SETC2009 Presented Papers (Hotel Equatorial, Penang, Malaysia)

Tuesday, November 3 – Thursday, November 5

	Cempaka/Anggerik	Bayan Ⅰ/Bayan Ⅱ	Tekukur	Teratai/Raya	Serindit
Tuesday, November 3rd	Openning Ceremony & Keynote Address				
	Engine Technology Ⅰ	Environmental Impacts Ⅰ	Vehicle Design	Diesel Engines Ⅰ	Vehicle Dynamics & Safety Ⅰ
	2009-32-0042 / 20097042	2009-32-0023 / 20097023	2009-32-0099 / 20097099	2009-32-0017 / 20097017	2009-32-0060 / 20097060
	2009-32-0049 / 20097049	2009-32-0041 / 20097041	2009-32-0109 / 20097109	2009-32-0018 / 20097018	2009-32-0081 / 20097081
	2009-32-0059 / 20097059	2009-32-0181 / 20097181	2009-32-0143 / 20097143	2009-32-0057 / 20097057	
	Engine Technology Ⅱ	Environmental Impacts Ⅱ	Materials Ⅰ	Diesel Engines Ⅱ	Vehicle Dynamics & Safety Ⅱ
	2009-32-0083 / 20097083	2009-32-0102 / 20097102	2009-32-0010 / 20097010	2009-32-0105 / 20097105	2009-32-0146 / 20097146
	2009-32-0129 / 20097129	2009-32-0158 / 20097158	2009-32-0065 / 20097065	~~2009-32-0159 / 20097159~~	2009-32-0152 / 20097152
	2009-32-0051 / 20097051		2009-32-0076 / 20097076	~~2009-32-0037 / 20097037~~	
	Engine Technology Ⅲ	HCCI Ⅰ	Materials Ⅱ	Alternative Fuels Ⅰ	NVH Technology
	2009-32-0069 / 20097069	2009-32-0070 / 20097070	2009-32-0082 / 20097082	2009-32-0026 / 20097026	2009-32-0128 / 20097128
	~~2009-32-0011 / 20097011~~	2009-32-0079 / 20097079	2009-32-0173 / 20097173	~~2009-32-0136 / 20097136~~	2009-32-0131 / 20097131
	2009-32-0122 / 20097122	2009-32-0035 / 20097035		2009-32-0113 / 20097113	2009-32-0015 / 20097015
Wednesday, November 4th	Advanced Combustion Ⅰ	Two Stroke Engines Ⅰ	Design & Simulation Ⅰ	Alternative Fuels Ⅱ	Collegiate Events Ⅰ
	2009-32-0043 / 20097043		2009-32-0138 / 20097138		2009-32-0092 / 20097092
	2009-32-0047 / 20097047	2009-32-0032 / 20097032	2009-32-0089 / 20097089	~~2009-32-0040 / 20097040~~	2009-32-0103 / 20097103
	2009-32-0068 / 20097068	2009-32-0077 / 20097077	2009-32-0054 / 20097054	~~2009-32-0111 / 20097111~~	2009-32-0107 / 20097107
	Advanced Combustion Ⅱ	Two Stroke Engines Ⅱ	Design & Simulation Ⅱ	Alternative Fuels Ⅲ	Collegiate Events Ⅱ
	2009-32-0045 / 20097045	2009-32-0046 / 20097046	2009-32-0176 / 20097176	~~2009-32-0115 / 20097115~~	2009-32-0147 / 20097147
	2009-32-0119 / 20097119	2009-32-0013 / 20097013	2009-32-0130 / 20097130	~~2009-32-0117 / 20097117~~	2009-32-0154 / 20097154
	2009-32-0135 / 20097135	2009-32-0030 / 20097030	~~2009-32-0163 / 20097163~~		2009-32-0177 / 20097177
	Advanced Combustion Ⅲ	Hybrids, Electric Drives & Fuel Cells	Lubricants	Alternative Fuels Ⅳ	Collegiate Events Ⅲ
	2009-32-0144 / 20097144	2009-32-0031 / 20097031	2009-32-0080 / 20097080	2009-32-0120 / 20097120	2009-32-0169 / 20097169
	2009-32-0095 / 20097095	2009-32-0061 / 20097061	2009-32-0075 / 20097075	~~2009-32-0168 / 20097168~~	2009-32-0170 / 20097170
	2009-32-0097 / 20097097		2009-32-0178 / 20097178		2009-32-0108 / 20097108
	Plenary Session				
Thursday, November 5th	HCCI Ⅱ	Fuel Supply Systems Ⅰ	Collegiate Events Ⅳ	Alternative Fuels Ⅴ	Engine Control Ⅰ
	2009-32-0085 / 20097085	2009-32-0044 / 20097044	2009-32-0171 / 20097171	2009-32-0066 / 20097066	2009-32-0019 / 20097019
	2009-32-0086 / 20097086	2009-32-0055 / 20097055	~~2009-32-0185 / 20097185~~	2009-32-0100 / 20097100	2009-32-0034 / 20097034
	2009-32-0087 / 20097087	2009-32-0056 / 20097056	~~2009-32-0188 / 20097188~~	2009-32-0132 / 20097132	2009-32-0073 / 20097073
	HCCI Ⅲ	Fuel Supply Systems Ⅱ	Design & Simulation Ⅲ	Alternative Fuels Ⅵ	Engine Control Ⅱ
	2009-32-0072 / 20097072	2009-32-0074 / 20097074	2009-32-0024 / 20097024	2009-32-0063 / 20097063	2009-32-0124 / 20097124
	2009-32-0021 / 20097021	2009-32-0149 / 20097149	2009-32-0164 / 20097164	2009-32-0048 / 20097048	2009-32-0014 / 20097014
	2009-32-0141 / 20097141	2009-32-0112 / 20097112	2009-32-0101 / 20097101		2009-32-0118 / 20097118
	Lunch & Closing Celemony				

＊ The following papers had been canceled those presentation at the conference.
Hence those 12 papers must be unpublished even though stored or deleted on proceedings CD.

Paper No.	Session	Author	Affiliation	CD
2009-32-0011 / 20097011	Engine Technology III	Ka U Chan	University of Macau	Stored
2009-32-0037 / 20097037	Diesel Engines II	C. Sundar Raj	Bharathiyar College of Engineering and Technology	Stored
2009-32-0040 / 20097040	Alternative Fuels II	Nafis Ahmad	King Abdulaziz University	Stored
2009-32-0111 / 20097111	Alternative Fuels II	Kapilan Natesan	National Institute of Technology Karnataka	Stored
2009-32-0115 / 20097115	Alternative Fuels III	Naga S. Sarada	JNT University	Deleted
2009-32-0117 / 20097117	Alternative Fuels III	Naga S. Sarada	JNTU College of Engineering	Deleted
2009-32-0136 / 20097136	Alternative Fuels I	Liu Jing Ping	Hunan University	Deleted
2009-32-0159 / 20097159	Diesel Engines II	B. Rajendra Prasath	Anna University, Chennai	Stored
2009-32-0163 / 20097163	Design & Simulation II	Mehrnoosh Dashti	Sciences and Research Campus, Azad University	Stored
2009-32-0168 / 20097168	Alternative Fuels IV	Valentin A. Soloiu	Georgia Southern University	Stored
2009-32-0185 / 20097185	Collegiate Event IV	William P. Attard	University of Melbourne, Australia	Stored
2009-32-0188 / 20097188	Collegiate Event IV	William P. Attard	University of Melbourne, Australia	Stored

Abstract of Technical Session

November 3rd Tuesday

〈Cempaka / Anggerik〉

11:00 - 12:30

Engine Technology I

Chair : Kazuyuki Shiomi (Honda R&D Co.,Ltd.)

Co-Chair : Robert Fleck (Queens University of Belfast)

2009-32-0042 / 20097042

Research on Extended Expansion General-Purpose Engine - Noise Characteristics Caused by Multiple Linkage System and Reduction of the Noise

Gaku Naoe, Sei Watanabe (Honda R&D Co.,Ltd)

Abstract: Research has been conducted on an extended expansion engine, using a multiple linkage system to increase the thermal efficiency of general-purpose engines. In this research, first, the test engine was subjected to an engine acoustics measurement to clarify its noise characteristics. Then, based on the analysis results of the noise characteristics, we propose the direction to reduce the noise of the multiple linkage system engine. When the test engine was operated under a no-load firing condition, rattle noise was observed. Also it was found that the timing of the occurrence of the rattle noise was near after top dead center (ATDC) ...

