumphal Arch of Galerius and the Rotonda. Many churches whose fine mosaics and wall-paintings are representative of various periods of Byzantine art have survived to enhance the image of the city. They include St. Demetrius, Panagia (Virgin) Acheiropoietus (i.e. not made by human hand), the Holy Apostles, St. Sophia, St. Catherine, Panagia Chalkeon (i.e. of the coppersmiths), St. Nicholas the Orphan, the Prophet Elijah, and the Monastery of Vlatadon. Large sections of the city-walls are still standing, including the landmark of the city, the White Tower. Also, noteworthy from a national, spiritual and cultural viewpoint are the continuing strong bonds between the city of Thessaloniki and Mt. Athos.

The modern era of material and cultural development in Thessaloniki dates from its liberation from the Turkish occupation in 1912. Thessaloniki then became the major city of Northern Greece. The Ministry of Macedonia and Thrace, the Cathedral, and a Court of Justice, in addition to other major Government institutions, are situated in the city. The town has two quite distinct sectors: The "old town", which is continuously undergoing reconstruction, and the modern sector, with many examples of advanced architecture.

In addition to the University of Thessaloniki, there are numerous institutions that contribute to the academic and cultural life of the city. Among them are the University of Macedonia, the Thessaloniki Polytechnic (TEI), the Archaeological and Byzantine Museums, the Folklore Museum, the State Conservatory, Theatre and Orchestra, the Society of Macedonian Studies and the Institute of Balkan Studies.

Thessaloniki is a flourishing city which thrives on financial activities and is one of the most significant trade and communication centres in the Mediterranean. It has an international airport, a port providing facilities to other Balkan countries, an internationally important industrial complex and an annual International Trade Fair. During 1997 Thessaloniki was the Cultural Capital of Europe.

Meeting Place

The Conference will take place from 24 to 28 September 2001, at the HELEXPO Conference Center J. Germanos, 154 Egnatia Street, 546 36 Thessaloniki, Greece.

Liability and Insurance

It is regretted that neither the organizers nor Eurostar-Travel Plan can accept any responsibility for injury or damage to persons or property during the Conference. Participants are, therefore, kindly requested to arrange their own insurance.

PRESENTATION OF PAPERS

Presentation of papers will be in the oral format. As the time allocated for each paper is 20 minutes, speakers are requested to timing their presentation in 13-15 minutes maximum highlighting the main features of their work, leaving 5-7 minutes for discussion. Session chairs will be very strict on time to ensure an appropriate running of the parallel session and the flow of attendees from one session to another. Overhead transparencies projector and projector for Power Point presentations will be available. Speakers are requested to bring their own notebook. Slide projector is available upon request.

OPEN FORUM SESSION

Due to the interest in the Conference and the tight deadlines necessary for the preparation of a reviewed papers meeting, it has not been possible for the Organisers to include all of the potential presentations whose abstracts were submitted after the deadlines. Having had a number of enquiries about the availability of making presentations on material which is precluded because of the above reasons, the Organisers have decided to include an Open Forum Session in the Conference. These papers ARE NOT included in the Conference Proceedings. Presentations in this session ONLY will be given in the poster format. Details on the poster presentation have been given to authors before the Conference. Although the posters can be displayed the whole week, authors are requested to stay in front of their poster for discussion with participants on WEDNESDAY 26 SEPTEMBER from 14:00 to 15:00.

SOCIAL DINNER

The social dinner will be held at the Yachting Club, Themistoki Sofouli Street, on Wednesday 26 at 20:30.

REGISTRATION

Fees

Full registration	600 Euro
Student (certification required)	550 Euro
Accompanying persons	60 Euro

Full and student registrations include participation to all technical sessions, a copy of bound Conference proceedings, lunches and coffee-breaks during the days of the Conference, and a banquet on September 26 evening (details at the registration).

Accompanying persons fee includes participation to the banquet on September 26.

The Grecian currency is the Greek Drachma (GRD). Drachma is part of the Euro currency system and the fixed exchange rate is 1 EUR = 340.75 GRD

Registration Hours

Sunday 23 15:00 - 19:00
Monday 24 through Thursday 27 08:30 - 12:30 & 14:30 - 17:30
Friday 28 08:30 - 12:30

METHODS OF PAYMENT

By credit card (Visa, MasterCard, Eurocard, American Express)

Cash, Major currencies may be accepted at the exchange rate of the day.

SYNOPSIS

start	end	Monday 24	Room 1	Room 2	Room 3	Room 4	Room 5
9:30	10:00	Welcome Address & Nu-Re Prize					
10:00	10:40	Nusselt-Reynolds Lecture 1 (Bergles)					
10:40	11:20	Nusselt-Reynolds Lecture 2 (Adrian)					
11:20	11:40	Coffee-Break					
11:40	12:20	Keynote Lecture 1 (Azzopardi)					
12:20	13:00	Keynote Lecture 2 (Grassi)					
13:00	14:00	Lunch					
14:00	14:40	Keynote Lecture 3 (Brouwers)					
14:40	16:20	Sessions (24/1)	JE-AR	MT-IMT 1	TH-FPB 1	HTE 1	TH-PD 1
16:20	16:40	Coffee-Break					
16:40	18:20	Sessions (24/2)	JE-IHT	MT-IMT 2	TH-FPB 2	HTE 2	TH-PD 2
18:20		End of Sessions					
		Tuesday 25					
8:20	9:00	Keynote Lecture 4 (Zum)					
9:00	10:40	Sessions (25/1)	JE-GE 1	MT-IMT 3	MM-BF	HTE 3	TH-TBL 1
10:40	11:00	Coffee-Break					
11:00	12:40	Sessions (25/2)	JE-GE 2	MT-IMT 4	PEA-HEX 1	TT-RC 1	TH-TBL 2
12:40	13:40	Lunch					
13:40	14:20	Keynote Lecture 5 (Karabelas)					
14:20	16:00	Sessions (25/3)	JE-GE 3	MT-IMT 5	PEA-HEX 2	TT-RC 2	MM-DD
16:00	16:20	Coffee-Break					
16:20	18:20	Sessions (25/4)	MM-TJ TH-SWP 1	TT-MT 1	PEA-HEX 3	BO-FB	MM-FS
18:20		End of Sessions					
		Wednesday 26					
8:20	9:00	Keynote Lecture 6 (Azevedo)					
9:00	11:00	Sessions (26/1)	TH-SWP 2	TT-MT 2 FD-RF	NR 1	PEA-IA	MM-BD
11:00	11:20	Coffee-Break					
11:20	13:00	Sessions (26/2)	TT-HR	BO-CHR	NR 2	CF-NC 1	CO-GE 1
13:00	14:00	Lunch					
14:00	15:00	Open Forum Session					
20:30	24:00	Social Dinner					

start	end	Thursday 27	Room 1	Room 2	Room 3	Room 4	Room 5
8:20	9:00	Keynote Lecture 7 (Kobayashi)					
9:00	9:40	Keynote Lecture 8 (Aleksenko)					
9:40	10:20	Keynote Lecture 9 (Kataoka)					
10:20	10:40	Coffee-Break					
10:40	12:20	Sessions (27/1)	CN 1	TH-TLF 1	TT-FMS	CF-NC 2	CO-GE 2
12:20	13:20	Lunch					
13:20	14:00	Keynote Lecture 10 (Auracher)					
14:00	15:40	Sessions (27/2)	CN 2	TH-TLF 2	BO-PB 1	CF-NC 3	CO-EM
15:40	16:00	Coffee-Break					
16:00	16:40	Keynote Lecture 11 (Kandlikar)					
16:40	18:20	Sessions (27/3)	TH-UF 1	TH-TLF 3 MT-TP 1	BO-PB 2	CF-NMC	CO-ER
18:20		End of Sessions					
		Friday 28					
8:20	9:00	Keynote Lecture 12 (Yoo)					
9:00	10:40	Sessions (28/1)	TH-UF 2	MT-TP 2	BO-BHT 1	MM-AS	MM-PDD
10:40	11:00	Coffee-Break					
11:00	11:40	Keynote Lecture 13 (Sacadura)					
11:40	13:20	Sessions (28/2)	FD-VF 1	TNB-GE 1	BO-BHT 2	MM-GE	CF-CHT
13:20	14:20	Lunch					
14:20	15:00	Keynote Lecture 14 (Nishioka)					
15:00	16:40	Sessions (28/3)	FD-VF 2	TNB-GE 2	FD-GE	MM-FL	TH-NC
16:40		Closure					

Session Keyword

BO - Boiling Heat Transfer

BO - PB Pool Boiling
BO - BHT Boiling Heat Transfer
BO - FB Flow Boiling
BO - CHR Critical Heat Flux and Rewetting

CN - Condensation

CO- Combustion
CO - ER Emission Reduction
CO - EM Experimental Methods
CO - GE General Studies

CF - Convective Flow

CF - NMC Natural and Mixed Convection
CF - NC Natural Convection
CF - CHT Convective Heat Transfer

FD - Fluid-Dynamics

FD - RF Rotating Flows
FD - VF Vortex Flows
FD - GE General

HEX - Heat Exchangers

JE - Jets
JE - AR Jet Arrays
JE - IHT Jet Impingement Heat Transfer
JE - GE General Studies

MT - Measurement Techniques

MT - IMT Instrumentation
MT - TP Thermophysical Properties

MM - Multi-Component and Multi-Phase Flows

MM - BF Bubbly Flow
MM - FS Flow Structure and Flow Transition
MM - BD Bubble Dynamics
MM - DD Droplet Dynamics
MM - PDD Particle and Droplet Dynamics
MM - TJ T-Junctions
MM - FL Flooding
MM - GE General Studies
MM - AS Atomization and Sprays

NR - Nuclear Reactor Safety

PEA - Process Equipment and Application

PEA - IA Industrial Applications
PEA - HTE Heat Transfer Enhancement

TH - Thermalhydraulics

TH - FPB Fluidized and Packed Beds
TH - NC Natural Circulation
TH - PD Pressure Drops
TH - TLF Liquid Films
TH - SWP Shock Waves and Wave Propagation
TH - TBL Turbulence and Boundary Layers
TH - UF Unstable and Unsteady Flows

TT - Thermodynamics & Heat and Mass Transfer

TT - RC Refrigeration and Cooling
TT - FMS Freezing, Melting and Solidification
TT - HR Heat Recovery
TT - GE General
TT - MT Mass Transfer

Monday 24, 9:30-10:00 - Plenary Room - Welcome Addresses, Nusselt-Reynolds Prize

Monday 24, 10:00-10:40 - Plenary Room - Nusselt-Reynolds Prize Lecture 1

Chairman: N. Kasagi

ExHFT for Fourth-Generation Heat Transfer Technology

A.E. Bergles

Rensselaer Polytechnic Institute, New York and University of Maryland, Maryland, USA

Monday 24, 10:40-11:20 - Plenary Room - Nusselt-Reynolds Prize Lecture 2

Chairman: R.K. Shah

Scaling of Velocity and Temperature Fluctuations in Turbulent Thermal Convection

R.L.J. Fernandes and R.J. Adrian

Department of Theoretical and Applied Mechanics, University of Illinois, Urbana, USA

Monday 24, 11:20-11:40 - Coffee Break

Monday 24, 11:40-12:20 - Plenary Room - Keynote Lecture 1

Chairman: C.W.M. van der Geld

Similarities and Differences between Gas/Liquid and Liquid/Liquid Flows

B.J. Azzopardi

School of Chemical, University of Nottingham, Nottingham, U.K.

Monday 24, 12:20-13:00 - Plenary Room - Keynote Lecture 2

Chairman: P. Stephan

Motivation and Results of a Long-Term Research on Pool Boiling Heat Transfer in Low Gravity

W. Grassi

University of Pisa, Department of Energetics, Pisa, Italy

Monday 24, 13:00-14:00 - Lunch

Monday 24, 14:00-14:40 - Plenary Room - Keynote Lecture 3

Chairman: T. Skiepko

Phase Separation in Centrifugal Fields with Emphasis on the Rotational Particle Separator

J.J.H. Brouwers

Department of Mechanical Engineering, Technische Universiteit Eindhoven, Eindhoven, The Netherlands

Monday 24, 14:40-16:20 - Room 1 - Session Jets: Jet Arrays

Chairman: D. Mikielewicz

Heat Transfer of Phase-Locked Modulated Impinging-Jet Arrays

G.C.J. Bart, A.J. van Ijzerloo, L.F.G. Geers, L. Hoek and K. Hanjalic

Department of Applied Physics, Delft University of Technology, Delft, The Netherlands

Local Heat-Transfer Characteristics of Impinging Jets in In-Line and Staggered Arrays

R. Matsumoto*, I. Ishihara* and Y. Nakatsuka**

*Department of Mechanical Systems Engineering, Kansai University, Osaka

**Kansai Chemical Engineering Co., Hyogo, Japan

Heat/Mass Transfer Characteristics of Arrays of Impingement Jets with Effusion Holes

H.H. Cho, P.H. Yoon, D.H. Rhee

Department of Mechanical Engineering, Yonsei University, Seoul, Korea

Impingement of Inline and Staggered Arrays of Jets with and without Initial Crossflow-Local and Average Heat Transfer Measurements

P. Brevet, E. Dorignac, M. Jolly and J.J. Vullierme

Laboratoire d'études thermiques, ENSMA, Futuroscope Chasseneuil Cedex, France

Flows Generated by the Impingement of Inline and Staggered Arrays of Jets

L.E. Brizzi, P. Brevet and C. Dejeu

Laboratoire d'études aérodynamiques, Futuroscope Chasseneuil Cedex, France

Monday 24, 14:40-16:20 - Room 2 - Session Measurement Techniques: Instrumentation 1

Chairman: M. Behnia

Quantitative Temperature Imaging in a Gas-Phase Turbulent Thermal Convection by Laser-Induced Fluorescence of Acetone

S.P. Kearney and F.V. Reyes

Engineering Science Centre, Sandia National Laboratory, Albuquerque, USA

Measurements of Bed Suction Effects on an Open Channel Flow with Laser-Doppler/Hot-Film Anemometry

A. Zeris and P. Prinos

Hydraulic Laboratory, Aristotle University of Thessaloniki, Thessaloniki, Greece

Data Filtering Applied to Infrared Thermographic Measurement intended for the Estimation of Local Heat Transfer Coefficient

S. Rainieri and G. Pagliarini

Industrial Engineering Department, University of Parma, Parma, Italy

An Experimental Technique for Near-Wall Turbulent Measurement

D. Poggi, A. Porporato and L. Ridolfi

Dipartimento di Idraulica, Trasporti e Infrastrutture Civili, Politecnico of Torino, Torino, Italy

Experimental Investigation of the Convective Heat Transfer Using Gradient Heat Flux Sensors

