

Section II.3 Report

SECTION COMMITTEE

The Committee of the Section II.3 on Fluid Phenomena in Energy Exchanges is as follows:

Chairman	Y. Hassan	USA
Secretary	J. Buongiorno	USA
	L. Meyer	Germany
	G. Palfalvi	Hungary
	I. Nezu	Japan
	N. Tanaka	Japan
	K. Hanjalic ⁽²⁾	the Netherlands
	H-H. Hwung	ROC
	A.P. Sorokin	Russia
	A. G. Hutton	U.K.
	M. A. Leschziner	U.K.
	C. J. Chen	USA
	F. Eltawila	USA
	H. Ninokata	Japan

RECENT PAST ACTIVITIES (OCTOBER 2001- MID 2003)

The section consists of four working groups: *Numerical Flow Modelling*; *Cooling Towers*; *Advanced Nuclear Reactors* and *Wind Engineering*. The first three groups are active, however, the Wind Engineering group is dormant and no activity to report.

The section continues to sponsor successful symposium series as:

The 8th International Symposium on Flow Modeling and Turbulent Measurements (FMTM2001) in Tokyo, Japan, Dec. 2001. A Symposium Proceedings was published by *World Scientific Publishing Company*, 2002.

The working group on Refined Flow Modeling sponsored the 9th ERCOFTAC/IAHR Workshop on Refined Turbulence Modelling, held in Oct. 2001 in Darmstadt, Germany, with a benchmark exercise on 4 test cases including a 3D one. Also it co-sponsored the Euromech 2002 held in Southampton, UK, July, 2002; and ETTM5, the 5th International Symposium on Engineering Turbulence Modeling and Measurements, Mallorca, Spain, September 2002. This Working Group is planning to continuously sponsor or co-sponsor the international meetings.

The working group on Advanced Nuclear Reactor Thermal-Hydraulic held the 10th International Meeting on ANRT in July 2001 in Obninsk, Russia, including a benchmark exercise. It is planning to sponsor the 11th Advanced Thermal Hydraulic Working Group Meeting with benchmark exercises again in Obninsk, July, 2004. Interactions with other groups and international societies are pursued to continue sponsoring and cosponsoring several activities, especially; with the renaissance of nuclear energy as an option in the

mix energy equation. The section will spare no efforts to foster co-operation with other organizations striving for similar section's goals.

The 12th IAHR Cooling Tower and Heat Exchanger Symposium was held in Sydney (Australia), in Nov. 2001.

The Section has organized a special seminar on Development in Industrial Fluid Mechanics and Applications in Energy Production during the Beijing conference with 8 papers presented.

Forthcoming planned Events Sponsored or Co-sponsored by the Section are:

- Workshop on Application of Computational Fluid Dynamics in Nuclear Industry at ICONE, April 2004.
- CFD Validation of Synthetic Jets and Turbulent Separation Control: NASA Langley Research Center Workshop (co-sponsored by IAHR), March 29-31, 2004.
- 9th International Symposium on Flow Modeling and Turbulent Measurements proposed to be sponsored by the Section and held in Europe, 2004 or 2005.
- A workshop entitled, "Application of Computational Fluid Dynamic in Nuclear Industry" is planned. This tutorial is proposed to be at ICONE-12 in April 2004.

Also the Section has been invited to co-sponsor:

- Nuclear Reactor Thermal Hydraulics, Operations and Safety (NUTHOS6), October 4-8, Nara, Japan.

In addition a discussion with Dennis Tenchine From CEA-Grenoble is started. It is related to the new activities of High Temperature Gas Cooled Reactors and Fast Reactors system as the increase in computations, CFD evaluations and experimental R&D studies of the advanced reactor designs. Technical exchange on these topics in the frame of the IAHR Section is needed and it will be pursued.

J. Buongiorno will update the section website and restart the section newsletter for the Fall 2003.

Attached in the Appendix is the call of planned workshops.