2009-32-0049 / 20097049

Improving the Fuel Consumption of Small Motorcycle Engine with YMJET-FI

Yoshitaka Nagai, Katsumi Suzuki, Takanori Tamura, Wataru Ishii, Hiroyuki Tsuzuku
(Yamaha Motor Co.,Ltd.)

Abstract: A construction of the technology concerning fuel consumption improvement is an important problem not only for the four-wheeled vehicle but also for the motorcycle in recent years when petroleum resources are depleted rapidly. Yamaha originally developed a new fuel injection system (YMJET-FI) and applied the system to a single cylinder, water-cooled and small-displacement engine. In this paper, we would introduce the results of improving the fuel economy with keeping high performance. Improvements were noted in three matters, namely, in the lower load range, 1.TStrengtheningT of in-cylinder flow, 2.Atomization of fuel spray, and 3.TReduction Tof wall film quantity. As a result of ...

2009-32-0059 / 20097059

Technologies for Enabling Concept of New-geometry 4-cylinder V-type Engine

Toru Kisaichi (Honda R&D Co., Ltd.)

Abstract: New 4-cylinder V-type engine has been developed with a concept of compact, low-vibration and pulse feeling. Traditional 4-cylinder 90-degree V-type engine places #2 and #4 cylinders on the V-type front bank while on the rear bank, it places #1 and #3 cylinders. On the other hand, new 76-degree V4 engine places #1 and #4 cylinders on the front bank while on the rear bank, #2 and #3 cylinders are placed for right-left symmetry. By adopting the OHC mechanism in which the intake valve is directly pressed by one cam and the exhaust valve is driven by the locker arm, higher rotation ...

Abstract of Technical Session

November 3rd Tuesday

〈Cempaka / Anggerik〉

14:00 - 15:30

Engine Technology II

Chair : Kazuyuki Shiomi (Honda R&D Co.,Ltd.)

Co-Chair : J Fülinger (BRP-Powertrain GmbH & Co KG)

2009-32-0083 / 20097083

Development of Technologies for Improving Fuel Economy of Small Motorcycle Engines

Satoshi Iijima, Ryo Kubota, Kazunori Kikuchi (Honda R&D Co., Ltd.)

Abstract: A single cylinder gasoline engine of displacement 125 cm3 for prototype was developed, and the fuel economy of this engine was improved by reducing friction and improving combustion. For reducing friction, various methods were innovated; enhancement of the oil film retention by modifying the striation finish on piston skirt, adding the needle bearing to the rocker arm shaft, press-fitting the bush into the small end of connecting rod, reducing contact pressure with the piston ring, and spray coating molybdenum disulfide onto the shift fork. By innovating these friction reduction methods, the friction of the engine was reduced by 6% compared to ...

2009-32-0129 / 20097129

Fuel Film Behavior Analysis Using Simulated Intake Port

Minoru Iida, Keiichi Yoshikawa, Hiroshi Tanaka (Yamaha Motor Co. Ltd.),
G. Wang, C. Arcoumanis (City University London)

Abstract: Transient behavior of the engine is one of the most crucial factors for motorcycle features. Characterization of the fuel film with port fuel injection (PFI) is necessary to enhance this feature with keeping others, such as high output, low emissions and good fuel consumption. In order to resolve the complicated phenomena in real engine condition into simple physical issues, a simulated intake port was used in our research with Laser Induced Fluorescence (LIF) technique to allow accurate measurement of the fuel film thickness, complemented by visualization of the film development and spray behavior using high-speed video imaging. Useful results have been ...

2009-32-0051 / 20097051

Study on Similarity of Pumping Flow in Engine Crankcase

Hidenori Arisawa, Motohiko Nishimura, Hiroyuki Watanabe, Atsushi Ueshima, Kazuki Arima, Akiyuki Yamasaki (Kawasaki Heavy Industries, Ltd.)

Abstract: For the prediction of pumping loss in the engine crankcase at the early stage of engine design, a similarity law of the pumping loss on parallel cylinders with the phase difference of 180 degrees has been derived from the sum of the power loss due to the drag force of airflow through the cylinder bulkhead holes and the inertia force of fluid. It has been found that the mean effective pressure in the crankcase is in proportion to the square of the mean flow velocity at the bulkhead holes. Then, in order to validate the similarity law, by using a prototype ...

Abstract of Technical Session

November 3rd Tuesday

〈Cempaka / Anggerik〉

16:00 - 17:30

Engine Technology III

Chair : Toshimi Kobayashi (Kawasaki Heavy Industries, Ltd.),
Co-Chair : Robert Fleck (Queens University of Belfast)

2009-32-0069 / 20097069

Power restriction on small capacity four stroke engines by exhaust gas recirculation - A new way of speed limiting with reduced exhaust emissions?

Jürgen Tromayer, Gerd Neumann, Roland Kirchberger, Helmut Eichlseder
(Graz University of Technology)

Abstract: Looking at the market for 2-wheelers driven by small capacity four stroke engines, it turns out that the legislation for exhaust emissions is mostly combined with a regulation of vehicle speed. Most of the vehicles in this category are still driven by engines equipped with carburetors which, unlike fuel injection systems, do not give the possibility to cut off fuel metering when high speed is achieved. When a carburetor is applied with a simple ignition unit, a reduction of spark advance is the only way to ensure correct vehicle speed, but there are a lot of disadvantages in terms of exhaust ...

2009-32-0011/20097011

Preliminary Study on Design and Control of a Novel CVT

K.U.Chan, P.K.Wong, H.W.Wu (University of Macau)

Abstract: C able transmissions (CVT) are not well suited for ecause of their limited torque capacity. Moreover, cal V-belt CVT usually could not match the engine paper proposes a coaxial dualrubber belt electronic ional single rubber-belt CVT, so that it can be applied to performance two-wheeled vehicles and superbikes. The DECVT can increase the torque capacity, and the transmission ratio of the DECVT could be changed according to the rider requirement. Experimental results ...

Canceled

2009-32-7122 / 20097122

Development of the New Rotax 1200 4-TEC Powersports Engine: From Concept to Production

S. Leiber, R. Rokita, M. Gumpesberger (BRP-Powertrain GmbH & Co KG),
D. Abdul Latiff Aw, F. Othman, F. Mohd Hasan Wong (PETRONAS Research Sdn Bhd)

Abstract: BRP, the leading producer of snowmobiles, personal watercrafts and ATVs, have decided to develop and commercialize their first snowmobile performance four stroke engine. A 1.2 liter inline 3-cylinder four-stroke engine layout has been selected to meet the challenge of achieving high performance, low fuel consumption and exhaust and noise emission legislation limits. Through the collaboration with PETRONAS, BRP were able to fast track the development of the Rotax 1200 4-TEC engine. Many front loading development activities, such as Digital Mockup (DMU), simulation and advanced testing of components and systems, were used to achieve the desired results in time. The engine, packaged ...

Abstract of Technical Session

November 3rd Tuesday

〈Bayan I/ Bayan II〉

11:00 - 12:30

Environmental Impacts I

Chair : Hiromi Deguchi (Suzuki Motor Corporations)

Co-Chair : Lorenzo Pace (Emitec G.m.b.H)

2009-32-0023/20097023

Influence Factor Analysis of Light-off Tests for Motorcycle Catalytic Converters

Manqun Lin, Hongda Qu, Xicheng Yan, Bin Jia, Jing Qin (Tianjin University)

Abstract: Investigation show there are many important influence factors can affect the light-off temperature (LOT in brief) testing results of catalytic converters. Contrast tests results show that different sample sizes and sample outside temperature result in different light off process. Exorbitant temperature of the gas heater and metal tube by which the exhaust gases pass through could arouse chemical reaction before the converter sample. Concentration of exhaust gases also can take effects on LOT testing results. ...