V.Y. Mitiakov, S.Z. Sapozhnikov*, Yu.S. Chumakov** and A.V. Mitiakov****

*Department of Thermodynamics and Heat Transfer

**Department of Hydroaerodynamics

***Department of Internal Combustion Engines, State Technical University of St.-Petersburg, Russia

Monday 24, 14:40-16:20 - Room 3 - Session Thermalhydraulics: Fluidized

and Packed Beds 1

Chairman: A. Kolar

Flow Characteristics in Channel with Local Blockage Packed with Spheres

G. Matsui, K. Mishiro*, H. Monji*, M. Tanaka** and H. Kamide***

*Institute of Engineering Mechanics and Systems, University of Tsukuba, Tsukuba

**O-arai Engineering Center, JNC, Ibaraki, Japan

Radial Dispersion in Liquid Flow through Packed Beds for $50 < Sc < 750$ and $103 < Pem < 105$

J.R.F. Guedes de Carvalho and J.M.P.Q. Delgado

Departamento de Engenharia Química, Universidade do Porto, Porto, Portugal

Instability of a Gas-Solid Fluidized Bed at High Particle Reynolds Numbers

P. Vainshtein, M. Shapiro** and C. Gutfinger**

*Faculty of Mechanical Engineering

**Laboratory of Transport Processes in Porous Materials, Technion-Israel Institute of Technology, Haifa, Israel

Direct Contact Air-Water Heat Transfer in a Column with Structured Packing

S. Kypritzis and A. J. Karabelas

Department of Chemical Engineering, Aristotle University of Thessaloniki, and Chemical Process Engineering Research Institute, P.O. Box 1517, GR 540 06 Thessaloniki, Greece

Determination of Molecular Diffusion Coefficient through Measurement of Mass Transfer around a Cylinder Exposed to Liquid Flow in a Packed Bed

J.R.F. Guedes de Carvalho, M.A. Alves and J.M.P.Q. Delgado

Departamento de Engenharia Química, Universidade do Porto, Porto, Portugal

Monday 24, 14:40-16:20 - Room 4 - Session Heat Transfer Enhancement 1

Chairman: A.E. Bergles

The Effect of Liquid Side Heat Transfer Improvement on a Compact Heat Exchanger

J. Suihkonen, R. Lankinen*, P. Sarkomaa* and R. Castrén***

*Department of Energy Technology, Lappeenranta University of Technology, Lappeenranta

**Retermia Ltd., Finland

Experimental Study on a Bank of Finned Pipes with Inclined Fins

I. Carvajal-Mariscal, F. Sánchez-Silva*, P. Quinto-Diez* and V.A. Pronin***

*LABINTHAP-SEPI-ESIME-IPN-CONACyT, México

**Moscow Power Engineering Institute, Faculty of Heat Engineering, Moscow, Russia

Two-Phase Flow Stabilization and Heat Transfer Enhancement at Vapour-Liquid Flow in Horizontal Tube under Subatmospheric Pressures

O.N. Kaban'kov, L.A. Sukomel and V.V. Yagov

Moscow Power Engineering Institute, Moscow, Russia

Heat Transfer Intensification by Small Particles in a Supersonic Flow

E.B. Vasilevskii, L.V. Yakovleva*, A.V. Chirikhin* and A.N. Osipov***

*Central Aerohydrodynamical Institute (TsAGI)

**Institute of Mechanics, Lomonosov Moscow State University, Russia

Heat Transfer Enhancement in Tubes of Ceramic Heat Exchangers

A.V. Soudarev, B.V. Soudarev*, V.V. Grishaev* and A.S. Leznov***

*NPP "TARC", JSC "K.T.S.", St.Petersburg, **JSC "GAZPROM", Moscow, Russia

Monday 24, 14:40-16:20 - Room 5 - Session Thermalhydraulics: Pressure Drops 1

Chairman: G. Yadigaroglu

Experimental Results on Pressure Drop Reductions and Flow Regime Transitions in Oil-Water Mixtures

G. Sotgia, G. Spartà*, E. Vendola* and P. Tartarini***

*Department of Energetics, Polytechnic University of Milan, Milano

**Department of Engineering Sciences, University of Modena and Reggio Emilia, Modena, Italy

A New Pressure Drop Correlation for Air-Water Flow in a Horizontal Tube

A.M. Ribeiro, T. Pimenta*, J.M.M.C. Lopes* and L.F. Melo***

*Instituto Superior de Engenharia do Porto

**Chemical Engineering Department University of Porto, Porto, Portugal.

Heat Transfer and Pressure Loss in a 180°-Turn of a Rectangular, Rib-Roughened Two Passage Channel

M. Schnieder, R. Höcker and J. von Wolfersdorf

ALSTOM Power, Baden/Dättwil, Switzerland

Two Phase Flow Patterns and Pressure Drop in the Heated Horizontal Tube at High Vapour Specific Volumes

O.N. Kaban'kov, L.A. Sukomel and V.V. Yagov

Moscow Power Engineering Institute, Moscow, Russia

Flow Structure and Pressure Gradient in Churn Flow

T. Sawai and M. Kaji

Department of Mechanical Engineering, Kinki University, Wakayama, Japan

Monday 24, 16:20-16:40 - Coffee Break

Monday 24, 16:40-18:20 - Room 1 - Jets: Jet Impingement Heat Transfer
Chairman: P. Tartarini

Heat Transfer during Transient Cooling of High Temperature Surface with an Impinging Jet in an Evacuated Enclosure

Y. Mitsutake, M. Monde and J. Hammad

Department of Mechanical Engineering, Saga University, Saga, Japan

Annular Impingement Heat Transfer on an Oscillated Heated Surface

K. Ichimiya and Y. Matsushima***

*Department of Mechanical Systems Engineering, Yamanashi University, Yamanashi

**Daihatsu Diesel Ltd., Osaka, Japan

Controlled Cooling of a Hot Plate with a Water Jet

H. Robidou, **, H. Auracher*, P. Gardin** and M. Lebouché****

*TU Berlin, Institut für Energietechnik, Berlin, Germany

IRSID, Maizieres-les-Metz Cedex, France, *LEMETA, Vandoeuvre Cedex, France

Heat Transfer Measurements of Impinging Two-Dimensional Slot Jets

X. Gao and B. Sundén

Division of Heat Transfer, Lund Institute of Technology, Lund, Sweden

Hydromechanics and Heat Exchange in Gaseous Impinging Jets

A.A. Gulakov, B.P. Zhilkin and Yu.M. Brodov

Ural State Technical University, Ekaterinsburg, Russia

Monday 24, 16:40-18:20 - Room 2 - Session Measurement Techniques: Instrumentation 2
Chairman: I. Zun

Surface Thermometry by Laser-Induced Fluorescence of Dy³⁺:YAG

K. Kontis, Y. Syogenji** and N. Yoshikawa***

*Department of Aerodynamics, Hellenic Air Force Academy, Athens, Greece,

**Department of Aerospace Engineering, Nagoya University, Japan

Application of LDA and PIV to Solid/Liquid Flow in Jet Loop Reactors with High Dispersed Phase Volume Fractions

R. Angst, P. Mier and M. Kraume

Department of Chemical Engineering, Technical University of Berlin, Berlin, Germany

Fast Wire-Mesh Sensors for Gas-Liquid Flows and Decomposition of Gas Fraction Profiles according to Bubble Size Classes

H.M. Prasser, E. Krepper and D. Lucas

Forschungszentrum Rossendorf E.V., Dresden, Germany

Microscale Temperature Measurement at an Evaporating Liquid Meniscus

C. Höhmann and P. Stephan

Fachgebiet für Technische Thermodynamik, Technische Universität Darmstadt, Darmstadt, Germany

Measurements of Gas Flow Parameters Inside Complex Geometry Industrial Units

A.G. Ghiaus, **, D.P. Margaritis* and D.G. Papanikolaou**

*Fluid Mechanics Laboratory, University of Patras, Rio-Patras, Greece

**Thermal Engineering Department, Technical University of Civil Engineering

of Bucharest, Bucharest, Romania

Monday 24, 16:40-18:20 - Room 3 - Session Thermalhydraulics: Fluidized and Packed Beds 2

Chairman: M. Kiya

Fluid Mechanics and Heat Transfer in Bubbling Fluidized Beds

O. Molerus

Lehrstuhl für Mechanische Verfahrenstechnik, Univ. Erlangen-Nürnberg, Erlangen, Germany

Transmittance of Packed Bed as Effective Radiative Property

B.J. Grochal

Institute of Fluid Flow Machinery of Polish Academy of Sciences, Gdansk, Poland

Experimental Investigation of Heat Transfer from a Cylinder to Fluidized Particles with a Latent Heat Sink

H. Groenewold and E. Tsotsas

Institute for Process Engineering, Otto-von-Guericke-University, Magdeburg, Germany

The Phenomenon of “Thermal Trap Effect” in Packed Bed of Glass Spheres

S. Polesek-Karczewska

Institute of Fluid Flow Machinery of Polish Academy of Sciences, Gdansk, Poland

Effect of Axial Tube Location on Heat Transfer in the Core of a Circulating Fluidized Bed

A.K. Kolar and R. Sundaresan***

*Department of Mechanical Engineering, Indian Institute of Technology, Madras,

**Department of Mechanical Engineering, Vellore Engineering College, Vellore, India

Monday 24, 16:40-18:20 - Room 4 - Session Heat Transfer Enhancement 2
Chairman: E.G. Keshock

Enhanced Boiling Tubes with Subsurface Structures: Investigation, Visualization and Industrial Application

R. Mertz, R. Kulenovic and M. Groll

Institute for Nuclear Technology and Energy Systems (IKE), University of Stuttgart, Stuttgart, Germany

Heat Transfer to Highly Viscous Fluids in a Vessel Agitated by a Non Standard Helical Ribbon Impeller

G. Delaplace, J.C. Leuliet, L. Fillaudeau and N. Belaubre

Institut National de la Recherche Agronomique, Villeneuve d'Ascq, France

Improvement of Heat Transfer in Joule Effect Tubular Heat Exchanger by Geometrical Modifications - Applications to Model (Milky Dessert) and Real (Whole Egg) Fluids -

L. Fillaudeau, G. Delaplace*, S. Lefebvre*, J.C. Leuliet* and F. Quenard***

*INRIA/LGPTA, Villeneuve d'Ascq

**ACTINI SA, Evian, France

Turbulent Swirling Flow Structure in Complex Shape Channels and its Effect on Enhancement of Heat Transfer Processes

B.V. Dzyubenko and G.A. Dreitser

Moscow Aviation Institute, Moscow, Russia

Heat Transfer Enhancement due to Swirl Created by Tangential Injection of Flow at the Inlet of an Artificially Roughened Annulus

S.A. Abdel-Moneim, A.R. El-Shamy and N.S. Berbish

Mechanical Engineering Department, Faculty of Engineering, Cairo, Egypt

Monday 24, 16:40-18:20 - Room 5 - Session Thermalhydraulics: Pressure Drops 2
Chairman: J. Deans

Drag Reduction in Polymers and Surfactants Solutions

L. Broniarz-Press, J. Rozanski and I. Poltorak

Department of Chemical Engineering and Apparatus, Poznan University of Technology, Poznan, Poland

Experimental Set-Up to Measure Tube-Side Heat Transfer and Pressure Drop in Laminar and Turbulent One-Phase Flow

P.G. Vicente, A. García and A. Viedma

Department of Thermal and Fluids Engineering, Technical University of Cartagena. Cartagena, Spain

Entrance Length and Pressure Drop in an Entry Gap Flow

J. Wojtkowiak and C.O. Popiel

Poznan University of Technology, Poznan, Poland

Characteristics of Single-Phase Heat Transfer and Pressure Drop in Plate Heat Exchangers with and without PTFE Coatings

L. Cheng and G. Xia***

*Department of Mechanical Engineering, Eindhoven University of Technology, Eindhoven, The Netherlands, **College of Environmental & Energy Engineering, Beijing Polytechnic University, Beijing, P.R. China

Turbulent Air Flow Friction and Heat Transfer of Finned Circular Tube Heat Exchanger with Rectangular Fins

D. Yang, T. Chen, C. Wan and M. Tang

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China

Tuesday 25, 8:20-9:00 - Plenary Room - Keynote Lecture 4

Chairman: P. Di Marco

Phase Discrimination vs. Multiscale Characteristics in Bubbly Flow

I. Zun

Faculty of Mechanical Engineering, University of Ljubljana, Ljubljana, Slovenia

Tuesday 25, 9:00-10:40 - Room 1 - Jets: General Studies 1

Chairman: W. Grassi

The Effects of Hole Arrangements on Heat/Mass Transfer of Impingement/Effusion Cooling System

H.H. Cho, J.H. Choi and D.H. Rhee

Department of Mechanical Engineering, Yonsei University, Seoul, Korea

Heat Transfer Experiments in a Submerged Impinging Round Jet Using Liquid Crystal Thermometry

J. Vejraska, ** P. Marty* and V. Sobolik***

*Equipe LEGI-GRETh, CEA/Grenoble, Grenoble, France

**Institute of Chemical Process Fundamentals, Praha, Czech Republic

Near Wall Flow Characteristics Beneath a Turbulent Impinging Jet

S. Ashforth-Frost, B.C.Y. Cheong and P.T. Ireland

Department of Mechanical and Manufacturing Engineering, The Nottingham Trent University, Nottingham, U.K.