PUBLICATIONS

- 8th International Symposium on Flow Modeling and Turbulence Measurement (FMTM) 2001, December 4-6, **2001**, Tokyo, Japan, Conference Report by Prof. H. Ninokata; Proceedings: *Advances in Fluid Modeling & Turbulence Measurements*, H. Ninokata, A. Wada and N. Tanaka, *World Scientific Pub Co.* 2002
- 7th International Symposium on Flow Modeling and Turbulence Measurement (ISFMTM) **2001**, October 5-8, 1998, Tainan, Taiwan.
- 10th International Meeting of the Working Group on Advanced Nuclear Reactors Thermohdraulics,, “Calculation of thermal characteristics of the ADS target model,” July 2001, Obninsk, Russia to be published in volume proceedings.

APPENDIX





International Association for Hydraulic Engineering and Research

Section on Energy Exchange and Fluid Phenomena

Ministry of the Russian Federation for Atomic Energy

**State Scientific Center of the Russian Federation
INSTITUTE FOR PHYSICS AND POWER ENGINEERING
named after A.I.Leipunski**



**11-th INTERNATIONAL MEETING OF THE WORKING GROUP
ON ADVANCED NUCLEAR REACTORS THERMOHYDRAULICS**

July, 2004, Obninsk, Russia

First announcement

Dear colleagues!

On behalf of the Organizing Committee of 11th Meeting of the Working Group on Advanced Nuclear Reactors Thermal Hydraulics, you are kindly invited to attend this meeting and would appreciate you to distribute this announcement among your colleagues.

International meetings of Working Group on Advanced Nuclear Reactors Thermal Hydraulics (WG ANRT) sponsored by International Association of Hydraulic Researches (IAHR) have held in different countries at several scientific centers – leading institutions in the field of reactor thermohydraulics. Ten previous meetings were held successfully in Saratoga Springs, USA (1980), Cambridge, USA (1981), Rome, Italy (1982), Sunnyvale, USA (1983), Richland, USA (1984), Grenoble, France (1988), O-arai, Japan (1988), Karlsruhe, Germany (1991), Rez, Czech Republic (1995), Grenoble, France (1998) and Obninsk, Russia (2001).

The proposed 11th meeting will take place July 2004, at the State Scientific Center of Russian Federation Institute of Physics and Power Engineering (IPPE), in Obninsk, Kaluga Region, Russian Federation.

The general topic of the meeting is “ Hydrodynamics and heat transfer in single and two-phase flow of liquid metals”

The technical program of the meeting will include the following topic areas:

- Fundamental research of hydrodynamics and heat transfer in liquid metals (in channels, chambers, nanostructures);

- Complex problems of hydrodynamics and heat transfer in liquid metal cooled reactors (reactor core, heat exchangers, mixing chambers and others);
- Thermal Hydraulics of Accelerator Driving Systems (ADS), including recent calculations and discussions of the previous 10th workshop benchmark problem on temperature distributions within the target of ADS. This benchmark results were presented at the last 10-th meeting of WG;
- Thermal hydraulics in nano-systems, capillary-porous structure based devices;
- Methods of thermal hydraulic calculation techniques and computational computer programs;
- Database and verification tests.

New benchmark problem will be proposed within the frame of WG meeting: “Hydrodynamics and heat transfer in a subassembly model cooled by liquid metal coolant”.

Please contact us on possibility of attending the Working Group meeting, contribution at the technical sessions or participation in the benchmark. We look forward to hearing from you.

Chair of Organizing Committee:

Professor Alexander P. Sorokin

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The brief information on activity of International Working Group is attached.

