Plenary Session

Wednesday, November 9, 15:15 - 17:35 at Hall C

Theme

Combustion and Electrification - Competition and Collaboration -

There is a growing concern on the environmental crisis with global warming, and the various approaches in each technical field for reducing the emissions of greenhouse gases into atmosphere are greatly drawing attention. So far, in the field of the internal combustion engines and their circumferences that have been considered as the core part of SETC, various new attempts for their improvement of efficiency have been done in technological areas.

On the other hand, a new stream to adopt electric power surges in the area of products as well, where small engines have made its base. Moreover, the study has been in progress developing a new plan for the electric power infrastructure, for example, the smart grid concept aiming at practical use. However, it has not reached to judging point of the complete shift to the electric power because there are many issues in its adoption. It may be a conceivable case, in our opinion, that the age of the diverse power resources will come in the foreseeable future.

In the SETC2011 Plenary Session, the following four topics will be introduced by specialists. Then, we would like to lead the attractive discussions regarding the future visions. Through those discussions, we hope that the researches and developments of internal combustion engine and electric drive technologies will be made further advancement by studies mutually done with diligence for the future.

Moderator

Prof. Takemi Chikahisa

Professor
Div. of Energy and Environmental Systems,
Graduate School of Engineering
Hokkaido University, Japan

Education

1976 B.E.(ME) Hokkaido University
1978 M.E.(ME) Hokkaido University
1980 M.S.(ME) University of Wisconsin-Madison
1982 Ph. D.(ME) Hokkaido University

Career

1982 Assistant Professor, Dept. of Mechanical Engineering, Hokkaido University
1984 Associate Professor, Div. of Mechanical Science, Hokkaido University
2003 Professor, Div. of Energy and Environmental Systems, Hokkaido University

Short CV

Professor Dr. Takemi Chikahisa obtained his M.S. in the University of Wisconsin-Madison in 1980 and Ph.D. in Hokkaido University Japan in 1982. He is currently a professor of Energy and Environmental Systems Division at Hokkaido University in Japan. His research interests include transport phenomena in fuel cell, combustion control in engines, and analysis of optimal energy system in the future.

Speakers

Subject Current Status and Future Forecast of Research and Development of Small Internal Combustion Engine

Mr. Pierre Duret

Director
Center for "Engines & Utilization of Hydrocarbons"
IFP School, France.

Pierre DURET was graduated in 1981 from the French Engineer School "Ecole Centrale de Paris" and started his career at IFPEN (IFP New Energy) in 1982 as research engineer responsible of the study and development of direct fuel injected two-stroke engines.
In 1987, he became Projects leader "Two-Stroke Engines" at IFPEN, responsible of a R&D group working on several projects of design and development of low emissions high fuel economy small two-stroke engines and gasoline controlled auto-ignition engines for world-wide customers.

In 1996, he joined the management of the IFPEN engines R&D as Assistant Director and then in 2011 as Deputy Director of the "Engines & Energy" Technology Business Unit. During this period (and still now) he sometimes acted as expert for French Public authorities and for the European Commission in internal combustion engines and also coordinated several EU Projects, Network of Excellence and International Consortium Projects driven by IFPEN.

In September 2003, he moved to the IFP School as Director of the Center for "Engines and Utilization of Hydrocarbons", still his current position.

In parallel, since May 2005, he is also the Chairman of the "Powertrain" Committee of the French Society of Automotive Engineers, especially involved in the organization of several International Congresses on Powertrains.

During his career, P. Duret applied for more than 30 families of granted patents and published more than 50 international papers on engines and powertrains for automotive and other applications. He got several "Best paper" Awards including two at SETC 1993 and 2002.

Abstract

The main objectives of the reduction of the fuel consumption and CO_2 emissions of the small engines have to be combined with an associated limitation of the pollutant emissions.

In the past, most of the progresses in terms of fuel efficiency have been done by diesel engines while remarkable levels were obtained in low pollutant emissions from gasoline engines. Now it is the time of the convergence towards gasoline engines with the fuel consumption of diesel ones and towards diesel engines with the low emissions of the gasoline ones.