Jet Cooling System of Gas Turbine Blades

B.M. Galitseyskiy

Department of Aviation-Space Thermal Technics, Moscow Aviation Institute, Moscow, Russia

Heat Transfer at Interaction of Liquid Nitrogen Jet with Surfaces

G.A. Dreitser, V.P. Firsov, I.V. Antyukhov and A.S. Prokopenko

Department of Aviation-Space Thermal Technics, Moscow Aviation Institute, Moscow, Russia

Tuesday 25, 9:00-10:40 - Room 2 - Measurement Techniques: Instrumentation 3

Chairman: P. Carrica

Flow-Field Measurements near Two Helicoid Fans by Cross-Correlation Particle Image Velocimetry

F. Peyrin and P.S. Mirade

Departement Transformation de Produits Animaux, Institut National de la Recherche Agronomique, St Genès Champanelle, France

A Thermal Imaging Procedure for Landmine Detection

J. Deans, B. Dempster**, G. Schmithals* and L.J. Carter**

*University of Auckland, Auckland, New Zealand

**University of Strathclyde, Scotland, U.K.

An Image Recording Method Utilising Two Cameras with Application to PIV

A. Fouras and J. Soria

Laboratory for Turbulence Research in Aerospace & Combustion, Department of Mechanical Engineering, Monash University, Melbourne, Australia

Proper Orthogonal Decomposition of Vorticity PIV Data on a Backward Facing Step Flow

J. Kostas, J. Soria* and M.S. Chong***

*Mechanical Engineering Department, Monash University, Melbourne

**Mechanical and Manufacturing Engineering Department, Melbourne University, Melbourne, Australia

High Time Resolution Ultrasonic Velocity Profiler

Y. Ozaki, T. Kawaguchi*, Y. Takeda**, K. Hishida* and M. Maeda**

*Department of System Design Engineering, Keio University, Yokohama, Japan

**Paul Scherrer Institut, Villigen PSI, Switzerland

Tuesday 25, 9:00-10:40 - Room 3 - Multi-Component and Multi-Phase Flow: Bubbly Flow
Chairman: A. Tomiyama

Downward Laminar Gas-Liquid Flow in a Vertical Pipe

O.N. Kashinsky and V.V. Randin

Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Development of Bubble Cluster Detection and Identification Method

A. Salesse, A. Larue de Tournemine and V. Roig

Institut de Mécanique des Fluides de Toulouse, Toulouse, France

Microstructure of the Flow Field Around a Bubble in Counter-Current Bubbly Flow

Y. Suzuki, M. Nakagawa**, M. Aritomi*, H. Murakawa*, H. Kikura* and M. Mori****

*Research Laboratory for Nuclear Reactors, Tokyo Institute of Technology, Tokyo

**Department of Mechanical Science and Engineering, Tokyo Institute of Technology, Tokyo

***Tokyo Electric Power Company, Yokohama, Japan

Co-Current Bubbly Flow in a Vertical Square Channel: Comparison Between Experimental and Modelling Results for Various Turbulence Models

A.D. Matos, E.S. Rosa and F.A. Franca

Department of Energy, State University of Campinas, Campinas, Brazil

A Comparative Analysis of Bubbly Flow Void Fraction Based on Different Approaches for Interfacial Drag Force

Z.V. Stosic and V.D. Stevanovic

Framatome ANP GmbH-NBTT, Erlangen, Germany

Tuesday 25, 9:00-10:40 - Room 4 - Heat Transfer Enhancement 3
Chairman: M. Groll

Experimental Analysis of the Performances of Finned Elliptical-Section Tube Air-Cooled Compact Heat Exchangers

G. Fabbri and S. Lazzari

Department of Energy, Nuclear and Environmental Control Engineering, University of Bologna, Bologna, Italy

Friction Factor and Heat Transfer in Triangular Ducts with Ridge Type Two Dimensional Roughness

S.W. Ahn and B.C. Lee

Gyeongsang National University, Institute of Marine Industry, Tongyong, Kyongnam, Korea

Influence of Macro-Roughened Surfaces on Convective Film Boiling Heat Transfer

A. Omrani and E.G. Keshock***

*University of Tennessee Space Institute, Tullahoma

**Mechanical Engineering Department, Cleveland State University, Cleveland, USA

Investigations In Heat Transfer Enhancement In Natural Convection In a Rectangular Enclosure With Suspensions of Microencapsulated Phase Change Materials - A Parametric Study

P. Datta, S. Sengupta** and T. Singh****

*Daimler Chrysler Corporation, Detroit

**University of Michigan-Dearborn, Dearborn

***Wayne State University, Department of Mechanical, Detroit, USA

An Experimental Investigation on Heat Transfer of Internally Ribbed Tube in The Near Critical Pressure Region

D. Sun, T. Chen, Y. Luo, Z. Hu and H. Luan

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China

Tuesday 25, 9:00-10:40 - Room 5 - Thermalhydraulics: Turbulence and Boundary Layers 1
Chairman: D. Papailiou

Improvement of a Stalled-Diffuser Performance by a Turbulent Wake

O. Mochizuki, H. Ishikawa and M. Kiya

Division of Mechanical Science, Hokkaido University, Sapporo, Japan

Flow around a Circular Cylinder with Non-Isothermal Blowing

L. Mathelin, F. Bataille and A. Lallemand

Centre de Thermique de Lyon, INSA de Lyon, Villeurbanne, France

Heat Transfer from a Line Source Located in the Periodic Laminar Near Wake of a Circular Cylinder

G. Godard and P. Paranthoën

LTH U.M.R. 6614 CNRS Université de Rouen, Mont Saint-Aignan Cedex, France

On the Transition from Laminar to Turbulent Regime in Vertical Upward Two-Phase Slug Flow

A.M.F.R. Pinto, M.N. Coelho Pinheiro**, S. Nogueira*** and J.B.L.M. Campos**

*Departamento de Engenharia Química, Universidade do Porto, Porto, Portugal

**Departamento de Engenharia Química, Instituto Politecnico de Coimbra, Coimbra, Portugal

***Von Karman Institut for Fluid Dynamics, Rhode Saint Genese, Belgium

Scintillometric Measurements of Atmospheric Turbulent Heat and Momentum Fluxes and Their Application to Atmospheric Stability Evaluation

V.J. Daoo, N.S. Panchal, F. Sunny and V. Venkat Raj

Health, Safety and Environmental Group, Bhabha Atomic Research Centre, Trombay, India

Tuesday 25, 10:40-11:00 - Coffee Break

Tuesday 25, 11:00-12:40 - Room 1 - Jets: General Studies 2
Chairman: G.C.J. Bart

Diffusion of Two-Dimensional Jets into Counterflowing Flow

N. Ogawa and A. Miura

Science University of Tokyo, Chiba, Japan

Phase-Averaged PIV Measurements of Turbulent ZNMF Jets

J. Cater, K. von Ellenrieder and J. Soria

Mechanical Engineering Department, Monash University, Melbourne, Australia

Mixing and Diffusion Processes of Twin Circular Free Jets with Various Nozzle Spacing

T. Harima, S. Fujita* and H. Osaka***

*Tokuyama College of Technology, Tokuyama

**Yamaguchi University, Ube, Japan

Spectral Analysis on the Disturbance of a Round Water Jet with an Annular Airflow

Y. Morozumi, A. Kuwata, J. Fukai and O. Miyatake

Department of Chemical Engineering, Kyushu University, Fukuoka, Japan

Quantitative Visualization of Turbulent Mixing in Parallel Triple Plane Jets

K. Yamamoto and K. Hishida

Department of System Design Engineering, Keio University, Yokohama, Japan

Tuesday 25, 11:00-12:40 - Room 2 - Measurement Techniques: Instrumentation 4
Chairman: H.M. Prasser

PTV Measurement on Interaction between Two Immiscible Droplets and Turbulent Uniform Shear Flow of Carrier Fluid

Y. Hagiwara, S. Sakamoto, M. Tanaka and K. Yoshimura

Department of Mechanical and System Engineering, Kyoto Institute of Technology, Kyoto, Japan

Velocity Profile Measurement by Ultrasound Time-Domain Correlation Method

G. Yamanaka, H. Kikura and M. Aritomi

Research Laboratory for Nuclear Reactors, Tokyo Institute of Technology, Tokyo, Japan

Acoustic Excitation and the Stability of Single Bubble Sonoluminescence for Various Noble Gases

G.A. Delgadino, F. Bonetto, R.T. Lahey, Jr.

Center for Multi-Phase Research, Rensselaer Polytechnic Institute, Troy, USA

LDA and PIV Measurements Applied to Single and Multiple Impinging Jets

L.F.G. Geers, M.J. Tummers, G.C.J. Bart and K. Hanjalic

Department of Applied Physics, Delft University of Technology, Delft, The Netherlands

Development of a Novel Artificial Heart Muscle Using Thermoelectric Actuators

S. Maruyama, R. Ibuki*, S. Sakai*, M. Yamada**, M. Sato***, T. Yanbe****, T. Takagi*, Y. Luo* and M. Behnia******

*Institute of Fluid Science, Tohoku University, Sendai, Japan

**Tohoku Electric Industrial Co. Ltd., Sendai, Japan

***Influence Planning Corp., Takamori, Japan

****Institute of Development, Aging and Cancer, Tohoku University, Sendai, Japan

*****School of Mech. & Manuf. Engr., The University of New South Wales, Sydney, Australia

Tuesday 25, 11:00-12:40 - Room 3 - Process Equipment and Applications:**Heat Exchangers 1**

Chairman: C.W.M. van der Geld

A Study on Mixing Between Gas Turbine Exhaust Gas and Fresh Air in a Supplemental-Fired Heat Recovery Steam Generator

C.S. Lee, B.E. Lee*, J.W. Ryu** and S.J. Park**

*R&D Center, Doosan Heavy Industries, Changwon

**Seoul National University, Korea

Distillation of Mixtures of Free Fatty Acids and Condensation in a Shell-and-Tube Heat Exchanger

M.M. Prieto and J.C. Bada***

*Energy Department, Oviedo University, Gijón

**Consejo Superior de Investigaciones Científicas, Villaviciosa, Spain

Ohmic Heating to Achieve UHT Sterilisation of Milk - Comparison with Plate Heat Exchanger and Definition of a Heat Dissipation Coefficient -

L. Fillaudeau, G. Delaplace*, J. C. Leuliet*, J.P. Tissier*, M. Berthou** and F. Chopard****

*INRIA/LGPTA, Villeneuve d'Ascq

**EDF-DER, Moret Sur Loing

***Alfa Laval Vicarb, Fontanil Cornillon, France

Experimental Study on the Heat Transfer Performance of Thermosyphons Using Plain and Micro Grooved Tube

K.I. Han, S.S. Yee*, S.H. Park*, S.H. Lee* and D.H. Cho***

*Pukyong National University, Pusan

**Daejin University, Kyonggi-do, Korea

Designing Shell-and-Coil Natural Convection Heat Exchangers

H. Taherian and P.L. Allen***

*Mechanical Engineering Department, Mazandaran University, Babol, Iran

**Mechanical Engineering Department, Dalhousie University (DalTech), Halifax, Canada

Tuesday 25, 11:00-12:40 - Room 4 - Thermodynamics and Heat and Mass Transfer: Refrigeration and Cooling 1

Chairman: J.M. Corberan

Performance Evaluation of a Cascade System Using R-22/R-23

H.G. Cho, J.H. Park and K.N. Cho

School of Mechanical Engineering, Sungkyunkwan University, Suwon, Korea

Experimental Investigation of the Mixing between Hot and Cold Gas in Two Cooling Processes

F. Bataille, J. Bellettre** and A. Lallemand**

*Centre de Thermique de Lyon, INSA de Lyon, Villeurbanne Cedex

**Departement Systemes Energetiques et Environnement, Ecole des Mines de Nantes, Nantes Cedex, France

The Effect of Diameter on the Heat and Mass Transfer Characteristics in a Vertical Absorber

J.K. Kim, J.H. Seo and K.N. Cho

School of Mechanical Engineering, Sungkyunkwan University, Suwon, Korea

Multiple Expansion Vapour Compression Refrigeration Cycle

J. Gryzagoridis and J.A. Browne

Department of Mechanical Engineering, University of Cape Town, South Africa

Heat and Mass Transfer Characteristics of a Helical Absorber Using LiBr+LiI+LiNO₃+LiCl Solutions

J.I. Yoon, H.S. Lee*, C.G. Moon*, E.P. Kim*, J.D. Kim** and B.B. Saha***

*Pukyong National University, Pusan

**Tongmyong College, Pusan, Korea

***Kyushu University, Fukuoka, Japan

Tuesday 25, 11:00-12:40 - Room 5 - Thermalhydraulics: Turbulence and Boundary Layers 2

Chairman: P. Paranthoen

Eduction of Multi-Scale Turbulent Structures in the Near-Wake of a Cylinder Using Wavelet Multi-Resolution Technique

H. Li and Y. Zhou***

*Department of Mechanical Engineering, Kagoshima University, Kagoshima, Japan

**Department of Mechanical Engineering, The Hong Kong Polytechnic University, Hong Kong, China

Comparison of Local Heat Transfer by Ammonia Absorption Measurements and Different Turbulence Models in a Square Duct with Longitudinal Vortex Generator Roughness

S. Wang, J. Bergmann and M. Fiebig

Institut für Thermo-und Fluidodynamik, Ruhr-Universität, Bochum, Germany

Turbulent Heat Transfer in a Separated and Reattached Flow on a Blunt Flat Plate

T. Ota and T. Kon***

*Department of Machine Intelligence and System Engineering, Tohoku University, Sendai

**Honda Motor Co., Ltd., Tokyo, Japan

Study on Relationship between Shear Stress Distribution and Bursting Motion in a Turbulent Boundary Layer by Using Micro Shear Stress Imager

Y. Iwadare, N. Miyagi, M. Kimura and H. Shoji

Department of Mechanical Engineering, Nihon University, Tokyo, Japan

An Experimental Study of Turbulent Backward-Facing Step Flow under Two-Frequency Forcing

S. Jin, H. Choi*, S. Kim*, J.Y. Yoo* and S. Kim***

*School of Mechanical and Aerospace Engineering, Seoul National University, Seoul

**Department of Precision Mech. Eng., Kangnung National University, Kangnung, Korea

Tuesday 25, 12:40-13:40 - Lunch

Tuesday 25, 13:40-14:20 - Plenary Room - Keynote Lecture 5**Chairman: A. Goulas**

Scale Formation in Tubular Heat Exchangers - Research Priorities*A.J. Karabelas*

Department of Chemical Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece

Tuesday 25, 14:20-16:00 - Room 1 - Jets: General Studies 3**Chairman: F. Daumas Bataille**

A 'Thin Layer' Model of Heat Transfer in a Laminar Liquid Film Formed by Impinging Jet*J. Mikielewicz* and D. Mikielewicz***

*Institute of Fluid Flow Machinery, Gdansk

**Technical University of Gdansk, Gdansk, Poland

Helical Vortices in the Axisymmetric Jets with Peripheral Suction*X.L. Xie*, H.L. Zhou* and W.W. Mar***

*Department of Mechanics & Engineering Science, Fudan University, Shanghai

**College of Basic Science, Donghua University, Shanghai, China

Application of the Quasi-Steady Liquid Cristal Technique in Three-Temperature Convective Heat Transfer Measurements*G. Engels*, Y. Kim** and R.E. Peck****

*MPC Products Corp. Skokie

**Honeywell, Phoenix

***Arizona State University, Tempe, USA

Instantaneous Behavior of Pulsating Submerged Planar Jets*E.C. Mladin* and D.A. Zumbrennen***

*Department of Mechanical Engineering, University Politehnica of Bucharest, Bucharest, Romania,

**Department of Mechanical Engineering, Clemson University, USA

Experimental Investigation on Heat Transfer Characteristics of Heated Jet in Crossflow*H. Wang, Y. Luo, D. Lu and T. Chen*

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China

Hydrodynamics and Heat Exchange of Free Swirl Gas Jet*B.V. Berg, B.P. Zhilkin and A.N. Shuba*

Ural State Technical University, Ekaterinsburg, Russia

Tuesday 25, 14:20-16:00 - Room 2 - Measurement Techniques: Instrumentation 5**Chairman: K. Hishida**

LDV Measurements of the Flow of Water in the Volute of a Centrifugal Pump*W.G. Li*

Hydraulic Machinery Division, Gansu University of Technology, Lanzhou, China

Liquid Crystal Technique Application for Heat Transfer Investigation in a Fin-Tube Heat Exchanger Element*M. Wierzbowski and J. Stasiek*

Technical University of Gdansk, Gdansk, Poland

Sensors/Transmitters Data Acquisition System to Value Temperature Distribution in a Natural Ventilation Building*P. Principi, C. Di Perna and E. Ruffini*

Dipartimento di Energetica, Università degli Studi di Ancona, Ancona, Italy

Identification of Chaotic Attractors in Gas Bubbling*J.T. Cieslinski* and R. Mosdorf***

*Technical University of Gdansk, Chair of Heat Technology, Gdansk

**Bialystok Technical University, Institute of Informatics, Bialystok, Poland

Leak Detection in Pipelines. Pressure Transients Analysis Through On-line Computer Techniques*C.F. Braga, S.L. Cruz, A. Cariati and J.A.F.R. Pereira*

