

COE-INES Business Trip Report

Meeting attended: COE-INES – Indonesia International Symposium: The Prospect of Nuclear Energy in Indonesia

Location: Grand Aquila Hotel, Bandung, Indonesia

Person Attending: 原子核工学専攻博士後期課程 1 年 NOVITRIAN

Dates: 1 – 6 March, 2005

COE-INES – Indonesia International Symposium: The Prospect of Nuclear Energy in Indonesia was held in Grand Aquila Hotel, Bandung, Indonesia. This symposium is performed to give a good opportunity for nuclear scientist and engineers from Tokyo Institute of Technology, Bandung Institute of Technology (ITB), Gadjah Mada University, Indonesia National Atomic Energy (BATAN) and Indonesia Nuclear Energy Regulatory Agency (BAPETEN) to share their ideas and activities in nuclear science and engineering fields. The symposium was opened by President of Bandung Institute of Technology, Prof. Djoko Santoso.



Picture 1: Prof. Djoko Santoso,

President of Bandung Institute of Technology

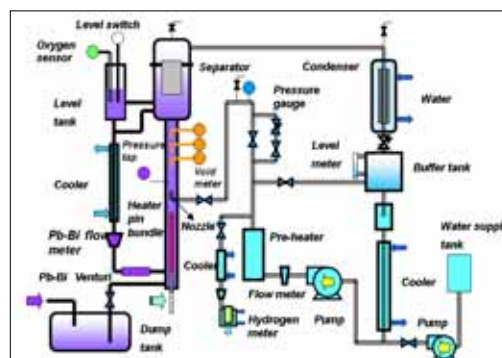
The symposium covered many aspects of nuclear science and engineering, and divided into a few sessions, such as on a plenary session, a parallel session and a panel session. The Plenary session discuss about Nuclear Energy in Indonesia, Nuclear Policy and Regulation, and Study on Innovative Nuclear Energy Systems. In the parallel session discuss about Reactor Design Study, Nuclear Materials, Thermal Hydraulic, Innovative Energy System, Nuclear proliferation, Fuel Cycle Concept, Reactor Physics Analysis, and other nuclear related activity.

My research work entitled “*Study on Pb-Bi Natural Circulation Phenomena, And Pb-Bi-Water Direct Contact Two-Phase Flow and Heat Transfer*” was presented at parallel session on 3rd March 2005. The aims of this work are to clarify the characteristics of Pb-Bi natural circulation, to clarify the lift pump performance for Pb-Bi circulation and to clarify the direct contact boiling heat transfer. Experimental study on Pb-Bi-water direct contact boiling two-phase flow has been performed using Pb-Bi-water direct contact boiling two-phase flow loop (Picture 2.). The loop consist of a Pb-Bi flow loop (four heater pin bundle, a chimney, an upper plenum, a level meter tank, an air-water cooler, and an electromagnetic flow meter) and

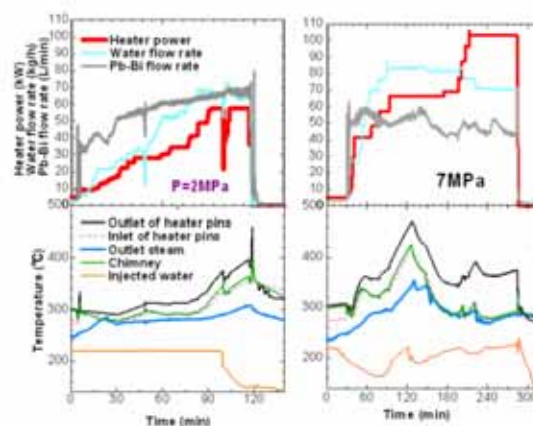
a water-steam flow loop (a pump, a preheated, an injection nozzle, the chimney, the upper plenum with mist separators and dryers, a condenser, a buffer tank, and an air-water cooler).

The natural circulation flow and the Pb-Bi-steam flows were simulated analytically using one-dimensional flow model including frictional, form and drag forces. Total hydraulic head through the loop were calculated from Pb-Bi densities at measured Pb-Bi temperatures in the loop. The Pb-Bi-steam two-phase frictional pressure loss was calculated by means of the two-phase flow multiplication factor of Lockhart-Martinelli model.

It was found that the calculated flow rate agreed well with the measured ones which indicated the validity of analytical models and Pb-Bi temperature decreased quickly in the chimney due to high heat transfer rate of Pb-Bi-water direct contact boiling. The profitable discussions were obtained, e.g. size of chimney about 30mm, so that one-dimensional flow model calculation can be conducted. Usage three-dimensional flow model will be conducted.



Picture2: Pb-Bi-water direct contact boiling two-phase flow loop



Picture 3: The experimental results for two pressure condition 2MPa and 7MPa

In panel session, held at the last day of symposium, the main topic about nuclear education and Job Opportunities in Nuclear Field. The panelists are Mr. Iyos Subkhi (Indonesia Nuclear Society), Prof. H. Sekimoto (Tokyo Tech), Mr. PERYOGA Yoga (student, Tokyo Tech), Mr. Topan Setiadipura (student, ITB). Nuclear knowledge management and ethics in nuclear education and activities were given a special attention by panelists, while other panelists mentioned about education, study and research activities in Tokyo Tech and in Bandung Institute of Technology. There was a discussion to share the experiences in this matter.



Picture3: Panel session: Mr. Topan S., Mr. Iyos Subkhi, Prof. H. Sekimoto, Mr. PERYOGA Yoga, Prof. Zaki Suud, and Prof. T. Obara

At the end of symposium, the participants (especially from Tokyo Tech), visiting tour to Indonesia National Atomic Energy (BATAN) and Bandung Institute of Technology (ITB) facilities. During the visit at BATAN, to all participants were showed a TRIGA 2000, a research reactor with 2000kWatt power operated by BATAN, not only for research activity, this reactor also produces radioisotopes needed for medication and radioactive tracer.



Picture4: Visit to BATAN, TRIGA 2000 reactor



During the visiting at ITB, the participants were showed the teleconference facility. At that occasion, a teleconference between ITB and Keio University of Japan was demonstrated.

Picture 5: Visit to ITB, Teleconference facilities

This symposium is expected to result a more close cooperation and understanding between Japan and Indonesia, especially among nuclear scientists and engineers.