For this purpose, several new technologies already need to be progressively implemented. For the gasoline engine, the short to medium term trends could be to increase the engine load by reducing the engine displacement (downsizing), to reduce the friction and pumping losses (with the 2-stroke cycle), to improve the part load fuel consumption (with direct injection and/or controlled auto-ignition), and to introduce some progressive electrification (from the stop & start to the progressive hybridization). For the diesel engine, the biggest challenge will be to reduce its pollutant emissions while simultaneously minimizing the increase of cost and complexity, especially regarding the aftertreatment systems.

Even in the automotive, due to the environment and CO_2 constraints, the thermal engines will most probably be smaller and smaller in the near future.

In a long term future, we could even expect that the last thermal engines that will be used in automotive will be the range extender of electric vehicles. According to this vision, we can then forecast a growing interest and bright future for the small engine technologies and for its dedicated SETC Conference that should become of higher and higher importance.

Subject

Trend and Future of Biofuel

Prof. Koji Yamane

Professor
Department of Mechanical Systems Engineering,
School of Engineering,
The University of Shiga Prefecture, Japan

Education

1983 BSc in Mechanical Engineering from Hokkaido University
1985 MSc in Mechanical Engineering from Hokkaido University
1988 Ph.D from Hokkaido University

Career

1988 Started academic career as Instructor in the Department of Mechanical Engineering, Kyoto University
1994 Lecturer at the same
1995 Associate Professor in the Department of Mechanical Systems Engineering at The University of Shiga Prefecture, Japan.
2001 Visiting Scientist of Massachusetts Institute of Technology
2002 Professor in the Department of Mechanical Systems Engineering at The University of Shiga Prefecture, Japan.

Award

1994 Best Paper Award from The Japan Society of Mechanical Engineers
2002 Best Paper Award from The Water Jet Technology Society of Japan
2007 Kansai Branch Award from The Japan Society of Mechanical Engineers-Kansai Branch
2009 Oleoscience Editors' Award from The Japan Oil Chemists' Society

Major Research Topics

Production of biodiesel from edible and non-edible feedstock with high FFA, Oxidation mechanism and antioxidants of biodiesel, Combustion and emission characteristics of diesel engines fuelled with biodiesel, biodiesel blend and pure plant oil.

Abstract

Alternative fuels are considered based on fuel security, economy, local pollution, and global warming. In utilization for internal combustion engines, end-use issues and fuel properties are more critical than in use for external combustion engines. Gasoline and diesel will continue as dominant automotive fuels by 2030. Natural gas is a quite common fuel alternative. DME, GTL -diesel, methanol, etc. are also alternative fuels derived from natural gas. To enabling considerable greenhouse-gas reductions in the transport sector, alternative fuels derived from biomass; bioethanol, biodiesel, bio-DME, biomethanol, BTL-diesel, etc., can contribute substantially to energy security and socio-economic development. 1st generation biofuels, such as ethanol from sugar-rich crops and biodiesel by FAME of oils or fats, typically have sustainability and end-use problems. However, these fuels might gradually be replaced by next generation or second generation advanced biofuels; HVO and BTL.

Traditional and 1st generation biofuels are that these fuels can be processed in large or small scale plant. The costs for the processing facilities are relatively low. So that, it is available to use these biofuel as local-born energy by local-born raw materials, however, HVO and BTL are only feasible for large refinery-type units. In this presentation, firstly, it focuses on status and outlook for biodiesel raw materials; food, non-food, and micro-algae. Second, issues and the solution manner which become the key in biodiesel production and utilizing by diesel engines are introduced.