Best Regards,

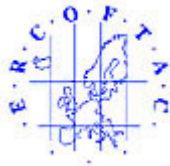
Pr. Alexander Sorokin

Head of International Working Group on
Advanced Nuclear Reactors Thermohydraulics

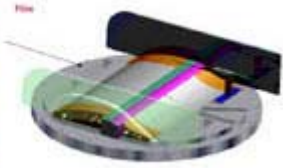
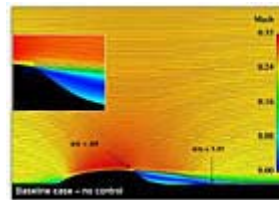
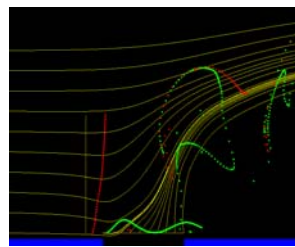
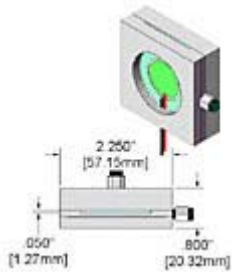
Langley Research Center Workshop

CFD Validation of Synthetic Jets and Turbulent Separation Control

In association with



NATIONAL
INSTITUTE OF
AEROSPACE



Case 1: Synthetic Jet
into Quiescent Air

Case 2: Synthetic Jet in a
Crossflow

Case 3: Flow over a Hump Model (Actuator
Control)



March 29-31, 2004

Woodlands Hotel and Conference Center
Colonial Williamsburg
Williamsburg, Virginia, USA

Local Organization: [Thomas Gatski](#), [Christopher Rumsey](#)

NASA Langley Research Center

Responsible NASA Official: [W. L. Sellers](#)

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GOALS, PAST ACTIVITIES AND PLANNED ACTIVITIES OF THE WORKING GROUP ON ADVANCED NUCLEAR REACTORS THERMAL HYDRAULICS

The Working Group on Advanced Nuclear Reactors Thermal Hydraulics, formerly the Working Group on Liquid Metals Thermal Hydraulics, was created by the Section on Fluid Phenomena in Energy Exchanges of the International Association for Hydraulic Research. Advanced nuclear reactors encompass all advanced concepts, including Liquid Metal Reactors, Light Water Reactors and Gas Cooled Reactors. The working group operates under the rules established in the by-laws of the Section and the Working Group. It is open, on an invitation" basis, to participants from industry, laboratories and academia.

The goals of this group are:

- (1) to effectively contribute to the solution of technical problems associated with the thermohydraulics aspects of design and safety of advanced nuclear reactors, while avoiding duplication of the efforts made in other existing groups;
- (2) to provide an international forum for engineers and researchers from various countries and organizations who are active in the group's area of interests;
- (3) to keep the members as well as meeting participants abreast of their fields and alerted to future challenges and opportunities by examining, on a continuing basis, the present and likely future directions of the group's areas of endeavor.

Major topics address the flow and heat transfer problems being encountered in applied research, analysis, experimentation and design practices. Emphasis is placed on the single-phase flow phenomena of interests to advanced nuclear reactors.

The group seeks to accomplish its goals by:

- (1) organizing and conducting working group meetings;
- (2) organizing and conducting benchmark exercises;
- (3) enhancing cross-fertilization with the other working groups of the Section on Fluid Phenomena in Energy Exchanges;
- (4) cooperating with other international organizations whose interests
- (5) and activities are related to those of the working group.

Working Group Meetings around particular subjects of interests are held approximately every two or three years. They are two to three day informal meetings and consist of oral presentations and discussions of current activities, devoting most of the time to discussions and exchange of direct technical experience. Solutions to a preassigned benchmark problem are also presented and discussed.

PAST MEETINGS AND ACTIVITIES

Formation of the "Liquid Metals Thermal Hydraulics" Working Group of the IAHR Section on Fluid Phenomena in Energy Exchanges was authorized at the Section Meeting held during the XVIII IAHR Congress in September 1979. M.D. Carelli was appointed Chairman of the working group. In 1990, the working group was restructured as "Advanced Nuclear Reactors Thermal Hydraulics' Working Group with a new charter and expanded area of interests. H. Ninokata was appointed Chairman of the working group. After 1998 Y. Hassan was appointed Chairman of the working group. Shown

below is a list of the past and planned working group meetings and benchmark exercises.
Now the leader of Working Group is A.Sorokin.

