Advanced Core for Energetics, Hiroshima University Vol. 44

HU-ACE NEWS LETTER

Advanced Core for Energetics, Hiroshima University

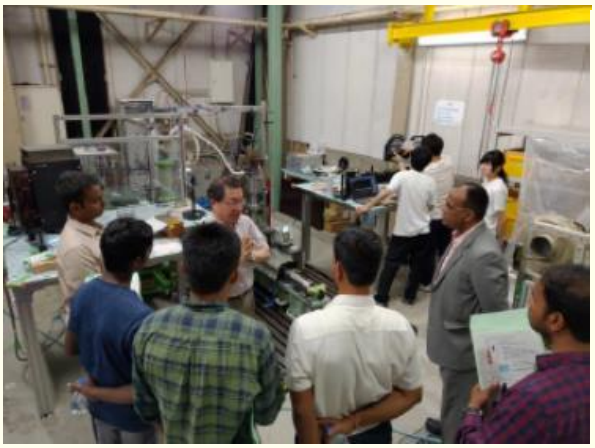
Vol. 44
2020.8

Activities of the Core

Aug. 3-13, 2020	Prof. Ichikawa provided an intensive lecture at the 8th Summer Lecture Program
Aug. 19, 2020	Workshop with BITS-Pilani, India(co-organization)
Aug. 20, 2020	The 48th HU-ACE Steering Committee Meeting

Workshop held with MMNE Lab of Birla Institute of Technology and Science (BITS) Pilani, India.

Hiroshima University (HU) is developing the education program of the graduate school under the collaboration with 6 universities in India. It is called “Japan-India International Linkage Degree Program (ILDP)” for developing innovators transforming advanced technology to social goals. ILDP is to confer a doctoral degree on a doctor course student under the co-supervision by the professors of HU and the member university in India. Development of ILDP is financially supported by the Inter-University Exchange Project of Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan. HU Advanced Core for Energetics (ACE) and MMNE (MEMS, Microfluidics and Nanoelectronics) Lab, BITS Pilani, jointly held the workshop online on August 19, 2020, to discuss on the international joint research in the energy area, which is the base of ILDP program. Following the opening remarks by the vice-presidents of the both universities, 7 presentations were made from HU-ACE and MMNE Lab, BITS Pilani. Possible collaborations of the combustion study of biofuel of HU-ACE and the biofuel synthesis study of MMNE Lab, BITS Pilani, and others were discussed.



Professors and students of BITS Pilani visited the laboratory of HU-ACE (July, 2019)

Program of Joint Workshop (August 19, 2020)

Opening remarks by Prof. Shin-ichi Tate (Director of IDLP, Vice President, HU) and Prof. Souvik Bhattacharyya (Vice Chancellor, BITS Pilani)	
Prof. Sanket Goel, BITS Pilani	1. Overview of MEMS, Microfluidics and Nanoelectronics (MMNE) Lab 2. Miniaturized viscometer and microbial fuel cells
Prof. Keiya Nishida, HU ACE	Hiroshima University Advanced Core for Energetics (HU-ACE), its research projects on fuels, combustion and internal combustion engines
Prof. Banasri Roy, BITS Pilani	Agricultural residue-based carbonaceous materials for the conversion of agricultural residues to renewable energy sources
Prof. Yukihiko Matsumura, HU ACE	Biomass treatment using hydrothermal conditions
Prof. Arshad Javed, BITS Pilani	Microfluidic system for combustion-gas sensing
Prof. Hongliang Luo, HU ACE	Droplets behaviors of impinging spray by a gasoline hole-type injector
Prof. Satish Kumar Dubey, BITS Pilani	IoT enabled /miniaturized sensors: Prospective about on-chip lubricating oil analysis

Issued by Advanced Core for Energetics, Hiroshima University
HU-ACE Secretariat, URA Division, Office of Research and Academia-Government-Community Collaboration, Hiroshima University 1-3-2 Kagamiyama, Higashi-Hiroshima, 739-8511 Japan
e-mail: hu-ace-info@ml.hiroshima-u.ac.jp, tel:+81-82-424-4425
URL: https://home.hiroshima-u.ac.jp/hu-ace/

HU-ACE NEWS LETTER Advanced Core for Energetics, Hiroshima University Vol. 44 No. 19

Research Topics

Evaluation of fluid behavior in invisible condition based on radiation measurement

Kenichi Tanaka

Associate Professor, Graduate School of Advanced Science and Engineering

Research fields: Energy engineering, Safety engineering

Keywords: Combustion, Explosion, Dust combustion, Hydrogen, Safety

Abstract

Background

For efficient production and usage of energy, evaluation of fluid behavior is an important task. In these fields, the fluid is usually in opaque pipes. In this case, the methodology of particle image velocimetry(PIV) is not applicable. The only method usable for this application is neutron radiography. The neutron radiography has limitations in principle or practicality. For example, it requires certain amount of imaged material such as bubble, liquid drop, and the region with ununiform concentration. It also requires a nuclear reactor as a neutron source. Based on this background, we are working on developing customized PIV which is usable for opaque pipes.

Methods

In the developed method, a radioactive marker is added to the fluid. The amount of radiation measured by a detector is used to estimate the marker position as show in Fig.1. By setting the measuring time short, the measured signal is constant regardless of the marker velocity. Using this technique, marker position is estimated depending on time, and fluid behavior is evaluated similar to usual PIV.

Results

The method was validated by measuring photons from a ^{137}Cs source at 1.36 MBq using NaI(Tl) detector. As an example, the measurement time was set at 0.5 s. The measured signal dependent on the source position and speed is shown in Fig.2. The signal intensity is almost constant for varied speed of the source. From the signal intensity, the source position was estimated. Consequently, its accuracy was 3 mm. By optimizing the activity, detector configuration, the number and arrangement of detectors, the specifications of the evaluation, such as source velocity, position resolution, dimension of direction (1D to 3D) is fit to the requirements by the application.

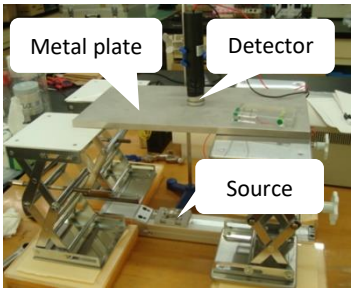


Fig.1 Experiment to validate the developed method

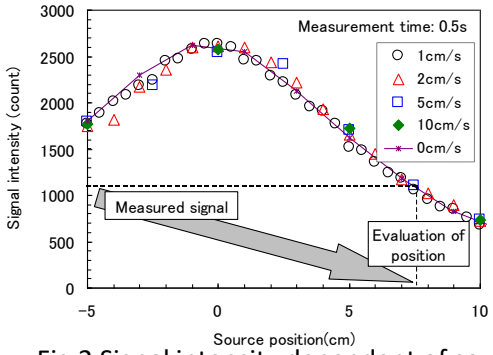


Fig.2 Signal intensity dependent of source position

This technique is JS patent (2017-081985). We are looking for partners, who develop this technique together. Please contact the Advanced Core office, or Academia-Government-Industry Collaboration Division (+81-82-424-5088).

References

[1]K. Tanaka, T. Kajimoto, Y. Ogata, Y. Matsumura, S. Endo, “A method to evaluate the behavior of object in invisible condition”, Kemikaru Enjiniaringu, 63(3) (2018) 183-186.