

HU-ACE NEWS LETTER

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Activities of the Core

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|---------------|---|
| Apr. 18, 2019 | The 51st Mechanical System Engineering Seminar |
| Apr. 18, 2019 | The 52nd Mechanical System Engineering Seminar |
| Apr. 26, 2019 | The 32nd HU-ACE Steering Committee Meeting |
| Apr. 30, 2019 | Prof. Nishida visited University and gave a lecture entitled "Experimental and CFD Studies of Fuel Spray Impinging on Flat Wall under Cross-Flow Ambient" and research guidance |

Mechanical System Engineering Seminar

As the HU-ACE seminar, The 51st and 52nd Mechanical System Engineering Seminars were co-hosted on April 18. Visiting Prof. Koyama (also belonging to National Institute for Materials Science, Shinshu University) and Prof. Ichikawa gave lectures at these seminars. We could hear interesting stories about the potential use of hydrogen energy and the future energy system. From now on, as HU-ACE, we plan to summarize the concept of energy in the future. It became appropriate lectures as the beginning.



Related information

The 3rd International Symposium on Fuels and Energy (ISFE2019) will be held on Jul. 8-10, 2019 in Higashi-Hiroshima City. We are looking forward to your participation.

<https://home.hiroshima-u.ac.jp/~isfe/isfe2019/top-page/registration/>



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Research Topics

SIP “Innovative Combustion Technology”

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Research fields: Engineering/Mechanical Engineering/Fluid Engineering

Keywords: Fuel Spray/ Liquid Atomization/ Internal Combustion Engine/
Diesel Combustion/ Laser Diagnostics/ Simulation



Abstract

Background

SIP, Cross-Ministerial Strategic Innovation Promotion Program, is the government supported research program conducted for 5 years from 2014 to 2018. 11 research projects on various research areas were adopted by the Council of Science, Technology and Innovation Policy in the cabinet office. “Innovative Combustion Technology” is one of the SIP projects whose objective is to improve the maximum break thermal efficiency of internal combustion engines for passenger cars (gasoline and Diesel) from the current 40% level to the challenging target 50%. 3 research groups from the HU-ACE joined “Gasoline Combustion Team”, “Diesel Combustion Team” and “Control Team”.

Methods

Professor Akira Miyoshi (Combustion Engineering) made the study on the chemical kinetics mechanism of fuel combustion in “Gasoline Combustion Team”, Prof. Yoichi Ogata (Fluid Engineering) on the wall heat transfer sub-models in 3D CFD software and their comparison in “Control Team”, and Keiya Niishida (Fluid Engineering) on the fuel injection strategy for enhancing spray mixture formation in “Diesel Combustion Team”. “Loss Reduction Team” worked for the “Innovative Combustion Technology” project together with the above 3 teams and over 1300 university professors, researchers and students joined the research. Figure 1 shows an example of the mixture concentration distribution in a Diesel spray which was measured by Nishida. His unique laser diagnostics contributed to the validation of the fuel injection simulation model developed by “Diesel Combustion Team”.

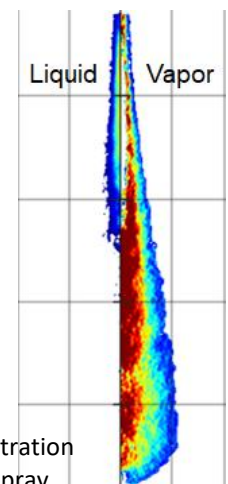


Fig. 1: Mixture Concentration Distribution in Diesel Spray

Results

Based on the “Super Lean-Burn” concept by “Gasoline Combustion Team”, the “Fast Space-Combustion” concept by “Diesel Combustion Team” as well as the reduction of mechanical friction loss, and the improvement of turbo-charger efficiency, the project target, maximum break thermal efficiency 50%, was achieved in 2018 as shown in Fig. 2; 51.5% for the gasoline engine and 50.1% for the Diesel engine.

Gasoline Combustion



Diesel Combustion



Fig. 2: Improvement of Maximum Break Thermal Efficiency

References

- Proc. Final Symposium of SIP Innovative Combustion Technology (January 28, 2019)
- <http://www.jst.go.jp/sip/k01.html> (April, 2019)