Department of Chemical Systems Engineering, Universidade Estadual de Campinas, Campinas, Brazil

Tuesday 25, 14:20-16:00 - Room 3 - Process Equipment and Applications:**Heat Exchangers 2****Chairman: B. Sundén**

Comparison of Heat and Mass Transfer in Different Heat Exchanger Geometries with Corrugated Walls*C. Zimmerer*, P. Gschwind**, G. Gaiser*** and V. Kottke***

*Membrana Research & development, Obernburg

**Chair of Food Process Engineering, University of Hohenheim, Stuttgart

***Institute of Chemical Process Engineering, University of Stuttgart, Stuttgart

Experimental Results Concerning Gas-Leakage Flow Patterns in a Rotary Heat Exchanger*T. Skiepko*

Department of Thermodynamics and Fluid Mechanics, Bialystok Technical University, Bialystok, Poland

Precipitation Fouling in Plate Heat Exchangers – The Role of Suspended Matter*N. Andritsos and A.J. Karabelas*

Chemical Process Engineering Research Institute and Department of Chemical Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece

Two-Phase Heat Transfer Analysis of Evaporators*J.M. Corberán and J. González*

Applied Thermodynamics Department, Universidad Politécnica de Valencia, Valencia, Spain

Experimental Studies to Select a Mixer Device Design for Use in PFBR Intermediate Heat Exchanger*G. Padmakumar*, T.R. Sundaramoorthy*, G. Vaidyanathan*, R. Prabhakar*, R.D. Kale*, R.**Mascomani**, M. Suresh**, C.B. Suresh**, T.V. Ashraf** and V. Jayaraman***

*Indira Gandhi Centre for Atomic Research, Kalpakkam

**Fluid Control Research Institute, Palghat, India

Tuesday 25, 14:20-16:00 - Room 4 - Thermodynamics & Heat and Mass Transfer:**Refrigeration and Cooling 2****Chairman: F. Oriolo**

Characterization of Semi-Crystalline Polymers during Cooling Processes*G.C. Alfonso*, M. Cartesegna** and L. Tagliafico***

*DCCI, Genova

**DITEC University of Genova, Genova, Italy

The Applicability of the EHD Technique for Dehumidification*W.Y. Cheng, S.P. Lin, R.J. Shyu, L.J. Fang and C.C. Wang*

Energy & Resources Laboratories, Industrial Technology Research Institute, Hsinchu, Taiwan

Experimental Results and Evaluation of Linear Compressor*S. Kawahara, T. Akazawa, S. Kawano, H. Hasegawa, M. Ueda and Y. Asaida*

Matsushita Electric Industrial Co. Ltd., Osaka, Japan

Coupled Heat Transfer through Building Components with Air Cavities*P. Stefanizzi*

Dipartimento di Fisica Tecnica, Politecnico di Bari, Bari, Italy

Near Critical Heat Transfer in CO₂ Process Cycle*R. Eggers* and U. Sievers***

*Technische Universität Hamburg-Harburg, Hamburg

**Fachhochschule Hamburg, Hamburg, Germany

Tuesday 25, 14:20-16:00 - Room 5 - Multi-Component and Multi-Phase Flow: Particle and Droplet Dynamics
Chairman: I. Kataoka

Experimental Measurements of Spreading of Volatile Liquid Droplets

N. Zhang and D.F. Chao***

*Ohio Aerospace Institute at NASA Glenn Research Center, Cleveland

**NASA Glenn Research Center, Cleveland, USA

Experimental Study of the Interaction of a Droplet Cloud with a Turbulent Stratified Free Convection Environment as Related to Heat and Mass Transport

A. Vouros, Th. Panidis*, D.D. Papailiou*, X.J. Chen**, L.J. Guo** and B. Chen***

*Department of Mechanical and Aeronautical Engineering, University of Patras, Rio, Greece

**State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, P.R.China

Injection of Water Droplets in an Axial Compressor

S. Zhukov, S. Bram and J. de Ruyck

Vrije Universiteit Brussel, Brussels, Belgium

Effect of Liquid Viscosity on Inception of Disturbance Waves and Droplets in Gas-Liquid Two-Phase Flow

K. Mori and K. Nakano***

*Department of Intelligent Machine Engineering, Osaka Electro-Communication University, Neyegawa,

**Sharp Corporation, Osaka Japan

Tuesday 25, 16:00-16:20 - Coffee Break

Tuesday 25, 16:20-17:40 - Room 1 - Multi-Component and Multi-Phase Flow: T-Junctions
Chairman: M. Shoukri

The Split of Slug Flow at a Small Diameter Horizontal T-Junction

R. Jones, E. Wren, G. Baker and B.J. Azzopardi

School of Chemical, Environmental and Mining Engineering, University of Nottingham, Nottingham, U.K.

The Phase Separation and Pressure Drop for R-22 Refrigerant in a Horizontal T-Junction

S.J. Tae, Y.H. Choi, K.N. Cho

School of Mechanical Engineering, Sungkyunkwan University, Suwon, Korea

Fundamental Study on Fluid Mixing Mechanism in a Tee Junction Area

K. Yuki, K. Okuyama*, S. Toda* and T. Muramatsu***

*Department of Quantum Energy, Tohoku University, Sendai

**O-arai Engineering Center, JNC, Ibaraki, Japan

Application of a T-Junction as a Partial Separator for Liquid/Liquid Flows

L. Yang, B.J. Azzopardi and A. Belghazi

Environmental and Mining Engineering, University of Nottingham, Nottingham, U.K.

Tuesday 25, 17:40-18:20 - Room 1 - Thermalhydraulics: Shock Waves and Wave Propagation 1
Chairman: M. Giot

Flat Plate Impingement of the Shock Wave Discharged from an Open End of a Shock Tube

T. Setoguchi, K. Yamashita*, H.D. Kim**, H.S. Kim** and K. Matsuo****

*Saga University, Japan

**Andong National University, Korea

***Kyushu University, Fukuoka, Japan

An Investigation of the Phase Change Process with Natural Convection in the New PCMS Encapsulated in a Rectangular Cavity

R. Domanski, K. Nagano**, M. Rebow* and T. Mochida***

*Institute of Heat Engineering, Warsaw University of Technology, Warszawa, Poland

**Environmental Engineering, Hokkaido University, Sapporo, Japan

Tuesday 25, 16:20-18:20 - Room 2 - Thermodynamics & Heat and Mass Transfer: Mass Transfer 1
Chairman: J.S. Lee

Experiment Investigation of the Humidifying and Desulfuration of Flue Gas in a Boiler of Power Plant

L.J. Guo, B. Chen*, X.J. Chen*, D.D. Papailiou** and Th. Panidis***

*State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China,

**Department of Mechanical Engineering and Aeronautics, University of Patras, Patras-Rion, Greece

Application of a Simplified Heat and Mass Transfer Model to the Measurement of the Transfer Factor of Moist Insulating Materials

P. Baggio, C. Bonacina**, M. Campanale**, L. Moro** and S. Zorzi***

*Dipartimento di Ingegneria Civile ed Ambientale, Università di Trento, Trento

**Dipartimento di Fisica Tecnica, Università di Padova, Padova, Italy

Experimental Determination of Adsorption Capacity and Optimisation of Performance of a Rotary Desiccant Dehumidifier for Hot Humid Climates

F. Toribio, P.H. Nguyen and M. Dupont

Groupe de Recherche sur les Energies Renouvelables, Université des Antilles et de la Guyane, Pointe-à-Pitre Cedex, France

Experimental Investigation and Theoretical Modeling of Heat and Mass Transfer in Absorbers for Cleaning Exhaust Flue Gases from Sulfur Dioxide

I.V. Derevich

Moscow State University of Environmental Engineering, Moscow, Russia

Energy and Mass Transfer Phenomena in Natural Draft Cooling Towers

B. Sirok, B. Blagojevic*, M. Novak**, M. Hocevar*** and F. Jere***

*Faculty of Mechanical Engineering, University of Ljubljana, Ljubljana

**Turboinstitut, Ljubljana, Slovenia

Dust Trapping and Absorption of Sulphur-Containing Components on the Film During a Steam-Gas Mixture Condensation

L.V. Romanova, I.V. Iakimova and A.V. Brattseva

St. Petersburg State Technological University of Plant Polymers, St.-Petersburg, Russia

Tuesday 25, 16:20-18:20 - Room 3 - Process Equipment and Applications: Heat Exchangers 3
Chairman: L. Melo

Investigation of Heat Loss from Advanced Solar Water Heaters

N. Groenhout, M. Behnia and G.L. Morrison

School of Mechanical and Manufacturing Engineering, University of New South Wales, Sydney, AUSTRALIA

Fouling Effects of Geothermal Water Scale on Heat Transfer Around In-Line Two Circular Cylinders

T. Ota, T. Uryu** and H. Yoshikawa**

*Department of Machine Intelligence and Systems and Engineering, Tohoku University, Sendai,

**Mitsubishi Electric Corp., Himegi, Japan

Formation of Fouling Layers on a Heat Exchanger Element Exposed to Warm, Humid and Solid Loaded Air Streams

S. Kaiser, D. Antonijevic and E. Tsotsas

Chair for Thermal Process Engineering, Otto-von-Guericke-University, Magdeburg, Germany

Measurement of Diffusion-Reaction Characteristics of Pseudomonas Fluorescens Biofilms

R.J. Taylor and T.R. Bott***

*School of Chemical Engineering, The University of Birmingham, Birmingham

**Imerys, Par Moor Laboratories, Cornwall, U.K.

Shallow Fluidized Bed Heat Exchanger - An Experimental Study

A.A. Bbernárdez Pécora and M.R. Parise

College of Mechanical Engineering, State University of Campinas, Campinas, Brazil

Thermal and Friction Characterization of Compact Heat Exchanger with One and Two Rows of Finned Elliptical Tubes

R.B. Perez and J.I. Yanagihara

Department of Mechanical Engineering, Polytechnic School of University of São Paulo, São Paulo, Brazil

Tuesday 25, 16:20-18:20 - Room 4 - Boiling: Flow Boiling
Chairman: H. Auracher

On Thermo-Hydraulic Instabilities in Small Channels During Flow Boiling

D.D. Brutin, F. Topin and L. Tadrist

Laboratoire de l'Insitut Universitaire de Systemes Thermiques Industriels, Technopôle de Château-Gombert, Marseille, France

Experimental Study on the Onset of Nucleate Boiling in Vertical Concentric Annular Tubes

I.S. Kim and S.H. Lee

School of Mechanical Engineering, Pusan National University, Pusan, Korea

Heat Transfer to Evaporating Binary Liquid Films Inside a Vertical Tube

R. Krupiczka, A. Roikegel and Z. Ziobrowski

Institute of Chemical Engineering, Polish Academy of Sciences, Gliwice, Poland

3-D Conjugate Heat Transfer Measurements in a Non-Uniformly Heated Circular Flow Channel Under Flow Boiling Conditions

R.D. Boyd Sr., P. Cofie and A. Ekhlassi

Thermal Science Research Center, Prairie View A&M University, Prairie View, USA

Investigation of a Heat Transfer for Forced Flow Boiling of Nitrogen in Channel at High Pressures

A.V. Klimenko, A.M. Sudarchikov and V.V. Klimenko

Moscow Power Engineering Institute, Moscow, Russia

Flow Boiling Heat Transfer in Tube Bundles

A. Gupta

Mechanical and Industrial Engineering Department, University of Roorkee, Roorkee, India

Tuesday 25, 16:20-18:20 - Room 5 - Multi-Component and Multi-Phase Flow: Flow Structure and Flow Transition
Chairman: G. Matsui

Measurements in High Pressure Wall Heated Annular Two-Phase Flow

R. Kumar and T.A. Trabold

Lockheed Martin Corporation, New York, USA

Prediction Methods for Interfacial Drag in Transitional Two-Phase Flow Regimes

Z.V. Stosic and V.D. Stevanovic

Framatome ANP GmbH-NBTT, Erlangen, Germany

Evolution of Two-Phase Slug Flow in Vertical and Inclined Pipes

R. van Hout, D. Barnea and L. Shemer

Department of Fluid Mechanics and Heat Transfer, Faculty of Engineering, Tel-Aviv University, Ramat-Aviv, Israel

Structure of Upward Slug Flow in a Vertical Pipe

O.N. Kashinsky, R.S. Gorelik and V.V. Randin

Institute of Thermophysics, Novosibirsk, Russia

A Transition Criterion for the Onset of Slugging or Mixing in Horizontal Conduits

J.N. Reyes, Jr

Department of Nuclear Engineering, Oregon State University, Corvallis, USA

Anomalous Taylor Vortex Flows in a Short Annulus

H. Kawai and H. Takahashi

Muroran Institute of Technology, Muroran, Japan

An Experimental Investigation on the Formation of Oil-Gas Two Phase Annular Flow in Horizontal Pipes

Z. Hu, H. Qian and F. Zhou

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China

Wednesday 26, 8:20-9:00 - Plenary Room - Keynote Lecture 6**Chairman: B. Azzopardi**

Wax Deposition in Subsea Pipelines: A Review of Modelling Attempts*L.F.A. Azevedo*

Department of Mechanical Engineering, PUC-RIO, Rio de Janeiro, Brazil

Wednesday 26, 9:00-11:00 - Room 1 - Thermalhydraulics: Shock Waves and Wave Propagation 2**Chairman: M. Giot**

Control of Shock Wave Using Nonequilibrium Condensation of Moist Air*S. Matsuo*, T. Setoguchi*, H. Yamashita*, K. Kaneko*, H.D. Kim** and K. Matsuo****

*Department of Mechanical Engineering, Saga University, Japan

**School of Mechanical Engineering, Andong National University, Andong, Korea

***Graduate School of Engineering Sciences, Kyushu University, Fukuoka, Japan

Thermodynamic Aspects in Modelling the Wave Phenomena in a Liquid-Vapour System*Z. Bilicki*

Institute of Fluid Flow Machinery, Polish Academy of Sciences, Gdansk, Poland

Enhancement of Shock Wave and Mass Transfer behind a Wave in Saturated Porous Medium*V.E. Nakoryakov and V.E. Dontsov*

Institute of Thermophysics, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Structure of Shock-Trains in Constant Area Ducts*K. Matsuo, Y. Miyazato, J.K. Kwon and M. Masuda*

Graduate School of Engineering Sciences, Kyushu University, Fukuoka, Japan

The Pressure Wave with Complete Vapor Condensation in Flow Boiling*V.V. Kuznetsov and O.V. Vitovsky*

Institute of Thermophysics, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Experimental Study of Thermo-Fluid Dynamic Phenomena in Superfluid Helium by using Superfluid Shock Tube Facility*H. Nagai*, Y. Ueta**, H.S. Yang**, M. Murakami** and K. Yanaka***

*Office of Research and Development, National Space Development Agency of Japan, Tsukuba

**Institute of Engineering Mechanics and Systems, University of Tsukuba, Tsukuba, Japan

Wednesday 26, 9:00-10:00 - Room 2 - Thermodynamics & Heat and Mass Transfer: Mass Transfer 2**Chairman: J.S. Lee**