2009-32-0041 / 20097041

Study of the Effects on the Emission of Purge Fuel from Carbon Canister and Its Control in Motorcycles

Jing Qin, XiCheng Yan, ManQun Lin, JunJie Zhang, Peng Liu, Bin Jia (Tianjin University)

Abstract: Effect of the carbon canister on motorcycle emissions and the way to diminish this negative effect has been investigated in this paper. Abundant experiments are carried out on a 125ml 4-stroke motorcycle to research the saturation absorbed fuel amount in carbon canister when motorcycles in a long idle time state and the diurnal fuel evaporating character when motorcycles in daily application state. Then the effects of the purge fuel on the dynamic air fuel ratio, the emissions concentration and the final total emission are studied during UDC containing 6 urban test cycles. Based on these results, an electronic valve is settled ...

2009-32-0181 / 20097181

Canister Purge Flow Control Study on EFI Single Cylinder Small Engine

Tian Liangyun, Han Benzhong, Xi Gang, Zhang Zhen, Chen Siyuan, Thilo Leineweber (United Automotive Electronic System Co. Ltd),

Xie Deyun (Jianshe Motorcycle Industry Group)

Abstract: With increasingly stringent emission requirement in China the evaporative emission legislation for motorcycles has been issued since July of 2008. According to the vehicle investigation two type effective solutions for EFI engine can be optional for this requirement: Passive system (not controlled by EMS) and active system (controlled by EMS). For passive system how to ensure enough purge flow but minimize the influence on mixture formation is the key and for active type, the point will focus on how to control and calculate the exact purge flow amount with the fluctuated intake air pressure for single cylinder engine. In this paper ...

Abstract of Technical Session

November 3rd Tuesday

〈Bayan I/ Bayan II〉

14:00 - 15:00

Environmental Impacts II

Chair : Hiromi Deguchi (Suzuki Motor Corporations)

Co-Chair : James Carroll (Southwest Research Institute)

2009-32-0102 / 20097102

Innovative 2 Wheeler Substrate Developments for EU5

Lorenzo Pace, Francois Jayat, Roman Konieczny (Emitec G.m.b.H.),

Martin Forster, Richard Humer, Daniel Mairhörmann, Rudolf Prem (KTM Sportmotorcycles AG)

Abstract: Future tighter emission limits for 2 wheelers in Europe and worldwide will require a completely new approach in catalyst system design. In particular, the EU5 scenario, probably with the same emission limits as 4 wheelers and, for the first time, emission durability requirements, needs a new strategy to combine higher and durable conversion efficiency with the classical characteristics of 2 wheeler systems: low cost, low weight with minimum impact on exhaust system layout and engine out performances such as low fuel consumption and good power output. This paper deals with the investigation of innovative metallic substrates keeping constant, as a first ...

2009-32-7158 / 20097158

Catalytic Coating for Effective Emission Reduction in a Small Motorcycle Application

Ansgar Wille, Marcus Bonifer (W.C. Heraeus GmbH)

Abstract: This paper will present a comparison of different catalytic coatings especially designed for small motorcycle application with regard to activity, durability and precious metal costs. Since recent catalytic formulations for this application widely use rather expensive platinum (Pt) -rhodium (Rh) formulations, this paper will present data for less expensive coatings which use palladium (Pd) as the main or the only active precious metal compound. Besides the fresh catalytic activity the thermal and chemical aging stability will be compared for PtRh, PtPdRh and Pd-only formulations. We will show that also less expensive Pd-rich catalytic coatings can be used for an effective emission ...

Abstract of Technical Session

November 3rd Tuesday

〈Bayan I/ Bayan II〉

16:00 - 17:30

HCCI I

Chair : Minoru Iida (Yamaha Motor Co,Ltd.)
Co-Chair : Jeffrey Allen (Scion-Sprays Ltd.)

2009-32-0070 / 20097070

A Study of HCCI Combustion using Spectroscopic Techniques and Chemical Kinetic Simulations

Akira Iijima, Koji Yoshida, Hideo Shoji (Nihon University)

Abstract: This study was conducted to investigate the influence of low-temperature reactions on the Homogeneous Charge Compression Ignition (HCCI) combustion process. Specifically, an investigation was made of the effect of the residual gas condition on low-temperature reactions, autoignition and the subsequent state of combustion following ignition. Light emission and absorption spectroscopic measurements were made in the combustion chamber in order to investigate lowtemperature reactions in detail. In addition, chemical kinetic simulations were performed to validate the experimental results and to analyze the elemental reaction process. The results made clear the formation behavior of the chemical species produced during lowtemperature HCCI reactions.

2009-32-0079/20097079

Improvement of Natural-gas HCCI Combustion by Internal EGR by Means of Exhaust Valve Re-opening

Kiyoshi Kawasaki, Kazuki Hirota, Shingo Nagata, Koji Yamane (The University of Shiga Prefecture), Hiroyuki Ohtsubo, Toru Nakazono (YANMAR Co., Ltd.)

Abstract: To control natural-gas HCCI combustion, internal exhaust gas recirculation (EGR) by exhaust valve re-opening (EVRO) during the induction stroke was applied to a single-cylinder test engine. The results demonstrate that combustion phasing can be controlled successfully by adjusting the EGR ratio, and so improvement of thermal efficiency and reduction in unburned exhaust emissions are feasible. In addition, the results of the EVRO method were compared to those of intake-valve pilot opening (IVPO) during the exhaust stroke. It was shown that EVRO is more useful than IVPO as a heat-recovery method for HCCI combustion.

2009-32-0035 / 20097035

A Dual-Fuel System to Achieve High Equivalence Ratio and High Engine Performance in Homogeneous Charge Compression Ignition (HCCI) Mode

Bancha Thanapiyawanit, Lu Jau-Huai (National ChungHsing University)

Abstract: A Dual-fuel system has been developed to achieve a large operation range with HCCI mode. The engine could run on equivalence ratio of 0.30 to 0.50 using N-heptane. A secondary fuel, iso-octane was injected at the points of equivalence ratio between 0.40 and 0.50. It's found extending operation point to equivalence ratio of 0.60. The required intake charge temperature distribution was lesser from 75° to 25°C. Maximum thermal efficiency was 46%. HC and CO emissions were improved which keep lower than 650 ppm and 0.8% correspondingly. NOx emissions increased rapidly at high load to maximum of 500 ppm

Abstract of Technical Session

November 3rd Tuesday

〈Tekukur〉

11:00 - 12:30

Vehicle Design

Chair : Toshimi Kobayashi (Kawasaki Heavy Industries, Ltd.)
Co-Chair : Roy Douglas (Queens University of Belfast)

2009-32-0099/20097099

Development of a Three Wheeler Engine With LPG fuel For Improved Performance Using Simulation Techniques

Ajith V Pai, G.S.Deshpande, V Lakshminarasimhan, Y Ramachandra Babu (TVS Motor Company Ltd.)

Abstract: Three-wheeler is a popular mode of transport in developing nations. Customers demand higher fuel economy from the vehicles to keep the operating costs to a minimum. Competitive environment of automobile market demands for new improved products with minimum development time. Computer simulations are very useful in reducing the development time through virtual prototyping and testing the system on computers rather than making the physical prototypes and testing on road. Particularly, lumped parameter modeling provides reasonably accurate results for predicting vehicle performance characteristics in short span of time. This is very useful when various system level targets have to be achieved and ...

2009-32-0109 / 20097109

Development of Touring Motorcycle with a 1,352 cm3 Engine

Hideto Yoshitake, Yuji Horiuchi, Hisatoyo Arima, Youichi Utsumi, Kazunori Miyoshi, Satoru Watabe, Masanori Kinuhata (Kawasaki Heavy Industries, Ltd.)

Abstract: The sport-tourer (i.e. touring motorcycle) powered by the 1,352 cm3 engine shown in Fig. 1 was launched by Kawasaki in July 2007. This worldwide model was introduced primarily in Europe and North America. This paper describes the development of the new tourer model whose concept was to create a sportoriented touring motorcycle. Descriptions include a variable-valve timing mechanism adopted for improving engine performance, a parallel-link type swing-arm adopted for improving vehicle dynamics, as well as a tire pressure monitoring system adopted for the first time on a motorcycle.