Subject Possibility and Issues of Electric Powered Two- Wheeler as Small Personal Mobility

Mr. Kazuki Takahashi

General Manager,
Tokyo Office,
YAMAHA Motor Co., Ltd., Japan

Education

1979 Bachelorship of Mechanical Engineering
Kyoto Institute of Technology

1981 Mastership of Mechanical Engineering
Kyoto Institute of Technology

Career

1981 YAMAHA Motor Co., Ltd. (Japan)
Research and Development Div. Noise reduction, Experimental analysis of Vibration, CAE / Multi body Dynamics

2001 YAMAHA Motor Europe R&D CREMA (Italy)
Project manager of Soft-Computing technology development,
Representative of the R&D office

2005 YAMAHA Motor Co., Ltd. (Japan)
General Manager of System technology R&D div. R&D Operations

2008 General Manager of Smart-Power technology div. R&D Operations

2009 General Manager of Electric Vehicle Div., Motorcycle Business Operations

2011 General Manager of Technical Administration div. Smart Power Vehicle Business Unit

2011 General Manager of Tokyo Office

Abstract

The history of electric four-wheeler seems to be actually older than the history of gasoline engine four-wheeler. A practical electric powered four-wheeler has already appeared in the world in the latter half of the 1800's. So-called the booms of electric vehicles have occurred twice and disappeared on the history of the vehicle development until present afterwards. And, we are just in the midst of the third EV boom now.

Just like the past two EV booms were disappeared, would the current EV boom also be disappeared consequentially? Or, would it become a third time lucky this time and could EVs obtain citizenship as personal mobility?

Two-wheelers have been also evolved in a long history as well as four-wheelers. And they have been arriving now as attractive personal mobility having compact and mobility abundant characteristics those four-wheelers don't have. When it comes to the history of electric two-wheelers, it is comparatively short, and their appearance in the world seems to be the latter half of the 20th century.

Because two-wheelers are compact and fuel-efficient personal mobility by its nature, the contribution rate of two-wheelers in the amount of the CO_2 exhaust of the entire transportation is a little. Therefore, in the aspect of contribution to the low carbon society, the effect of the CO_2 reduction simply by converting the two-wheeler's gasoline engine into electric motor would be also a little.

However, for instance, utilizing a compact two-wheeler instead of the four-wheeler as personal mobility for the short distance transportation, the traffic jam could be cut and consequentially CO_2 reduction from entire transportation would not be a little.

In this presentation, I would like to think about the possibility and issues of electric two-wheelers by introducing their current state as small personal mobility.

Subject Smart Community - Rebuuilding the Country with New Vision-

Mr. Shinsuke Ito

Deputy Director
Aerospace and
Defense Industry Division,
Manufacturing Industries Bureau,
Ministry of Economy Trade and
Industry, Japan

Education

1997 B.A. in Electric Engineering from Kyoto University
1999 M.E. in Electric Engineering from Kyoto University
2005 MBA from University of Washington

Career

1999 Joined the Ministry of Trade and Industry (MITI, now METI)
Assigned to Information Policy Division, Machinery and Information Industries Bureau
2000 Assistant Director
Americas Division, Trade Policy Bureau, METI
2002 Assistant Director
General Policy Division, Agency for Natural Resources and Energy
2003 University of Washington (MBA)
Government Sponsored Student
2005 Deputy Director for Environment and Technology
Automobile Division, Manufacturing Industries Bureau
2007 Deputy Director for General Management
Information Economy Division, Commerce and Information Policy Bureau
(In charge of "Smart Grid" and "Smart Community"
2010 Deputy Director for General Management
Infrastructure and Advanced Systems Promotion Office, Manufacturing Industries Bureau (In charge of "Smart City")
2011 Deputy Director for General Management
Aerospace and Defense Industry Division,
Manufacturing Industries Bureau

Abstract

Smart grid, smart house, and smart city have become very popular in Japan after the tragic 3.11. First of all, I will touch on the development of battery technology and its impact on power train of automobiles. The main part of the presentation will be on various activities around smart grid and smart city, which have become globally popular due to tighter energy and environment restrictions. Lastly, I will explain about Japanese initiative on smart grid, which we call as "Smart Community", and introduce various activities in Japan as regards to this initiative. There is a growing interest on smart community concept after the 3.11 as more people are looking for ways to reduce dependence on nuclear power source.