Heat and Mass Transfer in Rotating Air-Water Flow*I. Borisov*, A. Khalatov* and N. Syred***

*Department of Thermogasdynamics, National Academy of Sciences, Kiev, Ukraine

**School of Engineering, Cardiff University, Cardiff, U.K.

Heat and Mass Transfer During the Degassing of Polymers*I. Gestring and D. Mewes*

Institute for Process Engineering, University of Hannover, Hannover, Germany

Modeling and Experiments of the NH₃/H₂O Bubble Absorption Using a Non-Equilibrium Phenomenological Theory of the Mass and Heat Transfer*M.D. Staicovici*

Thermopower Equipment Research and Design Institute, SC ICPET-CERCETARE SA, Bucharest, Romania

Wednesday 26, 10:00-11:00 - Room 2 - Fluid-Dynamics: Rotating Flows**Chairman: F. Arinc**

The Effect of Diffuser Inlet Flow Angle on Diffuser Rotating Stall*J.H. Kim* and K.R. Cho***

*Siemens Building Technology Ltd., Seoul

**Department of Mechanical Engineering, Yonsei University, Seoul, Korea

Flow between Two Coaxial Rotating Cylinders with a Highly Water-Repellent Wall*K. Watanabe*, S. Ogata*, S. Isozaki** and T. Takayama**

*Graduate School of Engineering, Tokyo Metropolitan University, Tokyo

**Ebara Co., Tokyo, Japan

Thermal Modelling of a Rotating Cavity Rig to Simulate the Internal Air System of a Gas Turbine H.P. Compressor*A. Alexiou*, C.A. Long*, A.B. Turner* and C. J. Barnes***

*Thermo-Fluid Mechanics Research Centre, University of Sussex, Brighton

**Rolls-Royce Plc, Derby, U.K.

Wednesday 26, 9:00-11:00 - Room 3 - Nuclear Reactor Safety 1**Chairman: L. Maróti**

Flow and Solidification of Corium in the Vulcano Facility*C. Journeau, E. Boccaccio, C. Jegou, P. Piluso and G. Cognet*

Department of Thermalhydraulics and Physics, CEA/Cadarache, St Paul lez Durance, France

Water/Air Tests to Investigate the RPV Exterior Two-Phase Flow Behavior in the Event of a Core Melt*H. Schmidt*, W. Brettschuh*, E. Friesen*, O. Herbst*, W. Kastner*, W. Köhler*, J. Meseth* and J. Miettinen***

*Framatome ANP, Erlangen, Germany

**Technical Research Centre of Finland, Espoo, Finland

Modelling the Influence of Aerosol Deposition onto Horizontal Finned Tubes on Heat Transfer under Cross-Flow Condensing Conditions*L.E. Herranz*, J.L. Muñoz-Cobo** and M.J. Palomo***

*Department of Nuclear Fission, CIEMAT, Madrid

**Department of Nuclear Engineering, UPV, Valencia, Spain

An Experimental Investigation on a Steam Explosion with a Small Scale Tin-Water System*J.H. Kim, Y.S. Shin, I.K. Park, S.W. Hong, J.H. Song and H.D. Kim*

Thermal Hydraulics and Safety Research Team, Korea Atomic Energy Research Institute, Yusong, Taejeon, Korea

Hot-Leg Injection: 3D Versus 1D Three Velocity Fields Modeling and Comparison with UPTF Experiment*N.I. Kolev, H. Seitz and I. Roloff-Bock*

Framatome ANP, NDS1, Erlangen, Germany

Experimental Investigation on Heat Transfer in Surge Line Nozzle of Pressurizer in PWR*D. Lu, T. Chen, H. Wang and Y. Luo*

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China

3-D Flow Field Studied in Rod Bundles with Spacer Grids*W.Y. Xiong, B.D. Chen, Z.J. Xiao and X.J. Ma*

National Key Laboratory of Bubble Physics and Nature Circulation, Chengdu, China

Wednesday 26, 9:00-11:00 - Room 4 - Process Equipment and Applications: Industrial Applications**Chairman: R.J. Shyu**

Transient Behavior of a Compact Heat Transfer Surface During Brazing*D.P. Sekulic*, A.J. Salazar*, F. Gao**, J.S. Rosen*** and H.F. Hutchins*****

*CRMS, University of Kentucky, Lexington, USA

**National Key Laboratory of Advanced Welding Production Technology, Harbin Institute of Technology,

Harbin, P.R. China

***Delphi Harrison Thermal System, Lockport, USA

Numerical Simulation of the Side-Flow and Main-Flow Interactions in the Turbine Impulse Stage

*R. Chodkiewicz**, *B. Donevski***, *W. Gundlach**, *P. Hanausek** and *K. Sobczak**

*Technical University of Lodz, Institute of Turbomachinery, Lodz, Poland

**University St. Clement Ohridski, Faculty of Technical Sciences, Bitola, Macedonia

Effects of Lobe Shapes on the Performance of Roots-Type Vacuum Pump

H.J. Kim, D.W. Kim and Y.J. Kim

School of Mechanical Engineering, Sungkyunkwan University, Jangan-gu, Suwon, Korea

Performance of the Impinging Stream Emulsifiers

Z. Kemblowski, J. Sęk, A. Bobiński and M. Pingot

Faculty of Process and Environmental Engineering, Łódź Technical University, Łódź, Poland

Texture Simulation of High Temperature Phase Transformation in Steels

H.H.A. El-Sharawy

Department of Mechanical and Materials Engineering, Military Institute of Engineering, Rio de Janeiro, Brazil

Highly Ionized Aluminum Flux Produced by Electron Cyclotron Resonance Plasma Sputtering

V.N. Kharchenko, N.P. Poluektov, Yu.P. Tsar'gorodsev and I.G. Usatov

Department of Physics, Moscow State University of Forestry, Moscow, Russia

Wednesday 26, 9:00-11:00 - Room 5 - Multi-Component and Multi-Phase Flow:

Bubble Dynamics

Chairman: F.A. Franca

Bubble Rising Velocity in Saturated Liquid up to the Critical Pressure

*G.P. Celata**, *M. Cumo***, *F. D'Annibale** and *A. Tomiyama****

*ENEA, ITFD, Rome, Italy

**University of Rome, DINCE, Rome, Italy

***University of Kobe, Graduate School of Science & Technology, Kobe, Japan

Study of the Bubble Characteristic and the Local Void Fraction in Subcooled Flow Boiling using Digital Imaging- and Analysing Techniques

R. Maurus, V. Ilchenko and T. Sattelmayer

Lehrstuhl A für Thermodynamik, Technische Universität München, Garching, Germany

A Photographic Study on the Near-Wall Bubble Behavior in Subcooled Flow Boiling

*I.C. Bang**, *W.P. Baek*** and *S.H. Chang**

*Korea Advanced Institute of Science and Technology, Taejon

**Korea Atomic Energy Research Institute, Taejon, Korea

Bubble Dynamics in Nucleate Boiling around a Cylinder

M.A. Atmane and D.B. Murray

Mechanical Engineering Department, Trinity College Dublin, Dublin Ireland

Experimental Study on Terminal Velocity of Nitrogen Bubbles in FC-72

P. Di Marco, W. Grassi and G. Memoli

University of Pisa, Department of Energetics, Pisa, Italy

Calculation of Rise Velocity and Mass Transfer for Ellipsoidal Bubbles

P.I. Geshev and N.S. Safarova

Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Wednesday 26, 11:00-11:20 - Coffee Break

Wednesday 26, 11:20-13:00 - Room 1 - Thermodynamics & Heat and Mass Transfer: Heat Recovery

Chairman: S.P. Venkateshan

Characteristics of a Thermal Storage Tank on an Under-Water Ice-Harvesting System

*E.P. Kim**, *J.I. Yoon**, *I.S. Choi**, *J.D. Kim*** and *B.B. Saha***

*Pukyong National University, Pusan

**Tongmyong College, Pusan, Korea

***Kyushu University, Fukuoka, Japan

Experimental and Numerical Analysis of a Thermal Storage Tanks

R. De Césaro Oliveski, A. Krenzinger, H.A. Vielmo and C.W.M. Prieb

Departamento de Engenharia Mecânica, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

A New Technique for Enhancing Thermal Conductivity of Thermal Energy Storage Materials

J. Fukai, Y. Morozumi, Y. Hamada, W. Otsu and O. Miyatake

Department of Chemical Engineering, Kyushu University, Japan

Experimental Study on the Self-Operative Heat Transportation by Utilizing the Accumulated High-Pressure Vapor

*K. Kadoguchi**, *M. Yamazaki** and *M. Watanabe***

*National Institute of Advanced Industrial Science, Tsukuba

**Tokyo University of Fisheries, Tokyo, Japan

Solar Desalination with Recovery of Heat of Condensation

*B. Bouchekima**, *B. Gros***, *R. Ouahes**** and *M. Diboun*****

*Département Génie Chimique C.U. Ouargla, Ouargla, Algeria

**Département Génie Chimique I.U.T Paul Sabatier, Toulouse, France

***Laboratoire de Chimie Solaire U.S.T.H.B., El Alia, Algeria

****Institut de Chimie Industrielle U.S.T.H.B., El Alia, Algeria

Wednesday 26, 11:20-13:00 - Room 2 - Boiling: Critical Heat Flux and Rewetting

Chairman: R.D. Boyd

Experimental Investigation of Boiling Curve in Vicinity of CHF and Rewetting Conditions.

Part 1: Boiling Curve, Experiments and Post-CHF Test Results

*T. Iguchi**, *Z.V. Stosic*** and *C. Iwaki****

*JAERI - Japan Atomic Energy Research Institute, Tokai, Japan

**Framatome ANP GmbH-NBTT, Erlangen, Germany

***Toshiba, Kawasaki, Japan

Experimental Investigation of Boiling Curve in Vicinity of CHF and Rewetting Conditions.

Part 2: Reflood Test Results and Comparison to Post-CHF Test Results

*T. Iguchi**, *Z.V. Stosic*** and *C. Iwaki****

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***Toshiba, Kawasaki, Japan

Critical Power in a Hemispherical Narrow Gap

*R.J. Park**, *K.S. Ha**, *S.B. Kim**, *H.D. Kim** and *J.H. Jeong***

*Korea Atomic Energy Research Institute, Yusong-Ku, Taejon

**Chinan College of Foreign Studies, Chun-an, Korea

An Experimental and Analytical Study of the Effect of Flow Obstacles on the Critical Heat Flux

*D.C. Groeneveld**, *I.L. Pioro**, *Y. Guo**, *S.C. Cheng**, *Y.V. Antoshko**, *S.S. Doerffer*** and *A. Vasic**

*Fuel Channel Thermalhydraulics Branch, Chalk River Laboratories, AECL, Chalk River

**Department of Mechanical Engineering, University of Ottawa, Ottawa, Canada

New CHF Enhancement Techniques: Passive Impeller Micropump and Gravity Driven Fluid Flow

K.S. Yigit, M. Arik and A. Bar-Cohen

Laboratory for Thermal Management of Electronics, University of Minnesota, Minneapolis, USA

Fluid to Fluid Modeling of Critical Heat Flux

J. Chen, H. Zhao and J. Liao

National Key Laboratory of Bubble Physics and Nature Circulation, Chengdu, China

Wednesday 26, 11:20-13:00 - Room 3 - Nuclear Reactor Safety 2

Chairman: R.T. Lahey

Local Void Measurements in Integral-Type Experiments Simulating Nuclear Power Plant Transients

Gy. Ézsöl, L. Szabados* and H.M. Prasser***

*KFKI Atomic Energy Research Institute, Budapest, Hungary

**Research Center Rossendorf Inc., Germany

Experiments on the GEST-SIP1 Facility for Testing an Innovative Passive Injection System for LWRs

A. Achilli, G. Cattadori, R. Ferri and S. Gandolfi

SIET S.p.A., Piacenza, Italy

Simulation Method Research on Nuclear-Heat-Release Transient Characteristics

X. Wu, H. Zhao, X. Jiang, J. Liu and K. Wang

National Key Laboratory of Bubble Physics and Nature Circulation, Chengdu, China

High Temperature Behaviour of Reactor Core Materials under Air Oxidation Conditions

Z. Hózer, P. Windberg, I. Nagy, L. Maróti, L. Matus, M. Horváth, A. Pintér and M. Balaskó

KFKI Atomic Energy Research Institute, Budapest, Hungary

RELAP5/MOD3.2 Post Test Simulation and Accuracy Quantification of LOBI Test BT-02

R.C. Borges, F. D'Auria** and A.C.M. Alvim***

*Comissão Nacional de Energia Nuclear, Coordenação de Reatores, Rio de Janeiro, Brazil

**Dipartimento di Ingegneria Meccanica, Nucleare e della Produzione, Università di Pisa, Pisa, Italy

***Programa de Engenharia Nuclear, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

Experimental Research on the Double Tube Gravity Driven Boron Injection System

S.Y. Jiang, Y.J. Zhang, L.L. Gao and C.W. Ma

Institute of Nuclear Energy Technology, Tsinghua University, Beijing, China

Wednesday 26, 11:20-13:00 - Room 4 - Convective Flows: Natural Convection 1

Chairman: O. Manca

Study of Natural Convection from a Line Heat Source of a High Prandtl Number Fluids with Variable Viscosity in a Tank

N. Katsavos, I.G. Pappa, I.E. Sarris, I. Lekakis and N.S. Vlachos

Laboratory of Fluid Mechanics & Turbomachinery, University of Thessaly, Volos, Greece

Corona Wind Augmented Natural Convection: An Experimental Investigation

S. Bhattacharyya and A. Peterson***

*Department of Mechanical Engineering, IIT, Kharagpur

**Department of Mechanical Engineering, University of Canterbury, Christchurch New Zealand

Effect of Natural Convection on Heat Transfer to a Horizontal Flow of Supercritical Water in a Round Tube

M. Bazargan and D. Fraser

Department of Mechanical Engineering, University of British Columbia, Vancouver, Canada

An Experimental Study of Unsteady Natural Convection

D. Rousse, P. Jacquet** and A. Sawadogo**

*Département de Génie Mécanique, Université Laval, Quebec, Canada

**LABOMAP, Ecole Nationale Supérieure d'Arts et Métiers, Cluny, France

Natural Convective Heat Transfer in a Vertical Channel with Flow Resistance at the Lower End

I. Ishihara, T. Honiden** and R. Matsumoto**

*Department of Mechanical Engineering, Kansai University, Osaka

**Mitsubishi Cable Industries Ltd., Tokyo, Japan

Wednesday 26, 11:20-13:00 - Room 5 - Combustion: General Studies 1

Chairman: T. Niioaka

Burner Design Retrofit for Heavy Fuel Oil in Mexican Power Stations

R. Escalera, A. Chavez and R. Bolado

Instituto Mexicano del Petróleo, Centro IMP-Veracruz, Veracruz, Mexico

Pulse Detonation Engines. Experimental Investigation

D.I. Baklanov, L.G. Gvozdeva and N.B. Scherbak

Institute for Energy Density, Russian Academy of Sciences, Moscow, Russia

Active Control of Coaxial Jet Mixing and Combustion with Arrayed Micro Actuators

N. Kurimoto, Y. Suzuki and N. Kasagi

Department of Mechanical Engineering, The University of Tokyo, Tokyo, Japan

A Comparison of Experimental Indices to Determine Knock Limit in CHP SI Engines

G. Brecq, M. Tazerout and O. Le Corre

Département Systèmes Energetiques et Environnement, Ecole des Mines de Nantes, Nantes, France