2009-32-0143 / 20097143

Estimating of Motorcycle Frame Strength by Virtual Durability Test

Ryota Ide, Toshiaki Ogushi, Yoshihiko Sunayama, Yasuyuki Kishita, Shinji Watanabe
(SUZUKI MOTOR CORPORATION)

Abstract: The computational method and the CAE technique have been developed to evaluate durability performance of a motorcycle body. The computational method in this study consists of three parts of simulation. The first is the mode analysis of the body parts. The second is the multi body dynamics simulation, which calculates forces loaded into the frame of a motorcycle body equivalent to actual durability tests. The third is the static structure analysis, which calculates stress distribution using the forces calculated by the multi body dynamics simulation as boundary conditions. Also, two kinds of durability tests, that are the chassis durability test and ...

Abstract of Technical Session

November 3rd Tuesday

〈Tekukur〉

14:00 - 15:30

Materials I

Chair : Shunichi Kometani (Yamaha Motor Co.,Ltd.)

Co-Chair : Jay Meldrum (Michigan Technology University)

2009-32-0010 / 20097010

Weight saving in small engine and vehicle component by utilization of die cast creep resistant alloys

Hiroyuki Omura, Tatsuki Yonemaru, Jo Asada (Ryobi Limited),

Hideharu Nakashima (Kyushu University)

Abstract: Magnesium alloys have been used and developed in applications for various motorcycle components and others such as cylinder head cover, crankcase and oil pan due to light weight, high specific strength and recycles ability. However, many of those alloys suffer from inferior die cast ability and high temperature properties, such as creep resistant. Ryobi limited has developed the creep resistant alloy in order to be utilized for the various motorcycle components and so forth. The properties of new die cast creep resistant alloy have been introduced. The targets for development of the properties of new alloy are the same creep resistant ...

2009-32-0065 / 20097065

Research on Pb-free Electroless Ni Plating for Pistons of General-purpose Engines

Kenji Suto, Tomonori Saito (Honda R&D Co., Ltd.), Sumitaka Watanabe (Japan Kanigen Co., Ltd.)

Abstract: Ni-P-B plating applied to the piston of a generalpurpose engine with an aluminum alloy cylinder contains some thousands ppm of Pb, which is used as the treating liquid stabilizer, in its plating. But, Pb is considered an environmental hazardous and it is necessary to reduce its amount in the plating. Our previous researches, however, reveal that Pb plays a major role in wear and seizure resistance. In order to obtain the sliding properties equivalent to Ni- P-B plating that contains Pb, therefore, it is necessary to review the composition of Ni-P-B plating. In this research, therefore, we specifically focus on the plating ...

2009-32-0076 / 20097076

Development of Nitrocarburized High Strength Crankshaft Through Controlling Vanadium Carbonitride Precipitation by Normalizing

Satoru Suwa, Daiji Kawaguchi, Atsushi Murakami (Honda R&D Co., Ltd.),

Kazuyoshi Kimura, Masato Tada (Daido Steel Co., Ltd.)

Abstract: In addition to the requirements of high power output and compactness, further reduction of weight is being required for motorcycle engines from the standpoint of fuel economy and reduction of CO2 emissions. For this purpose, it is important to reduce crankshaft weight, which is the heaviest rotating part in the engine. The crankshaft has to be strong enough to bear loads, as the demands of weight reduction are increasing. Yet, productivity has to be considered at the same time even when increasing crankshaft strength. In this report of crankshaft material studies that feature high fatigue strength, machinability and distortion correctability, attention ...

Abstract of Technical Session

November 3rd Tuesday

〈Tekukur〉

16:00 - 17:00

Materials II

Chair : Shunichi Kometani (Yamaha Motor Co.,Ltd.)

Co-Chair : Robert Kee (Queen's University of Belfast)

2009-32-0082 / 20097082

Development of High Fatigue Strength Valve Spring Using Control of White Layer by Nitriding

Keiichi Maekawa, Atsushi Murakami (Honda R&D Co., Ltd.),

Masayuki Hashimura (NIPPON STEEL CORPORATION),

Hiroshi Yarita (suzuki metal industry Co., Ltd.), Takanori Watanabe (AIR WATER INC.)

Abstract: For the requirements of high power output, lightweight and improved fuel consumption of motorcycles to respond to global environmental needs, high fatigue strength to cope with high stress is becoming more important than ever for valve springs. To satisfy such needs, a new alloy steel that softens less in tempering (1),(2) and nitriding that increases surface hardness of valve springs has been developed using oil-tempered silicone-chrome steel wire as the base material. Also, with regards to shot-peening to create compression residual stress on the surface, studies are being performed for multi-stage and high-hardness peening. The research reported in this paper is ...

2009-32-0173 / 20097173

Establishment of Judder Analysis Technique & New Friction material

Kazuyoshi Miyachi (FCC Thailand CO., LTD),

Tomohiro Hasegawa, Kazuma Matsushita (FCC CO., LTD)

Abstract: In recent years, a requirement for improved anti-judder clutch characteristics, especially wet centrifugal clutches, has increased due to the growing motorcycle market in ASEAN region. F.C.C. has been developing anti-judder friction material, one of the key factors in diminishing vehicle judder and improving clutch feeling. Performance tests of wet centrifugal clutches were generally conducted by on-vehicle test, which could be subjective and takes considerable amount of time. In this study, in a case of wet centrifugal clutch it was succeeded to simulate the vehicle judder by using clutch unit tester quantitatively and the obtained results could be utilized as evaluation index ...

Abstract of Technical Session

November 3rd Tuesday

〈Teratai / Raya〉

11:00 - 12:30

Diesel Engines I

Chair : Toru Nakazono (YANMAR Co., Ltd.)

Co-Chair : Luigi Allocca (Istituto Motori - CNR)

2009-32-0017 / 20097017

Analysis of Droplets Evaporation Process of Diesel Spray at Ignition Delay Period using Dual Nano-spark Shadowgraph Photography Method

Abdullah Adam, Tomoaki Yatsufusa, Tomonori Gomi, Nobuyuki Irie, Yoshiyuki Kidoguchi

(The University of Tokushima)

Abstract: Evolution of evaporating diesel spray is complex phenomena; however, it is important process for ignition, combustion and emission formation in diesel combustion. In this research, droplets evaporation process at spray boundary was experimentally investigated focusing on the behavior of evaporating droplets during ignition delay period. In the experiment, nano-spark shadowgraph photography technique was applied to a rapid compression machine. This study developed a new optical system to observe spray evaporation process. The existing systems can hardly analyze transitional behavior of vapor phase of spray and droplets behavior in high number-density region. The new technology that is named dual nanospark shadowgraph photography ...

2009-32-0018/20097018

Analysis of Relation between Mixture Formation during Ignition Delay Period and Burning Process in Diesel Combustion

Amir Khalid, Tomoaki Yatsufusa, Takayuki Miyamoto, Jun Kawakami, Yoshiyuki Kidoguchi,

(The University of Tokushima)

Abstract: Many technologies for reducing exhaust emissions of wide variety of diesel engines from small size to large size ones have been considered with the improvement throughout the combustion process. To reduce emissions, mixing of fuel and air is still important phenomena. Purpose of this study is to clarify the relation between mixture formation during the ignition delay period and burning process in diesel combustion that strongly affects the exhaust emissions. In this study, a rapid compression machine was used to simulate actual phenomenon inside the combustion chamber with changing ambient density. In addition, swirl velocity and injection pressure were changed as ...

2009-32-0057 / 20097057

Development of Newly Concept Diesel Engine for Industrial Use

Masato Ueda, Masayasu Takami, Tamon Tanaka, Koichi Funaki, Hideya Miyazaki

(Kubota Corporation)

Abstract: Very wide ranging applications or versatility are requires to industrial diesel engines. Moreover, engines should be fitted the market trends, that are such as high reliability, low fuel consumption, and/or compact size with high output power (high power density). In addition, in recent years, exhaust emissions regulations have been detting strict; hence the further emission reduction is required in keeping and improving the above mentioned demands. From such backgrounds, we developed new direct injection turbo diesel engine for industrial use, that satisfies the market needs with a high level by adopting the new concept engine structure and the emission reduction devices.