WORKING GROUP MEETINGS

№	Date	Topics	Organizers and Place
1.	Octobers, 1980	Organizational meeting of the working group	M.D. Carelli Saratoga Springs / USA
2.	October 5-6, 1981	Overviews of R&Ds at each country, rod bundles and plena: experiments, theories and computations	M.D. Carelli MIT, Cambridge / USA
3.	September 15-17, 1982	Dedicated to rod bundles thermo-hydraulics	M. Pezzilli ENEA, Rome / Italy
4.	January 17-19, 1983	Dedicated to plena and pipes thermo-hydraulics	E.L. Gluekler GE, Sunnyvale / USA
5.	July 31-August 3, 1984	Thermal hydraulics in rod bundles and plena/pipes (entire group meeting)	R.L. Stover Richland / USA
6.	June 23-27, 1986	Thermal hydraulics in rod bundles and plena/pipes; a first benchmark problem presented.	D. Grand CEA-CENG-Grenoble / France
7.	August 1-3, 1988	Thermal hydraulics in rod bundles and plena/pipes; a second benchmark problem presented.	H. Ninokata PNC-OEC, O-arai/Japan
8.	August 27-29, 1991	Thermal hydraulics of advanced nuclear reactors including LMFBRs/LWRs/HTGRs; a third benchmark problem presented.	K. Rehme KfK, Karlsruhe / Germany
9.	June 6-8, 1995	Thermal hydraulics of advanced nuclear reactors including LMFBRs/LWRs/HTGRs; a fourth benchmark problem presented.	F. Mantlik NRI, Rez / Czech
10.	April 7-9, 1998	Thermal hydraulics of advanced nuclear reactors including LMFBRs/LWRs/HTGRs; a fifth benchmark problem presented.	D. Tenchine CEA- Grenoble
11.	July 17-19, 2001	Thermal hydraulics for Fast Reactors with different coolant; a sixth benchmark problem presented.	A. Sorokin Minatom, IPPE, Obninsk, Russia
12.	2004	Hydrodynamics and heat transfer in single and two-phase flow of liquid metals LMFBRs, a seventh benchmark problem to be presented.	A. Sorokin Minatom, IPPE, Obninsk, Russia

BENCHMARK EXERCISES

№	Date	Topics	Organizers and Place
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№	Date	Topics	Organizers and Place
1.	January-June, 1986	Thermal buoyancy effects at a pipe/plenum interface: results presented at the 5th Working Group Meeting	K. Kasza (ANL) CEA-CENG-Grenoble / France
2.	February-August, 1988	Model investigations on decay heat removal by natural convection: results presented at the 6th Working Group Meeting	D. Grand (CEA) and D. Weinberg (KfK) PNC-OEC, O-arai / Japan
3.	January-August, 1991	Thermal hydraulic interactions of buoyancy driven upward and downward flows and thermal stratification: results presented	H. Ninokata and Y. Ieda (PNC) KfK, Karlsruhe/ Germany at the 7th Working Group Meeting
4.	April-January, 1994 1995	Thermal hydraulic exchange processes associated with turbulent jet flows: results presented at the 8th Working Group Meeting	K. Rehme and W. Baumann (KfK) NRI, Rez / Czech
5.	April-January, 1997 1998	Detailed velocity distribution in rod bundles results to be presented at the 9th Working Group Meeting	F. Mantlik (NRI, Rez/Czech) CEA-Grenoble, France
6.	March-June 2001	Calculation of thermal characteristics of the ADS target model	A. Sorokin Minatom, IPPE, Obninsk, Russia
7.	January-July 2004	Calculation of hydrodynamics and heat transfer in the model subassembly cooled by liquid metals coolant	A. Sorokin Minatom, IPPE, Obninsk, Russia