Thermal Flux Characterization of Multiholed Plates Using Neural Networks : Application to Combustion Chamber Walls

J.B. Lopez Velasco, B. Leger**, J.M. Emidio**

*Turbomeca, Sce Aérothermodynamique

**Laboratoire Aquitain de Recherche en Aérothermique, Université de Pau, Bordes Cedex, France

Wednesday 26, 13:00-14:00 - Lunch

Wednesday 26, 14:00-15:00 - Open Forum Session

Poster presentations

Thursday 27, 8:20-9:00 - Plenary Room - Keynote Lecture 7**Chairman: U. Renz**

Experimental Study of High-Pressure Turbulent Premixed Flames*H. Kobayashi*

Institute of Fluid Science, Tohoku University, Sendai, Japan

Thursday 27, 9:00-9:40 - Plenary Room - Keynote Lecture 8**Chairman: H. Auracher**

Wave Flow Liquid Film under Complicated Conditions*S.V. Alekseenko*

Institute of Thermophysics SB RAS, Novosibirsk, Russia

Thursday 27, 9:40-10:20 - Plenary Room - Keynote Lecture 9**Chairman: I. Zun**

Development of Inverse Natural Convective Fluid and its Thermo-hydrodynamic Characteristic*I. Kataoka and K. Yoshida*

Department of Mechanophysics Engineering, Osaka University, Osaka, Japan

Monday 24, 10:20-10:40 - Coffee Break

Thursday 27, 10:40-12:20 - Room 1 - Condensation 1**Chairman: J.P. Meyer**

On the Prediction of Condenser Plate Temperatures in a Cross-Flow Condenser*F.L.A. Ganzevles and C.W.M. van der Geld*

Faculty of Mechanical Engineering, Eindhoven University of Technology, Eindhoven, The Netherlands

Condensation Heat Transfer of Herringbone Micro Fin Tubes*A. Miyara* and Y. Otsubo***

*Department of Mechanical Engineering, Saga University, Saga-shi

**Graduate School of Science and Engineering, Saga University, Saga-shi, Japan

Design Considerations for Dropwise Condensation on Tube Bundles*D.A. McNeil, B.M. Burnside and G. Cuthbertson*

Department of Mechanical and Chemical Engineering, Heriot-Watt University, Edinburgh, U.K.

Study of Condensation Heat Transfer of a Pure Fluid and Binary Mixture in a Bundle of Enhanced Surface Tubes*M. Belghazi*, A. Bontemps** and C. Marvillet**

*GRETh,DTA/DTEN-CEA/Grenoble, Grenoble

**Laboratoire des Ecoulements Geophysiques et Industriels, Université Joseph Fourier, Grenoble, France

In-Tube Condensation of Steam-Air Mixtures*F. Aglar*, S. Saric**, A. Tanrikut* and O. Yesin***

*Technology Department, Turkish Atomic Energy Authority, Ankara

**Mechanical Engineering Department, Middle East Technical University, Ankara, Turkey

Thursday 27, 10:40-12:20 - Room 2 - Thermalhydraulics: Liquid Films 1**Chairman: S. Alekseenko**

Experiments in Laminar Film Flow Along a Corrugated Wall*M. Vlachogiannis and V. Bontozoglou*

Department of Mechanical & Industrial Engineering, University of Thessaly, Volos, Greece

On Freely-Falling Liquid Film Along a Vertical Flat Plate*C. Bertani and M. De Salve*

Dipartimento di Energetica, Politecnico di Torino, Torino, Italy

Thermal Performances of a Falling Film Graphite Evaporator*S. Bessener**, V. Renaudin**, M. Daroux*, J.M. Hornut**, and P. LeGoff**

*LSGC, CNRS, ENSIC, INPL, Nancy

**UHP-Nancy 1, Villers-les-Nancy, France

Local and Instantaneous Distribution of Heat Transfer Rates through Wavy Films*F. Al-Sibai, A. Leefken and U. Renz*

Lehrstuhl für Wärmeübertragung und Klimatechnik, RWTH Aachen, Aachen, Germany

Measurement of Falling Films Thickness by Capacitive Sensors*W. Ambrosini*, N. Forgiione*, F. Oriolo* and A. Kammerer***

*Dipartimento di Ingegneria Meccanica, Nucleare e della Produzione, Università di Pisa, Pisa, Italy,

**Technische Universität München, Lehrstuhl A für Thermodynamik, Garching, Germany

Thursday 27, 10:40-12:20 - Room 3 - Thermodynamics & Heat and Mass Transfer: Freezing, Melting and Solidification**Chairman: F. Arinc**

Heat Transfer and Phase Transformations in Laser Annealing of Thin Si Films*C.P. Grigoropoulos, S. Moon and M. Lee*

Department of Mechanical Engineering, University of California, Berkeley, USA

Evaluation of Analytical Model on Power Balance of Skull Melting Set-up*S.W. Hong*, B.T. Min*, H.D. Kim* and J.K. Choi***

*Korea Atomic Energy Research Institute, Yusong, Taejeon

**Dongshin University, Naju, Chonnam, Korea

Experimental Study on the Thermal Performance with Frosting to Predict Frost Growth on a Flat Plate*N. Shimomura*, M. Kumada**, R. Chu** and T. Mizuno***

*Matsushita Refrigeration Company, Kusatsu City

**Department of Mechanical Engineering, Gifu University, Gifu City, Japan

Convective Melting of Ice near 4°C*G.R. Vieira*, S.L. Braga** and D. Gobin***

*Department of Mechanical Engineering, Universidade Católica de Petrópolis, Petrópolis, Brazil,

**Department of Mechanical Engineering, Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil,

***FAST-UMR-CNRS, Orsay, France

Thursday 27, 10:40-12:20 - Room 4 - Convective Flows: Natural Convection 2**Chairman: W. Lewandowski**

Air Natural Convection in a Convergent Channel with Uniformly Heated Plates*N. Bianco*, O. Manca**, S. Nardini* and V. Naso**

*DETEC, Università degli Studi di Napoli Federico II, Napoli

**DIA, Seconda università degli Studi di Napoli, Aversa, Italy

Experimental Data and Evaluation of Numerical Methods for Natural Convection in a Rectangular Enclosure with a Uniformly Heated Bottom Surface*J. Onishi*, H. Ikegami**, N. Otsuka***, S. Ito** and M. Mizuno*****

*Department of Intelligent Machine Engineering, Osaka Electro-Communication University, Osaka

**Osaka Gas Co.

***Mitsubishi Electric Corp.

****Department of Environmental Engineering, Osaka University, Osaka, Japan

Radiative Effects on Natural Convection in a Vertical Channel with an Auxiliary Parallel Plate*A. Andreozzi, O. Manca and B. Morrone*

Dipartimento di Ingegneria Aerospaziale, Seconda Università di Napoli, Aversa, Italy

Natural Convection of Suspension with Water and Fine Particles in a Rectangular Vessel Heated and Cooled from Opposing Vertical Walls: Effects of Initial Particle Concentration Gradient

*C. Kang**, *M. Okada*** and *A. Hattori***

*School of Mechanical & Aerospace Engineering, Seoul National University, Seoul, Korea

**Department of Mechanical Engineering, Aoyama Gakuin University, Tokyo, Japan

Experimental Analysis of Chimney Effect in a Vertical Isoflux Channel

*O. Manca**, *M. Musto** and *V. Naso***

*DIA, Seconda università degli Studi di Napoli Real Casa dell'Annunziata, Aversa

**DETEC, Università degli Studi di Napoli Federico II, Napoli, Italy

Thursday 27, 10:40-12:20 - Room 5 - Combustion: General Studies 2

Chairman: A. Chavez

Observation of Soot Agglomeration Process with Aid of Thermophoretic Force in a Microgravity Jet Diffusion Flame

O. Fujita and *K. Ito*

Department of Mechanical Science, Hokkaido University, Sapporo, Japan

Experimental Study on Pressure Effect and Diffusion Effect of Oxygen Gas by Magnetic Field

*H. Tanaka**, *M. Uehara**, *K. Yoshida***, *M. Kimura***, *H. Shoji*** and *A. Saima***

*Department of Applied Physics, National Defense Academy, Hashirimizu Yokosuka

**Department of Mechanical Engineering, Nihon University, Tokyo, Japan

Premixed Flame Kernel Growth in the Presence of a Vortex Ring

*Y. Xiong**, *W.L. Roberts**, *M.C. Drake*** and *T.D. Fansler***

*Department of Mechanical and Aerospace Engineering, North Carolina State University, Raleigh,

**General Motors Research, Development and Planning, Warren, USA

Experimental Study of Flow and Combustion Processes based on Physical and Numerical Modelling Techniques

*J. Baranski**, *W. Blasiak*** and *J. Stasiek**

*Technical University of Gdansk, Gdansk, Poland

**Royal Institute of Technology, Stockholm, Sweden

The Clinker Burning Process Simulated with Different Thermochemical Databases

*M. Modigell**, *D. Liebig** and *K. Hack***

*Institute for Chemical Engineering, RWTH Aachen, Aachen

**GTT-Technologies, Herzogenrath, Germany

Thursday 27, 12:20-13:20 - Lunch

Thursday 27, 13:20-14:00 - Plenary Room - Keynote Lecture 10

Chairman: K. Mishima

New Experimental Results in Boiling Heat Transfer

*H. Auracher**, *W. Marquardt***

*TU Berlin, Institut für Energietechnik, Berlin

**RWTH Aachen, Lehrstuhl für Prozesstechnik, Aachen, Germany

Thursday 27, 14:00-15:40 - Room 1 - Condensation 2

Chairman: A.J. Karabelas

Condensation Heat Transfer Coefficients of the Zeotropic Refrigerant Mixture R-22/R-142b in Smooth Horizontal Tubes

F.J. Smit and *J.P. Meyer*

Department of Mechanical and Manufacturing Engineering, Rand Afrikaans University, Johannesburg, South Africa

Local Heat Transfer During Dropwise Condensation of Steam on a Single Horizontal Tube

*M. Izumi**, *S. Kumagai***, *R. Shimada**** and *N. Yamakawa****

*Department of Mechanical Engineering, Miyagi National College of Technology, Natori

**Department of Machine Intelligence and System Engineering, Tohoku University, Sendai

***Department of Mechanical Engineering, Ishinomaki Senshu University, Ishinomaki, Japan

Experimental Investigation of EHD Condensate Drainage from Horizontal Finned Tube

D. Butrymowicz, *M. Trela* and *J. Karwacki*

Institute of Fluid Flow Machinery of Polish Academy of Sciences, Gdansk, Poland

The Comparison of Steam Condensation Rates when there are Low Concentrations of Ammonia, Methylamine and Trimethylamine in the Vapour

J. Deans, *C. Korte* and *M. Dunstall*

Department of Mechanical Engineering, University of Auckland, New Zealand

Film Condensation on Eccentrically Cut Horizontal Integral-Fin Tubes

L.K. Sreepathi

Department of Mechanical Engineering, JNN College of Engineering, Shimoga, India

Thursday 27, 14:00-15:40 - Room 2 - Thermalhydraulics: Liquid Films 2

Chairman: U. Renz

Flow Dynamics and Heat Transfer in Intensively Evaporating Wavy Liquid Film

A.N. Pavlenko, *V.V. Lel*, *A.F. Serov* and *A.D. Nazarov*

Institute of Thermophysics, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Conditions for the Change of the Droplet Structure into the Water Film on a Heated Wall Surface Overflowed by a Stream of Air

Z. Zapalowicz

Department of Mechanical Engineering, Technical University of Szczecin, Szczecin, Poland

Heat Transfer and Breakdown of Subcooled Falling Liquid Film on a Middle Size Heater

E.A. Chinnov, *D.V. Zaitsev*, *I.A. Sharina*, *I.V. Marchuk* and *O.A. Kabov*

Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Characteristics of Liquid Film in a Vertical Pipe with the Presence of Gas Flow

S. Alekseenko, *A. Cherdantsev*, *S. Kharlamov* and *D. Markovich*

Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Methodic of Measurements and Experimental Results of Local Heat Transfer at Liquid Film Flow on the Horizontal Finned Tubes

V. Rifert, *V. Sidorenko*, *V. Usenko* and *I. Zolotukhin*

National Technical University of Ukraine, Kiev, Ukraine

Thursday 27, 14:00-15:40 - Room 3 - Boiling: Pool Boiling 1

Chairman: S. Kandlikar

Boiling of Saturated FC-72 on Square Pin Fin Arrays

G. Guglielmini, *M. Misale* and *C. Schenone*

DITEC, Università di Genova, Genova, Italy

Passive Enhancement in Two Phase Heat Transfer: Analysis of Pool Boiling and CHF with Fins and Metallic Wire Nets

A. Franco and *E. Latrofa*

Dipartimento di Energetica, University of Pisa, Pisa, Italy

Adverse Electric Field Effects on Heat Transfer in Transition and Film Boiling

*V. Masson** and *P.M. Carrica***

*Centro Atómico Bariloche, Bariloche

**Universidad Argentina de la Empresa, Buenos Aires, Argentina

Bubble Growth Rate at Pool Boiling in Wide Range of Reduced Pressures

V.V. Yagov

Moscow Power Engineering Institute, Moscow, Russia

Study of Transition from Film to Nucleate Boiling on a Solid Hemispheric Surface

V.V. Glazkov, V.G. Zhilin**, Yu.A. Zeigarnik**, Yu.P. Ivochkin**, O.A. Sinkevich* and V.R. Tsoi****

*Moscow Power Engineering Institute, Moscow

**Joint Institute for High Temperature of the Russian Academy of Sciences, Moscow

***Scientific Research Center, Electrogorsk, Russia

Thursday 27, 14:00-15:40 - Room 4 - Convective Flows: Natural Convection 3

Chairman: J.Y. Yoo

Some Experiments on Natural-Convective Heat Transfer from Slender Vertical Cylinder

C.O. Popiel, J. Wojtkowiak and K. Bober

Poznan University of Technology, Poznan, Poland

An Interferometric Investigation of the Effect of Separation Distance and Temperature Imbalance on Natural Convection for Two Horizontal Cylinders at Moderate Rayleigh Numbers

P. Razelos and R.N. Krikkis***

*College of Staten Island, CUNY New York, Athens

**Institute of Chemical Engineering and High Temperature Processes, Patras, Greece

Scale Model: An Effective Tool in Validation of CFD Simulation Results in Natural Convection

R. Kulkarni

Faculty of Engineering & Technology, Multimedia University Melaka, Malaysia

An Experimental Study of Natural Convection and Surface Radiation in an Open Cavity