Abstract of Technical Session

November 3rd Tuesday

〈Teratai / Raya〉

14:00 - 15:30

Diesel Engines II

Chair : Toru Nakazono (YANMAR Co., Ltd.)

Co-Chair : Roy Douglas (Queens University of Belfast)

2009-32-0105 / 20097105

Light Duty Diesel Engine: Optimization of Performances, Noxious Emission and Radiated Noise

M. Costa, D. Siano, L. Allocca, A. Montanaro (Istituto Motori - CNR),

F.Bozza (DIME - Universit di Napoli)

Abstract: The paper aims at performing an environmental and energetic optimization of a naturally aspirated, lightduty direct injection (DI) diesel engine, equipped with a Common Rail injection system. Injection modulation into up to three pulses is considered starting from an experimental campaign conducted under non-evaporative conditions in a quiescent optically-accessible cylindrical vessel containing nitrogen at different densities. The engine performances in terms of power and emitted NOx and soot are reproduced by multidimensional modelling of the in-cylinder processes. The radiated noise is evaluated by resorting to a recently developed methodology, based on the decomposition of the CFD 3D computed in-cylinder pressure signal. ...

2009-32-0159 / 20097159

Simulation and Analysis of Combustion, Performance and Emission Characteristics of Biodiesel Fueled Low Heat Rejection Direct Injection Diesel Engine

B.Rajendra Prasath, P.Tamil Porai, Mohd.F.Shabir, T.Senthil Kumar (Anna University)

Abstract: A eveloped for a conventional and a Low Heat Reje with biodiesel. Model for the prediction of heat tr performance and emission levels were synthesize own of the piston, cylinder head, valves and liner) SZ) of 0.5 mm thickness. Methyl esters (called biodiesel) have been derived from non-edible vegetable oil such as Jatropha oil. In this work, the combustion, heat release analysis, rate of heat transfer with and without ...

Canceled

2009-32-0037/20097037

Effects of Thermal Barrier Coating on Diesel Engines Driven by 1, 4 Dioxane Ethanol Diesel Blends

C. Sundar Raj, S. Sendilvelan (Dr.MGR Educational and Research Institute),

S. Arul (Panimalar College of Engineering), C. G. Saravanan (Annamalai University)

Abstract: 1, of ethanol in diesel in a clear solution. The object anol-diesel blended fuel with 10% 1,4 dioxane ac , combustion and emissions data for evaluation without thermal barrier coating. Results show impr for all conditions of the engine. Drastic reduction in smoke density is found with the blends as compared to neat diesel and the reduction is still better for ...

Canceled

Abstract of Technical Session

November 3rd Tuesday

〈Teratai / Raya〉

16:00 - 17:30

Alternative Fuels I

Chair : Tomoo Shiozaki (Honda R&D Co.,Ltd.)

Co-Chair : Luigi Allocca (Istituto Motori - CNR)

2009-32-0026 / 20097026

Experimental Investigation of Performance and Emissions of a Sequential Port Injection Compressed Natural Gas Converted Engine

How Heoy Geok, Taib Iskandar Mohamad, Shahrir Abdullah, Yusoff Ali, Azhari Shamsudeen (National University of Malaysia)

Abstract: A single cylinder port injection gasoline engine was converted to a bi-fuel gasoline-compressed natural gas operation. The engine was run at wide open throttle and speeds ranging from 1500 to 5000 rpm. Cylinder pressure and air-fuel flow rate were recorded to calculate the indicated performance. Results show CNG operation yields higher FCE and lower ISFC. However, the indicated power, indicated torque, IMEP and volumetric efficiency of CNG were reduced due to lower charge density and slower flame speed. In terms of exhaust emissions, CNG shows significantly lower emission of HC, CO2 and CO. The NOx emission however shows mixed behavior.

2009-32-0136 / 20097136

Rate of Heat Release Analysis of an Engine Fueled with Butanol-Gasoline Blend

YANG Jing, WANG Yong, LIU JingPing, YANG HanQian (Research Center for Advanced Powertrain Technology), ZHONG Zhihua (Hunan University)

Abstract: C HR) profiles of a gasoline engine fueled with gaso mixing fractions. The possible causes in the obser e theory of chemical reaction dynamics. Influence ssed. It is demonstrated that Butanol is a very prom g and emission reduction.

Canceled

2009-32-0113 / 20097113

Flame Propagation of Bio-Ethanol in a Constant Volume Combustion Chamber

Chinda Chareonphonphanich, Prathan Srichai (King Mongkut's Institute of Technology Ladkrabang)

Abstract: This research presents an experimental study of the combustion of ethanol blends with gasoline in a constant volume combustion chamber. The test fuels are gasoline, E20 (ethanol20%), E85 (ethanol85%) and pure ethanol. The pressure in combustion chamber was measured. The images of flame propagation were recorded by schlieren technique with high speed video camera. The effects of equivalent ratio, temperature, pressure on the combustion characteristics were studied. The results show the greater percent of ethanol provides faster burn rate of combustion and higher peak of cylinder pressure. The peak combustion pressure E100 is 0.873 MPa which is higher than E85, E20 ...

Abstract of Technical Session

November 3rd Tuesday

〈Serindit〉

11:00 - 12:00

Vehicle Dynamics & Safety I

Chair : Takayuki Koizumi (Doshisya University),
Co-Chair : Robert Kee (Queen's University of Belfast)

2009-32-0060 /20097060

Cooperative Steer Control on Motorcycle between Rider and Active Support Torque

Takayuki Koizumi, Nobutaka Tsujiuchi, Yoshiki Noritou (Doshisha University)

Abstract: In this research, we aim at the construction of a steering cooperation-type front-wheel steering control system to reduce the rider's steering load by stabilizing the behavior of the motorcycle when turbulence in the direction of a roll occurs during low-speed driving. Finally, a front-wheel steering control system that considers cooperation with a rider's steering based on the experimental result is constructed, and the utility is verified by simulation.

2009-32-0081/20097081

Rider Response Time in Motorcycle Riding

Sai Praveen V, Venkata Mangaraju K, Venkatesh G., Babu R (TVS Motor Company Ltd.)

Abstract: The perception response time of automobile drivers is very sensitive to the driver's mental and physical state. Measurements of response times through experimental set ups are extremely challenging especially for two wheeler riders. In this paper, the motorcycle rider perception response time is estimated in close to realistic driving situations using an experimental set up. The setup consists of a stationary control unit, giving different visual stimuli to the rider at randomly varying time while riding the motorcycle on a test track. The rider responds and controls the motorcycle as per the visual stimuli. The visual stimuli and actuation time are ...

Abstract of Technical Session

November 3rd Tuesday

〈Serindit〉

14:00 - 15:00

Vehicle Dynamics & Safety II

Chair : Takayuki Koizumi (Doshisya University)

Co-Chair : Dalibor Jajcevic (Graz University of Technology)

2009-32-0146 / 20097146

Development of the Electronically-Controlled Combined Brake System

Hiroaki Amano (Kawasaki Heavy Industries, Ltd.), Tobias Fluck (Robert Bosch GmbH)

Abstract: Motorcycles in general are equipped with independent brake systems provided separately for the front and rear wheels. Because motorcycles characteristically exhibit large front-rear load fluctuations while running, they require a level of rider skill to operate the frontrear independent brake system in order to accomplish an appropriate front-rear brake distribution. However, motorcyclists have various levels of rider skills, from beginner to experienced rider. The combined brake system has been developed as an effective means for complementing these rider skills. This paper describes the characteristics of the electronically-controlled combined brake system that realizes a finer skill support than the conventional mechanically combined ...

2009-32-0152 / 20097152

Simulation and experimental study to improve wobbling stability in 3-wheeler

D.Gangi Reddy, GSG.Ravikanth, Tushar R.Gawade, V.Jeyamurugan, M.Nagarjun Reddy
(TVS Motor Company Ltd.)

Abstract: This work shows numerous experimental and simulation results regarding the stability of a three wheeled vehicle. Some vibration modes concerning three-wheeled vehicles can become unstable for a given vehicle speed. In particular, the wobble mode involves mostly the front frame while the weave mode involves mostly roll and yaw oscillations of the rear frame. This paper mainly focuses on the wobble mode, which was identified as the most influential vibration mode impacting vehicle handling, through experiments on the road using the three-wheeled passenger vehicle. A large number of parameters such as caster trail, steering damping coefficient, front frame inertia about steering axis, ...

Abstract of Technical Session

November 3rd Tuesday

〈Serindit〉

16:00 - 17:30

NVH Technology

Chair : Tadao Okazaki (Kubota Corporation)

Co-Chair : James Carroll (Southwest Research Institute)

2009-32-0128 / 20097128

Damping loss factor prediction in statistical energy analysis for co-generation system enclosure

Nobutaka Tsujiuchi, Takayuki Koizumi, Satoshi Morita (Doshisha University),
Hiroshi Uehara (YANMAR Co., Ltd.)

Abstract: This paper describes damping loss factor prediction in statistical energy analysis (SEA) for co-generation system (CGS) enclosures. To accurately predict vibration and noise by SEA, it is important to estimate parameters called the damping and coupling loss factors. In this study, the damping loss factors were estimated by the decay ratio method and a technique for calculating the modal damping ratio that uses a multi-degree of freedom curve fit. The calculated loss factor was applied to the vibration prediction of the co-generation system, and the influence of the internal loss factor calculation method on prediction accuracy was verified.

2009-32-0131 / 20097131

Evaluation of Feeling of Pulse for Cruiser-type Motorcycle

Takayuki Koizumi, Nobutaka Tsujiuchi, Takahisa Onishi (Doshisha University)

Abstract: This paper describes the relationship between the rider's evaluation of feeling of pulse and the seat vibration of the cruiser-type motorcycle. A simulated running condition was created to measure the seat vibration and engine speed. Next, the seat vibration was reproduced on the hydrodynamic shaker. Finally, we examined the influence of which order of rotational speed effects evaluation of feeling of pulse in a forced vibration test. As a result, it is known that 0.5th and 1st orders of seat vibration contribute to evaluation of feeling of pulse near 1,500 to 2,000 rpm of engine totation.

2009-32-0015/20097015

On experimental techniques to determine acoustic performance of small exhaust silencers

Jüri Lavrentjev, Hans Rämmal (Tallinn University of Technology)

Abstract: In this paper the acoustic performance of silencers has been investigated. The experimental techniques to study the attenuation of a silencer are in focus. A novel test procedure has been described and used to determine the sound transmission through the silencers in hot mean flow conditions. The experiments have been carried out on two motorcycle engine silencers with different design. The results analyzed and discussed clearly present the influence of the induct flow conditions on the sound transmission loss of the silencer.

Abstract of Technical Session

November 4th Wednesday

〈Cempaka / Anggerik〉

8:00 - 9:30

Advanced Combustion I

Chair : Yasuo Moriyoshi (Chiba University)

Co-Chair : Robert Fleck (Queens University of Belfast)

2009-32-0043 / 20097043

Development of an NOx Reduction System Using Exhaust Valve Controls in Small Engines for Motorcycles

Kazuo Fujihara, Yamato Nakamizo, Mitsuru Kojima, Teruhide Yamanishi (Honda R&D Co.,Ltd.)

Abstract: Exhaust gas recirculation (EGR) systems are used as a technology to reduce NOx emissions. However, the charging of the fresh air-fuel mixture decreases due to the inflow of the burnt gas from the EGR system, and the drivability deteriorates. Therefore, an internal EGR system that uses the thermal energy of the burnt gas is generally designed. Such a system employs a variable valve timing mechanism using the hydraulic or the electromagnetic to reduce the exhaust emissions and the fuel consumption and to obtain favorable drivability, generally. However, because such a system is expensive, there are few small motorcycles with the internal ...

2009-32-0047 / 20097047

Effective Engine Downsizing Through the Use of Compression Ignition Poppet-Valved 2-Stroke Engine With Novel Combustion Cycle Involving Oxygen and Water

Azmi Osman (PETRONAS Research Sdn. Bhd.)

Abstract: A novel combustion cycle involving oxygen and water is proposed as a potential replacement to the existing Otto and Diesel cycles. The cycle involves a compression ignition 2-stroke engine equipped with poppet exhaust valves and 2 high pressure gas injectors. Novel exhaust valve timing and lift strategy is applied to control the cylinder temperature for optimal fuel auto-ignition. High purity oxygen is used to replace air. Water having high specific heat capacity and gas constant is used as a working medium. In theory, relatively higher engine output from a comparable size of engine displacement can be expected as lesser heat is ...

2009-32-7068 / 20097068

Testing and Evaluation of Fuel Properties Effect on High Speed Engine Performance

Zulkhairi Salleh, Chan Ming Yau, Wan Ahmad Nadzri (PETRONAS Research Sdn.Bhd.)

Abstract: In the past, the performance of motorcycle engines has improves quite rapidly through intensive competition in racing and marketplace. In today's very competitive market environment, fuel producers also have to continuously develop and renew their products performance and capability in order to improve their business competitive edge and market share. With more consumer awareness on environment concerns, fuel product require a better mean of assessing their product performance for internal combustion engine market including motorcycle for improve fuel economy and exhaust emission pollutants. Fossil fuel resources depletion and uncertainty in oil prices further worsen the situation. Advancement in internal combustion engine ...

Abstract of Technical Session

November 4th Wednesday

〈Cempaka / Anggerik〉

10:00 - 11:30

Advanced Combustion II

Chair : Yasuo Moriyoshi (Chiba University)

Co-Chair : Robert Kee (Queen's University of Belfast)

2009-32-0045 / 20097045

Simulation and experimental investigations of a directinjection combustion system for high speed - high performance engines

Stephan Schmidt, Martin Abart, Oliver Schögl, Dalibor Jajčević, Alexander Trattner, Roland Kirchberger, Helmut Eichlseder (Graz University of Technology)

Abstract: This publication presents the development of a GDI combustion system for high speed - high performance engines. The paper describes the development of the combustion process and its results, the development methodology, covering 1D and 3D CFD simulations, and shows extensive experimental investigations. With 3D CFD simulations the necessary deeper insights in the mixture preparation process of a homogenous GDI combustion system are gained. The findings of the simulation are transferred to an injection and combustion system for a 4-cylinder test engine. The results of the experimental investigations of the 4-cylinder engine equipped with GDI technology show the potential of GDI applications ...

2009-32-0119 / 20097119

Very Lean and Diluted SI Combustion Using a Novel Ignition System with Repetitive Pulse Discharges

Tatsuya Kuboyama, Yasuo Moriyoshi (Chiba University), Kimitoshi Tanoue (Oita University), Eiki Hotta (Tokyo Institute of Technology), Yuichiro Imanishi, Naohiro Shimizu (NGK Insulators, LTD.), Katsuji Iida

Abstract: A newly developed small-sized IES (inductive energy storage) circuit with semiconductor switch at turn-off action is successfully applied to an ignition system of a small gasoline internal combustion engine. This IES circuit can generate repetitive nanosecond pulse discharges. An ignition system using repetitive nanosecond pulse discharges is investigated as an alternative to a conventional spark ignition system. The present study focuses on the extension of the operational limits for lean and diluted combustion using the repetitive nanosecond pulse discharges. First, in order to investigate the flame kernel formation process when the repetitive nanosecond pulse discharges are used, the initial flame kernel ...

2009-32-0135 / 20097135

Effect of Boost Pressure on Engine Performance and Exhaust Emissions in Direct-Injection Compressed Natural Gas (CNG-DI) Spark Ignition Engine.

Girma Tadesse, A. Rashid A. Aziz (Universiti Teknologi PETRONAS)

Abstract: Natural gas vehicle gives 11-22% lower power output compared to equivalent liquid-fuelled vehicles. With direct injection of gaseous fuel there has been a problem of reduction in volumetric efficiency when injecting the fuel at early and partial direct injection. This is due to some of the air will be displaced by the fuel as these injection timings have inlet valve open during injection. Recently, there is an increasing interest in supercharging S.I. engines operating on natural gas mainly to its superior knock resisting properties in comparison to traditional liquid fuels. The present work reports the effect of boost pressure on engine ...

Abstract of Technical Session

November 4th Wednesday

〈Cempaka / Anggerik〉

13:00 - 14:30

Advanced Combustion III

Chair : Yuh Motoyama (Yamaha Motor Co., LTD.)