N. Ramesh, C. Balaji** and S.P. Venkateshan***

*National Aerospace Laboratories, Bangalore

**Heat Transfer and Thermal Power Laboratory, Indian Institute of Technology, Madras, India

Thursday 27, 14:00-15:40 - Room 5 - Combustion: Experimental Methods

Chairman: J.F. Sacadura

Surface Heat-Transfer Measurements Inside a Supersonic Combustor by LIF

K. Kontis and N. Yoshikawa***

*Department of Aerodynamics, Hellenic Air Force Academy, Athens, Greece

**Department of Aerospace Engineering, Nagoya University, Japan

Temperature Measurements and Heat-Transfer Modelling Using Plate Thermometers in a Plasterboard Wall System Subjected to a Standard Furnace Test

G.E. Collins, C Brescianini and C. Wojcik

Fire Science and Technology Laboratory, CSIRO, Sydney, Australia

Flow Characterization of Flickering Methane/Air Diffusion Flames using PIV

G. Papadopoulos, R.A. Bryant** and W. Pitts***

*Dantec Dynamics Inc., Mahwah

**National Institute of Standards Technology, Building and Fire Laboratory, Gaithersburg, USA

Application of Quotient Pyrometry to Industrial Pulverised Coal Combustion

T. Sabel, S. Unterberger and K.R.G. Hein

Institute of Process Engineering and Power Plant Technology (IVD), University of Stuttgart,

Stuttgart, Germany

Real-Time Exposure Holographic Interferometric Measurement and Tomography of C₂H₂ Flame Temperature Field

S. Huang and J. Peng

Department of Power Engineering, Huazong University of Science and Technology, Wuhan, China

Thursday 27, 15:40-16:00 - Coffee Break

Thursday 27, 16:00-16:40 - Plenary Room - Keynote Lecture 11

Chairman: G.P. Celata**Fundamental Issues Related to Flow Boiling in Minichannels and Microchannels**

S.G. Kandlikar

Mechanical Engineering Department, Rochester Institute of Technology, Rochester, U.S.A

Thursday 27, 16:40-18:20 - Room 1 - Thermalhydraulics: Unstable and Unsteady Flows 1

Chairman: to be assigned

Experimental Investigation of Annular Diffuser in Consideration of Efficiency and Unsteady Flow

P. Kraus, J. Messner and H. Stetter

Institut für Thermische Strömungsmaschinen und Maschinenlaboratorium, University of Stuttgart, Stuttgart, Germany

Effects of Pulsation on External Flow Heat Transfer around a Rod

Y. Ishino, T. Abe**, S. Yamaguchi*** and N. Ohiwa**

*Department of Mechanical Engineering, Nagoya Institute of Technology, Nagoya

**Toyota Motor Co., Toyota

***Department of Transportation Machine Engineering, Meijo University, Nagoya, Japan

Dynamics and Quasi-Periodicity in Axially Forced Taylor-Couette Flow

M. Sinha, I.G. Kevrekidis** and A.J. Smits**

*Gas Dynamics Laboratory, Princeton University, Princeton

**Chemical Engineering & PACM, Princeton University, Princeton, USA

Experimental Investigation of Propagating Flow Instabilities Generated by Super Vibratory Agitation

A. Jianu, M. Brede*, P. Claude**, A. Leder* and H.J. Speck****

*Institute of Fluidmechanics, University of Rostock, Rostock

**Chemetal GmbH, Frankfurt/Main

***Daimler Chrysler AG, Sindelfingen, Germany

Self-Oscillation of Cavitating Flow Around an Elliptic Cylinder

T. Mori, T. Takahashi**, T. Kaga*** and T. Ota*****

*Japan Defence Agency, Tokyo

**Central Research Institute of Electric Power Industry, Yokosuka

***Department of Mechanical Engineering, Hachinohe Institute of Technology, Hachinohe

****Department of Machine Intelligence and Systems Engineering, Tohoku University, Sendai, Japan

Thursday 27, 16:40-17:40 - Room 2 - Thermalhydraulics: Liquid Films 3

Chairman: U. Renz

Falling Liquid Film of the Surface Active Agents Solutions

L. Broniarz-Press and D. Dulski

Department of Chemical Engineering and Apparatus, Poznan University of Technology, Poznan, Poland

Thermocapillary Convection in a Falling Thin Liquid Film Locally Heated

O.A. Kabov, B. Scheid**, L.A. Sharina* and J.C. Legros***

*Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

**Microgravity Research Center, Universite Libre de Bruxelles, Brussels, Belgium

The Long Waves on a Liquid Film Falling over a Vertical Cylinder

O.Y. Tselodub, ** and A.A. Bocharov**

*Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk

**Novosibirsk State University, Novosibirsk, Russia

Thursday 27, 17:40-18:20 - Room 2 - Measurement Techniques: Thermophysical Properties 1

Chairman: O. Kashinsky

Experimental Investigation of Dynamic and Equilibrium Surface Tension Characteristics of Aqueous Surfactant Solutions

V.M. Wasekar, J. Zhang and R.M. Manglik

Thermal-Fluids and Thermal Processing Laboratory, University of Cincinnati, Cincinnati, USA

Effective Thermal Properties of Mexican Geothermal Cementing Systems from 25 to 220 °C

*A. García**, J.M. Morales**, E. Contreras*, E. Santoyo*** and G. Espinosa*****

*Instituto de Investigaciones Eléctricas, Temixco

**Centro Nacional de Investigación y Desarrollo Tecnológico, Cuernavaca

***UNAM, Centro de Investigación en Energía, Temixco

****UAM-iztapalapa, Depto. de IPH, México

Thursday 27, 16:40-18:20 - Room 3 - Boiling: Pool Boiling 2

Chairman: M. Misale

Two-Phase Structure Measurements for Bubbles Departing from a Heated Surface by Means of One- and Two-Probe Hot-Wire Anemometry

J. Bonjour, N. Ginet** and M. Lallemand***

*Laboratory du Froid- Cnam, Paris

**CETHIL - INSA, Villeurbanne Cedex, France

An Experimental Investigation on the Boiling Heat Transfer on the Vertical Square Surface

J.H. Song, J.G. Kim, S.B. Kim and H.D. Kim

Korea Atomic Energy Research Institute, Yusong, Taejeon, Korea

Experimental Investigation in Pool Boiling Heat Transfer of Ternary Mixture and Heat Transfer Correlation

Y. Fujita and M. Tsutsui

Department of Mechanical Engineering Science, Kyushu University, Fukuoka, Japan

Boiling Incipience of Ethanol on Platinum Surface: Influence of Pressure

K. Mizukami, X.C. Zhuo and S. Mukasa

Department of Mechanical Engineering, Ehime University, Matsuyama, Japan

Heat Transfer from Horizontal Tubes During Pool Boiling of Water and R141b

J.T. Cieslinski and P.R. Dominiczak

Technical University of Gdansk, Gdansk, Poland

Thursday 27, 16:40-18:20 - Room 4 - Convective Flows: Natural and Mixed Convection

Chairman: S.M. Zubair

The Review of Particular Experimental Methods of Free Convective Heat Transfer

W.M. Lewandowski

Department of Apparatus and Chemical Machinery, Technical University of Gdansk, Gdansk, Poland

Turbulent Mixed Convection Heat Transfer in a Vertical Flat Channel with Opposing Flows

P. Poskas and R. Poskas

Lithuanian Energy Institute, Kaunas, Lithuania

Free Convection of the Near Critical Fluid in Ground-Based and Microgravity Environment

V.I. Polezhaev, V.M. Emelianov, A.A. Gorbunov and E.V. Soboleva

Institute for Problems in Mechanics, Russian Academy of Sciences, Moscow, Russia

An Experimental Study of the Frost Formation on a Cold Surface in Free Convective Flow

G. Tanda and M. Fossa

DITEC, University of Genova, Genova, Italy

Secondary Flow Characteristics and Convective Heat Transfer in a Curved Rectangular Duct with External Heating

T.T. Chandratilleke

Department of Mechanical Engineering, Curtin University of Technology, Perth, Australia

Thursday 27, 16:40-18:20 - Room 5 - Combustion: Emission Reduction

Chairman: N. Selcuk

NOx Emission from High-Temperature Air/Methane Counterflow Diffusion Flame

R. Fuse, H. Kobayashi**, Y. Ju***, K. Maruta**** and T. Niioka***

*National Space Development Agency, Kagoshima

**Institute of Fluid Science, Tohoku University, Sendai

***Department of Aerospace Engineering, Tohoku University, Sendai

****Department of Science and Technology System, Akita Prefectural University, Honjo, Japan

Filtration Combustion of Hydrogen Sulfide, Comparison of Theory and Experiment

J.P. Bingué, A.V. Saveliev, A.A. Fridman and L.A. Kennedy

Department of Mechanical Engineering, University of Illinois at Chicago, Chicago, USA

FTIR Low Resolution Emission Spectrometry of a Laboratory-Scale Diffusion Flame: Experimental Set-Up

R. Bourayou, R. Vaillon and J.F. Sacadura

Centre de Thermique de Lyon, INSA de Lyon, Villeurbanne Cedex, France

Improving Combustion of High Asphaltene Heavy Fuel Oil by Water Emulsification

R. Ocampo-Barrera, A. Diego-Marin**, M. Martinez-Flores**, A. Tamayo-Flores** and E. Alarcón-Quiroz***

*Instituto Mexicano del Petróleo, Centro IMP-Veracruz, Veracruz

**Instituto de Investigaciones Eléctricas, Procesos Térmicos, Temixco, Mexico

Friday 28, 8:20-9:00 - Plenary Room - Keynote Lecture 12

Chairman: A.M. Taylor

Recent Progress in Visual Fluid Dynamics

J.Y. Yoo

School of Mechanical and Aerospace Engineering, Seoul National University, Seoul, Korea

Friday 28, 9:00-10:40 - Room 1 - Thermalhydraulics: Unstable and Unsteady Flows 2

Chairman: Z. Bilicki

The Spatial Amplification of Disturbances in the Kármán Boundary-Layer

Y.K. Hwang and Y.Y. Lee

School of Mechanical Engineering, Sungkyunkwan University, Suwon, Korea

The Spatial Amplification of Disturbances in Vertical Natural Convection Flows of Water Near Density Extremum

Y.K. Hwang

School of Mechanical Engineering, Sungkyunkwan University, Jangan-gu, Suwon, Korea

Transition in a Laminar Spot

A. Matsumoto

College of Science and Technology, Nihon University, Tokyo, Japan

Experimental Study of Transient Evaporation of Superfluid Helium Induced by Incidence of Second Sound Thermal Pulse onto Free Surface

M. Murakami, T. Furukawa, M. Maki and J. Fujiyama

Institute of Engineering Mechanics and Systems, University of Tsukuba, Tsukuba, Japan

Pressure Transient in Compressible Bubbly Flows in the Petroleum Industry

D. Kim, S. Corvera**, A. Di Lullo**, N. Mancini** and F. Podenzani***

*High Informatics College of Novosibirsk State University, Novosibirsk, Russia

**EniTecnologie, San Donato Milanese, Italy

Friday 28, 9:00-10:40 - Room 2 - Measurement Techniques: Thermophysical Properties 2

Chairman: O. Kashinsky

On the Effective Thermal Conductivity of Dry Olivine

F. Gori and S. Corasaniti

Department of Mechanical Engineering, University of Rome "Tor Vergata", Rome, Italy

Application of a Cubic Equation of State to a Self-Consistent Thermodynamic Model to Obtain Thermodynamic Surfaces for Various Organic Heat Transfer Fluids

E. Silvestri

Ansaldo Energia, Divisione Nucleare, Genova, Italy

Experimental Determination of the Functional Relationship Among Concentration, Temperature and Refractive Index for Ammonium Chloride Solutions

C.S. Stampa and S.L. Braga***

*Department of Mechanical Engineering, Universidade Católica de Petrópolis, Petrópolis

**Department of Mechanical Engineering, Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil

Method of Thermal Conductivity Determination of Conductive Composites at a High Temperature

V.V. Vorobey, G.E. Ostrovskiy**, E.N. Nikiporets*, O.V. Tatarnikov** and S.V. Tashchilov***

*Moscow Aviation Institute, Moscow

**Open Joint-Stock Company Research, Development and Production Corporation "KOMPOZIT",

Korolev, Russia

Thermodynamics Properties of HFC 134a in Wide Intervals of Pressure and Temperature Including the Critical Region

V.A. Rykov, I.V. Rykova*, E.E. Ustjuzhanin**, B.F. Reutov** and A.B. Lobanov***

*State Academia of Cooling Technology, St. Petersburg

**Moscow Power Engineering Institute, Moscow, Russia

Friday 28, 9:00-10:40 - Room 3 - Boiling: Boiling Heat Transfer 1

Chairman: V. Wadekar

Nucleate Boiling in Climbing Films: a Flow Visualisation Study

J.R. Barbosa Jr., G.F. Hewitt and S.M. Richardson

Department of Chemical Engineering, Imperial College of Science, London, U.K.

Boiling Heat Transfer at Liquid-Liquid Interface between Water and Molten Metal

Y. Saito, T. Tanaka** and K. Mishima**

*Research Reactor Institute, Kyoto University, Osaka

**Graduate School of Energy and Science, Kyoto University, Kyoto, Japan

Experimental Study on Boiling in Micro-Chambers

B. Seyedan, A.M.C. Chan and M. Shoukri

Department of Mechanical Engineering, McMaster University, Hamilton, Canada

Experimental Investigations of Bubble Entrainment Peculiarities at Steam Generation in Horizontal Channel with Porous Coating

V.I. Borzenko and S.P. Malyshenko

Institute of High Temperatures, Russian Academy of Sciences, Moscow, Russia

An Experimental Investigation of the Influence of System Pressure on the Boiling Heat Transfer Coefficient in a Closed Two-Phase Thermosyphon Loop

R. Khodabandeh and B. Palm

Department of Energy Technology, Royal Institute of Technology, Stockholm, Sweden

Friday 28, 9:00-10:40 - Room 4 - Multi-Component and Multi-Phase Flow: Atomization and Sprays

Chairman: I. Ishihara

Determination of Bulk Temperature of Semitransparent Oxide Particles in Thermal Spraying from the Experimental Data on their Color Temperature

L.A. Dombrovsky and M.B. Ignatiev***

*Institute of High Temperatures of the Russian Academy of Sciences, Moscow

**Institute of Metallurgy, Moscow, Russia

Index of Performance of Effervescent Atomisers

O. Schmidt, J.S. Lewis* and J. Kubie***

*School of Engineering Systems, Middlesex University, London

**School of Engineering, Napier University, Edinburgh, U.K.

Practical Design of Ultrasonic Spray Devices: Experimental Testing of Several Atomizer Geometries

M. Dobre and L. Bolle

Department of Mechanical Engineering, Université Catholique de Louvain, Louvain-la-Neuve, Belgium

Properties of Sandblasting Nozzle for Micro Processing

N. Ogawa and K. Matsuyama

Science University of Tokyo, Chiba, Japan

Measurement of Spray Cooling Heat Transfer Using an Infrared-Technique

F. Puschmann, E. Specht and J. Schmidt

Institute of Fluid Dynamics and Thermodynamics, Otto-von-Guericke-Universität, Magdeburg, Germany