Co-Chair : Stephan Schmidt (Graz University of Technology)

2009-32-0144 / 20097144

The Diffusion Combustion Induced by the High Voltage Electrical Discharge - The Influence of Fuel Property on Combustion Behavior -

Yohsuke Takeshita, Koji Yoshida (Nihon University)

Abstract: A new diffusion combustion method characterized by plasma jet ignition is proposed. In this new diffusion combustion, the fuel is injected and ignited by the high-voltage electrical discharge, so this combustion method can be applied for various fuels which have different ignitability. Tests were carried out with seven fuels by using a combustion bomb. When a small orifice was used, fuels which had branched chain molecular structure were hardly ignited. In case of large orifice, all test fuels were surely ignited, and the maximum combustion pressures of branched chain structure molecular fuels were higher than those of straight chain structure molecular fuel.

2009-32-0095 / 20097095

The Effect of Corona Discharge on Pre-Mixed Combustion

Koji Yoshida, Yosuke Soma (Nihon University)

Abstract: The flame propagation behavior of hydrogen-air and propane-air mixtures under application of high-voltage non-uniform electric field was explored by using combustion vessel. Both mixtures were ignited by laser-induced breakdown of Nd:YAG laser. In a case of propane-air mixture, top of flame front was drawn to the electrode and bottom of flame front was expanded. In a case of hydrogen-air mixture, the wrinkle caused by the preferential diffusion was enhanced by corona discharge, however the entire flame front was merely moved toward downward by corona wind. Therefore, the non-uniform electric field strongly influences charged particles originated in hydrocarbon of propane-air mixture.

2009-32-0097 / 20097097

Studies on Reducing Cycle by Cycle Variations and Improving Performance of a Small Carbureted Gasoline Engine

M.Krishnasamy, Y Ramachandra babu (TVS Motor Company Ltd.),

A.Ramesh, M.K.G Babu (Indian Institute of Technology)

Abstract: Experiments were conducted on a single cylinder 160cc, four stroke gasoline SI engine. Preliminary experiments were conducted on the base engine to characterize the nature of CBC (cycle by cycle) variations and the influencing parameters. The results have indicated that as the ignition advances, Peak pressure increases and its COV (Coefficient of variation) reduces. IMEP increases up to MBT (Minimum advance for Best Torque) timing and its COV reduces. HC emission and BSFC are minimum at MBT timing. The best AFR (main jet) and spark timing are selected based on low CBC variations and good performance. The engine behavior with ...

Abstract of Technical Session

November 4th Wednesday

〈Bayan I/ Bayan II〉

8:30 - 9:30

Two Stroke Engines I

Chair : Tomoo Shiozaki (Honda R&D Co.,Ltd.)

Co-Chair : Stephan Schmidt (Graz University of Technology)

2009-32-0032 / 20097032

Development of the Gaseous Fuel Direct Injection System for Small Two-Stroke Transports

TEOH Yew Heng, Dr. Horizon GITANO-BRIGGS, TAN Yee (Hern University Science Malaysia)

Abstract: It is well known that conventional carbureted two-stroke engines have high exhaust emission and poor fuel efficiency. To solve these problems direct gaseous fuel injection (DI) was introduced as a lower cost alternative to the gasoline direct injection (GDI) System. In this paper we investigate the use of liquefied petroleum gas (LPG) as a fuel in terms of lean combustion operation, and focus on analysis of in cylinder combustion pressure, fuel mass fraction burned, engine performance and exhaust emissions. Results are compared for various injection timings from premixed (early injection) to fully direct injection mode (late injection). Results show that late ...

2009-32-0077 / 20097077

Application of Scavenging-Port Injection of CNG to a Boat Engine at Running Conditions

Ryosuke Shina, Hideaki Suzuki, Mikiya Araki, Hisao Nakamura, Seiichi Shiga (Gunma University), Hideo Kishimoto (YAMATO Motor, Co., Ltd.)

Abstract: In a boat two-stroke two-cylinder engine, SC-port fuel injection of CNG was applied at running condition in comparison with the fuelling with a gas-mixer. Three methods of tests were employed; operation at a testbench, at an anchored condition and on a running boat. In a lower engine speed, the beneficial effect of higher thermal efficiency was obtained, while in higher engine speed range especially at the running condition, it has the inverse effect of lower thermal efficiency. It is based on the limited range of lower injection rate of the fuel injectors, and thus the fuel injection rate of this type ...

Abstract of Technical Session

November 4th Wednesday

〈Bayan I/ Bayan II〉

10:00 - 11:30

Two Stroke Engines II

Chair : Tomoo Shiozaki (Honda R&D Co.,Ltd.),
Co-Chair : Juergen Tromayer (Graz University of Technology)

2009-32-0046/20097046

Simulation of Scavenging Process, Internal Mixture Preparation, and Combustion of a Gasoline Direct Injection Two-Cylinder Two-Stroke Engine

Dalibor Jajcevic, Raimund A. Almbauer, Stephan P. Schmidt (Graz University of Technology)

Abstract: The continuous improvement of the numerical methods together with the increase of computer power allows the simulation of more and more complex technical problems even for increasing calculation domains. In order to get effective and significant results for the two-stroke twocylinder engine, the simulation of the complete geometry with both cylinders and the complete exhaust port is required. However, the simulation requires several revolutions until the gas dynamic inside the exhaust port achieves a steady state. Hence, the simulation of a twocylinder two-stroke engine consumes a lot of calculation time; nevertheless it is still acceptable in the development process of a ...

2009-32-0013 / 20097013

Knocking Investigations in a small Two-Stroke SI Engine

Kai Schreer, Kai W. Beck, Sören Bernhardt, Ulrich Spicher (Universitaet Karlsruhe),
Werner Geyer, Stephan Meyer (Andreas STIHL AG & Co. KG)

Abstract: The trend of higher specific power and increased volumetric efficiency leads to unwanted combustion phenomenon such as knocking, pre-ignition and selfignition. For four-stroke engines, the literature reports that knocking depends, to a large extent, on the ignition angle, the degree of enrichment and the volumetric efficiency. In recent research, knock investigations in two-stroke engines have only been carried out to a limited extent. This paper discusses an investigation of the influence of various parameters on the knock characteristics of a small, high-speed, two-stroke SI engine. In particular, the degree of enrichment, the volumetric efficiency and the ignition timing serve as the parameters.

2009-32-0030 / 20097030

Spectroscopic Measurements in Small Two-Stroke SI Engines

Kai W. Beck, Thomas Heidenreich, Steve Busch, Ulrich Spicher (Universität Karlsruhe),
Tim Gegg, Armin Kölmel (Andreas STIHL AG & Co. KG)

Abstract: This paper demonstrates the potential of optical sensors in the combustion chamber of a small twostroke SI engine to detect conditions that hinder an optimal combustion process using emission bands and/or emission lines. The primary focus is on the spectroscopic examination of the combustion radiation emissions cycle-by-cycle. For this purpose, sparkignition type combustion events, as well as the influence of both the air-fuel-ratio and the fuel type, are investigated on a crank angle resolved basis. Furthermore, an assessment of the radiation emissions of the OH, CH and C2 radicals is made. As a next step, the calculation of a temperature profile ...

Abstract of Technical Session

November 4th Wednesday

〈Bayan I/ Bayan II〉

13:00 - 14:00

Hybrids, Electric Drives & Fuel Cells

Chair : Yasuyuki Muramatsu (Yamaha Motor Co.,Ltd.)

Co-Chair : J Fürlinger (BRP-Powertrain GmbH & Co KG)

2009-32-0031 / 20097031

Development and Operation of a 1kW Direct Methanol Fuel Cell Stack

Kazuyoshi Furukawa, Yasuyuki Muramatsu, Shuhei Adachi (Yamaha Motor Co.,Ltd.)

Abstract: Yamaha Motor Co., Ltd. has been developing 1kW generator system of direct methanol fuel cell (DMFC). The performance and durability characterization of a 1kW DMFC stack that the weight of the stack was decreased 20% in comparison with that of previous stack was evaluated. The DMFC operation condition was optimized from the design of experiment and the results of the net output. The overall system efficiency of the Yamaha DMFC system using the stack became a maximum in current 20A, was 30%. The stack was generated at 20A under the Daily Start up and Shutdown (DSS) condition for 1500h. This report ...