Friday 28, 9:00-10:40 - Room 5 - Multi-Component and Multi-Phase Flow: Particle and Droplet Dynamics

Chairman: A.M. Taylor

Contact Angle Behavior during Impingement of Molten Solder Droplets on Metal Plates

C. Richard, I.S. Bayer and C.M. Megaridis

Department of Mechanical Engineering, University of Illinois, Chicago, USA

Motion of Two Settling Particles in a Stagnant Viscous Fluid inside a Vertical Cylinder

M. Shinohara

Department of Mechanical Engineering, Gifu National College of Technology, Gifu, Japan

Particle Deposition in Low-Speed, High-Turbulence Flows

M. Reck, P.S. Larsen and U. Ullum

Department of Mechanical Engineering, Technical University of Denmark, Copenhagen, Denmark

Evaporation of the Array of Hydrocarbon Droplets in an Air Stream

T. Kadota, Y. Ohta, H. Enomoto and D. Segawa

Department of Mechanical Engineering, Osaka Prefecture University, Japan

Oblique Impact of Droplets on Walls and Films

S. Sikalo, C. Tropea**, M. Marengo*** and E.N. Ganic**

*Faculty of Mechanical Engineering, University of Sarajevo, Bosnia/Herzegovina

**SLA, Technische Universität Darmstadt, Darmstadt, Germany

***Faculty of Engineering, University of Bergamo, Dalmine, Italy

Friday 28, 10:40-11:00 - Coffee Break

Friday 28, 11:00-11:40 - Plenary Room - Keynote Lecture 13

Chairman: N. Selcuk

Experimental Characterization of Thermal Radiation Properties of Dispersed Media

J.F. Sacadura and D. Baillis

INSA Lyon - CETHIL, Lyon, France

Friday 28, 11:40-13:20 - Room 1 - Fluid-Dynamics: Vortex Flows 1

Chairman: T. Skiepko

Effect of Embedded Vortices on Film Cooling Performance on a Flat Plate

J.S. Lee, H.G. Jung and S.B. Kang

School of Mechanical & Aerospace Engineering, Seoul National University, Seoul, Korea

Flow Structures of Swirling Wakes behind Circular Discs

R.F. Huang and F.C. Tsai

Department of Mechanical Engineering, National Taiwan University of Science and Technology, Taipei, Taiwan

Experimental Investigation of the Confined Vortex Flow in a One Channel Vortex Enhanced Heat Exchanger

F. Dupont, N. Daviot, C. Gabillet and P. Bot

Institut de Recherche de l'Ecole Navale, Brest-Naval, France

Vortical Structures behind Three Side-by-Side Cylinders

X.W. Wang, Y. Zhou* and H. Li***

*Department of Mechanical Engineering, The Hong Kong Polytechnic University, Hong Kong, China,

**Department of Mechanical Engineering, Kagoshima University, Kagoshima, Japan

Friday 28, 11:40-13:20 - Room 2 - Thermodynamics & Heat and Mass Transfer: General Studies 1

Chairman: A. Prata

Rayleigh-Bénard Phenomena, Bifurcations, Exergy Degradation and System Evolution

G. Bisio and C. Pisoni

Energy and Conditioning Department, University of Genoa, Genova, Italy

Experimental Measurements of Radiative Heat Flux in Complex Geometries and Comparison with Numerical Modelling

J.S. Almeida, W. Malalasekera** and E.H. James***

*Laboratorio de Integraçao e Testes-LIT, Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

**Department of Mechanical Engineering, Loughborough University, Loughborough, U.K.

Prediction of Stagnation Region Heat Transfer Using a Neural Network

B. Seyedan, A.N. Oo*, C.Y. Ching* and M. Shoukri**

*Department of Mechanical Engineering, McMaster University, Hamilton

**Faculty of Engineering & Applied Science, Memorial University of Newfoundland, St. John's, Canada

Non-Newtonian Laminar Heat Transfer in Stirred Tank Bioreactors

Y. Kawase, M. Hoshino and T. Takahashi

Department of Applied Chemistry, Toyo University, Saitama, Japan

Non-Linearity: Fundamentals and Applications in Different Processes

G. Bisio, L. Tagliafico* and A. Bisio***

*Energy and Conditioning Department, University of Genoa, Genova

**Botanical Institute, University of Genoa, Genova, Italy

Friday 28, 11:40-13:20 - Room 3 - Boiling: Boiling Heat Transfer 2

Chairman: K. Mishima

The Steam Boat and the Elasticity and Capability of a Bubble in Subcooled Boiling

J.J. Schröder, St. Alraun, A. Bode and M. Krüger

Institute for Thermodynamics, University of Hannover, Hannover, Germany

Boiling and Evaporation Heat Transfer from a TiO₂-Coated Surface

Y. Takata, S. Hidaka*, J.M. Cao*, T. Nakamura*, H. Yamamoto, M. Masuda*, T. Ito* and T. Watanabe***

*Departement of Mechanical Science and Engineering, Kyushu University, Fukuoka

**Research Center for Advanced Science and Technology, The University of Tokyo, Tokyo, Japan

Explosive Vaporization on a Microheater: Effect of Dissolved Gas

E.S. Vasserman

Institute of Thermophysics, Siberian Division of the Russian Academy of Sciences, Novosibirsk, Russia

Some Aspects of Reconstruction of Attractors from the Heating Surface Temperature Fluctuations in Boiling

R. Mosdorf

Biasystok University of Technology, Biasystok, Poland

Development of Nucleate Boiling in an Annular Clearance

T. Bohdal, Z. Bilicki and M. Czapp

Tecnical University of Koszalin, Department of Thermomechanics and Refrigerating Engineering, Koszalin, Poland

Friday 28, 11:40-13:20 - Room 4 - Multi-Component and Multi-Phase Flow: General Studies
Chairman: B. Azzopardi

Impedance Probe for Phase Distribution Measurements and Flow Pattern Identification in Oil-Water Flows

J. Lovick and P. Angeli

Department of Chemical Engineering, University College London, London U.K.

Effects of Polymer, Surfactant, and Salt Additives to a Coolant on the Mitigation and the Severity of Vapor Explosions

M. Furuya and I. Kinoshita

Central Research Institute of Electric Power Industry, Tokyo, Japan

Behaviors of Bubble Formation from a Bottom Porous Nozzle in a Bath

M. Kaji, T. Sawai*, K. Mori** and M. Iguchi****

*Department of Mechanical Engineering, Kinki University, Wakayama

**Department of Intelligent Machine Engineering, Osaka Electro-Communication University, Osaka

***Division of Materials Science and Engineering, Hokkaido University, Sapporo, Japan

A New Magnetic Fluid Circulator Utilizing Waste Gas and /or Heat - First Report, Feasibility Test

M. Sadatomi, H. Tsubone**, A. Kawahara* and Y. Sato****

*Department of Mechanical Engineering and Mat. Sci., Kumamoto University, Kumamoto

**Department of Mechanical Engineering, Ariake National College of Technology, Omuta

***Yatsushiro National College of Technology, Yatsushiro, Japan

Experimental Research of Magnetohydrodynamic Resistance to a Flow of Lead, Gallium, Lead-Bismuth, and Lead-Lithium Eutectics in a Transverse Magnetic Field

A.V. Besnosov, S.S. Pinaev*, V.N. Zakhvatov*, A.V. Semyonov*, T.A. Bokova* and P.V. Romanov***

*Nizhny Novgorod State Technical University, Nizhny Novgorod

**Russian Scientific Centre of Kurchatov Institute, Moscow, Russia

Friday 28, 11:40-13:20 - Room 5 - Convective Flows: Convective Heat Transfer

Chairman: G. Guglielmini

The Effect of Swirl on Convective Heat Transfer Downstream of Sudden Axisymmetric Expansions in a Circular Duct

J. Ward, A. Bertelmann and D.R. Garwood

School of Technology, University of Glamorgan, Pontypridd, U.K.

Interferometric Study of Convective Heat Transfer Structures above the Horizontal Isothermal Rectangular Plates

E. Radziemska and W.M. Lewandowski

Department of Apparatus and Chemical Machinery, Technical University of Gdansk, Gdansk, Poland

An Experimental Investigation of Forced Convection Heat Transfer in Channels with Rib Turbulators by means of Liquid Crystal Thermography

D. Cavallero and G. Tanda

DITEC University of Genova, Genova, Italy

Friday 28, 13:20-14:20 - Lunch

Friday 28, 14:20-15:00 - Plenary Room - Keynote Lecture 14

Chairman: to be assigned

On the Mechanism of Supersonic Cavity Flow Oscillations

M. Nishioka, T. Asai, S. Sakaue and K. Shirai

Department of Aerospace Engineering, Osaka Prefecture University, Osaka, Japan

Friday 28, 15:00-16:40 - Room 1 - Fluid-Dynamics: Vortex Flows 2

Chairman: T. Skiepko

Criterion for the Necklace Vortex Excitation in Criss-Cross Circular Cylinder System

I. Kumagai, T. Matsumoto**, T. Takahashi* and M. Shirakashi**

*Department of Mechanical Engineering, Nagaoka University of Technology, Nagaoka

**Mitsubishi Heavy Industries Co., Ltd., Japan

Experimental Study of Interference Drag For Multi-Element Objects

A. Sakellaridis and A. Lazaridis

Department of Mechanical Engineering, Wiedener University, One University Place,

Chester, PA 19013, USA

Comparison of Rotating Flows with Vortex Breakdown in Cylindrical and Quadratic Containers

J.N. Sorensen, V. Okulov*, **, I. Naumov** and E. Varlamova*, ***

*Department of Mechanical Engineering, Technical University of Denmark, Kongens Lyngby, Denmark

**Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Influence of the Dissymmetry in Rotating Fluids on the Vortex Core Precession and Spectral Characteristics of the Flows

I. Naumov, **, V. Meledin*, ** and V. Okulov**

*Institute of Thermophysics Siberian Branch of the Russian Academy of Sciences, Novosibirsk

**Technological Design Institute of Scientific Instrument Engineering, Novosibirsk, Russia

Studies on Junction Flow in Swirling Flow Exhaust Pipe System

L. Cao, Y. Liu, H. Liu and S. Shuai

Power Engineering Department, Huazhong University of Science & Technology, Wuhan, China

Friday 28, 15:00-16:40 - Room 2 - Thermodynamics & Heat and Mass Transfer: General Studies 2

Chairman: G. Zummo

Heat Transfer in a Spherical Cavity during Variation of Dynamics Conditions

V.I. Terekhov, S.V. Kalinina and Yu.M. Mshvidobadze

Institute of Thermophysics, Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

Heat Transfer During Foam Flow Across Bank of Tubes

J. Gyls, M. Jakubcionis and S. Sinkunas

Department of Thermal and Nuclear Energy, Kaunas University of Technology, Kaunas, Lithuania

Experimental Research on Heat Transfer Phenomena through Fuel Oil in Railway Wagon Tanks

I. Ionel, C. Ungureanu, D. Lelea, P.D. Oprisa-Stanescu

Department of Thermal Machines and Transport, Plitehnica University of Timisoara, Timisoara, Romania

Novel Method Thermodynamic Analysis of Energy Intensive Systems

V. Nikulshin, C. Wu** and V. Nikulshina****

*Odessa State Polytechnic University, Odessa, Ukraine

**U.S. Naval Academy, Annapolis, USA

***Odessa State Academy of Refrigeration, Odessa, Ukraine

Heat Transfer to Kerosene at Supercritical Pressure in a Round Tube with a Large Heat Flux at the Wall

Z. Hu, T. Chen and Y. Luo

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China

Friday 28, 15:00-16:40 - Room 3 - Fluid-Dynamics: General Studies

Chairman: A. Goulas

Visualisation of Three-Dimensional, Transonic Cavity Flows

N. Tabora, D. Bray and K. Knowles

Department of Aerospace, Power and Sensor, Cranfield University, Swindon, U.K.

Investigation of Airfoil Ground Effects Using a Moving Belt System

Y.J. Kim and J.H. Cho

School of Mechanical Engineering, Sungkyunkwan University, Jangan-gu, Suwon, Korea

Hydrodynamics of Aeration and Suspending in a Mixer

P. Wesolowski

Department of Chemical Engineering and Apparatus, Poznan University of Technology, Poznan, Poland

Some Functions of Wing Apparatus in Insects

S. Sudo, K. Tsuyuki* and T. Ikehagi***

*Department of Mechanical Engineering, Iwaki Meisei University, Iwaki

**Institute of Fluid Science, Tohoku University, Sendai, Japan

Pump Design CAD Based on the PDE Numerical Grid Generation Techniques

C. Li, J. Su and X. Cheng

Power Engineering Department, University of Shanghai for Sci & Tech, Shanghai, China

Friday 28, 15:00-16:40 - Room 4 - Multi-Component and Multi-Phase Flow: Flooding

Chairman: M. Furrer

Visualization of Flooding Instability in Counter-Current Gas-Liquid Flow Along Vertical Flat Walls

J.R.F. Guedes de Carvalho and M.J.F. Ferreira

Departamento de Engenharia Química, Universidade do Porto, Porto, Portugal

Counter-Current Gas/Liquid Flow through Channels with Corrugated Walls. Visual Observations of Liquid Distribution and Flooding

S.V. Paras, E.I.P. Drosos*, A.J. Karabelas* and F. Chopard***

*Department of Chemical Engineering & Chemical Process Engineering Research Institute, Aristotle University of Thessaloniki, Thessaloniki, Greece

**ALFA LAVAL – VICARB, Le Fontanil Carnillon, France

Experimental Study on CCFL in Narrow Annular Gaps with Large Diameter

J.H. Jeong, S.J. Lee, R.J. Park and S.B. Kim

Korea Atomic Energy Research Institute, Yusong-ku, Taejon, Korea

Flooding Phenomenon and Determination of Interfacial and Wall Shear in One Dimensional Two-Fluid Model

T. Skorek

Thermal Hydraulics Division, Gesellschaft für anlagen- und Reaktorsicherheit (GSR) mbH, Garching, Germany

An Investigation on the Flow Characteristics of Oil-Water Emulsions Flow in the Annulus with the Inner Rotating Cylinder

J. Zhang, T. Chen, Y. Luo and H. Wang

State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, Xi'an, China

Friday 28, 15:00-16:40 - Room 5 - Thermalhydraulics: Natural Circulation

Chairman: G. Tanda

Experimental Dynamics of a Natural Circulation Loop

G. Cammarata, A. Fichera, I.D. Guglielmino and A. Pagano

Dipartimento di Ingegneria Industriale e Meccanica, Università degli Studi di Catania, Catania, Italy

Heat Island Effect in Urban Areas: Airborne Measurements to Determine the Radiation Intensity

A.M. Papadopoulos and E.A. Kalognomou

Laboratory of Heat Transfer and Environmental Engineering, Aristotle University of Thessaloniki, Greece

Influence of Power Steps on the Thermohydraulic behavior of a Natural Circulation Loop

M. Misale, D. Cavallero and M. Frogheri

DITEC, University of Genoa, Genova, Italy

Natural Circulation in a Adiabatic Air-Water Loop

A. Kulkarni and K. Iyer

Department of Mechanical Engineering, Indian Institute of Technology, Bombay, India