2009-32-0061 / 20097061

Well-To-Wheel Energy Analysis of Conventional and Electric Motorcycles in Malaysia

Ahmad Syazli MOHD KHALIL, Dr. Horizon GITANO-BRIGGS (University Science Malaysia)

Abstract: In this paper we investigate well-to-wheel energy consumption of a conventional carbureted four stroke 110cc motorcycle and comparable electric motorcycle using lead acid batteries and Li-polymer batteries. The vehicles are tested on a chassis dynamometer using a steady-state test based on the ECER40 drive cycle. Vehicle energy consumption was measured and compared on a cost per kilometer basis. Vehicle life cycle analysis was performed based on expected or measured life times of the major components such as engines, batteries and electric motors. This study indicates that electric motorcycles cost less to operate than conventional motorcycles, but are unlikely to be competitive ...

Abstract of Technical Session

November 4th Wednesday

〈Tekukur〉

8:00 - 9:30

Design & Simulation_I

Chair : Hidenori Arisawa (Kawasaki Heavy Industries, LTD.)

Co-Chair : Tao Bo (Ricardo UK Ltd.)

2009-32-0138 / 20097138

Simultaneous Evaluation on Aerodynamics and Air-cooling Performances for Motorcycle using CFD Analysis

Tohru Shimizu, Toshihisa Abe, Yoshihiko Sunayama, Shinichi Watanabe, Eiichi Nakamura
(SUZUKI MOTOR CORPORATION)

Abstract: In order to optimize the balance between aerodynamics and air-cooling performances for a motorcycle, a simulation method of external flow around a vehicle has been developed. In this paper, steady-state flow calculations were performed using two types of turbulence models, the realizable k-_ and the SST k-_, and two levels of mesh sizes of computational models and their results were compared. To validate the computational results, wind tunnel tests were conducted and CD, CL and mean velocity of flow passing through heat exchangers were measured. The computational results on drag coefficient and mean velocity show good agreements with the experimental ones.

2009-32-0089 / 20097089

Research on Dynamic Behavior Simulation Technology for Cam-Drive Mechanism in Single-cylinder Engines

Keiichi Dan, Takuro Kawakami (Honda R&D Co., Ltd.)

Abstract: A theoretical evaluation technology for timing chain systems in single-cylinder engine has been established. Hitherto, there have been almost no theoretical evaluation reports published about drive loss and slapping noise in cam drive systems including timing chains. Thus, tensioner lifter and tensioner guide specifications to satisfy requirements related to slapping noise and friction loss have been determined only by tests with actual engines. In this research, a highly accurate mechanism-simulation model has been constructed that takes into account factors such as dynamic characteristics along with crank sprocket and timing chain contact stiffness and friction coefficient in addition to static characteristics of ...

2009-32-0054 / 20097054

Mount Force Reduction in a Scooter Engine Mounting System

Manjunath Bhat, Kannan Marudachalam (TVS Motor Company Ltd.),
C. Padmanabhan (Indian Institute of Technology)

Abstract: Crank balance factor and phase of crank balance tuning to minimize an engine mount forces by experimental methods during vehicle development is a time consuming process. The degree of crank balance factor and phase of crank balance optimization achieved relying on this approach alone is highly dependent upon the development engineer's experience. This situation should be helped if the initial crank balance factor and phase of crank balance provided to the development activity is near optimum. Engine mount forces are very crucial as they are primarily responsible for vibration of the vehicle. This paper discusses a method of modeling a scooter ...

Abstract of Technical Session

November 4th Wednesday

〈Tekukur〉

10:00 - 11:30

Design & Simulation II

Chair : Hidenori Arisawa (Kawasaki Heavy Industries, Ltd.)

Co-Chair : Roy Douglas (Queens University of Belfast)

2009-32-0176/20097176

Miniature HCCI Free-Piston Engine Compressor For Orthosis Application

Lei Tian, David B. Kittelson, William K. Durfee (University of Minnesota)

Abstract: A miniature homogenous charge compression ignition (HCCI) free-piston engine compressor aimed at an ankle-foot orthosis application is described. Analysis of the human ankle shows that a fluid power source in the neighborhood of 10 W is needed. To account for compressor and actuator inefficiencies, the power output at the engine cylinder is designed to be 30 W. A compact engine compressor package has been designed and mathematically modeled. Experiments using existing engine components characterized the leakage model. Through the dynamic simulation of the engine, major parameters of the engine have been specified. Simulations indicate that the HCCI freepiston engine compressor, designed ...

2009-32-0130 / 20097130

Side Opening Intake Strategy Simulation and Validation for a Sleeve Valve Port Application

Muhammad Hafidz Rahmat, Asyraf Ahmad, Mohd Faizan Ahmad Zuhdi
(PETRONAS Research Sdn Bhd)

Abstract: Engine breathing is one of the most vital aspects in an internal combustion engine. Increasing the efficiency of air intake allows sufficient supply of oxygen for the combustion process and improves the effectiveness of the air-fuel mixing. Prior sleeve valve technology is known for its immense port design flexibility despite the challenging and expensive archaic valve technology. The prospect of better flow induction and fresh knowledge on innovative valve mechanism application renews optimism of salvaging this overlooked sleeve valve port technology. To fathom the feasibility of a port flow employing the sleeve valve mechanism, a three dimensional steady fluid dynamics simulation ...

2009-32-0163/20097163

Prediction of Spark Ignition Engine Performance by Thermodynamic Simulation of a Real Cycle

Mehrnoosh Dashti (Islamic Azad University), Ali Asghar Hamidi (University of Tehran),
Ali Asghar Mozafari (Sharif University of Technology)

Abstract: In this ... on the first law of thermodynamic has been deve... mic processes and chemical state of the working fl... ustion, ignition delay and expansion processes. Th... bustion process. The species CO2, CO, H2O, H2... The model predicts the trends and tradeoffs by theoretical thermodynamically based analysis to determine the performance characteristics. Experimental data are presented to indicate the validity of the model. The predicted ...

Canceled

Abstract of Technical Session

November 4th Wednesday

〈Tekukur〉

13:00 - 14:30

Lubricants

Chair : Toshimi Kobayashi (Kawasaki Heavy Industries, Ltd.)
Co-Chair : Jay Meldrum (Michigan Technological University)

2009-32-0080 / 20097080

Performance of Motorcycle Engine Oil with Sulfur-Based Additive as Substitute Zn-DTP (Part II)

Nobuaki Watanabe, Moritsugu Kasai, Akira Mitara (Idemitsu Kosan Co., Ltd.),
Masatoshi Akagi (Honda R&D Co., Ltd.)

Abstract: As well as a four-wheeled vehicle, in the field of motorcycle, development of the CO2 reduction technology and practical use are required for global environment. Zinc dialkyldithiophosphate (Zn-DTP) type additives are widely used for engine oil formulations. However, phosphorus compounds are environmental load materials. The reduction of the quantity of phosphorus compounds in engine oils is required to reduce poisoning of three-way catalysts used to purify exhaust gases from internal combustion engines. Ito1) reported that they developed a sulfur-based additive as a substitute for Zn-DTP. Their non-phosphorus engine oil formulation for four-wheeled vehicles with a sulfur-based additive was examined to evaluate ...

2009-32-0075 / 20097075

Development of Catalyst-Friendly FC-W® Certified Marine Oils Utilizing Novel ZDP Technology

Brent Dohner, Ewa Bardasz, Mike Brenner (The Lubrizol Corporation Wickliffe)

Abstract: Phosphorus is known to reduce the effectiveness of the three-way catalysts commonly used by automobile manufacturers by deactivating the catalyst. This process occurs as zinc dialkyldithiophosphate (ZDP) decomposes in the engine oil, creating many phosphorus species, which provide excellent wear protection of the engine but can also interact with the active sites of the three-way catalyst. This reactivity has led to API specifications for engine oils with lower concentrations of phosphorus. In order to further minimize catalyst deactivation without compromising wear protection, a novel ZDP technology was designed for engine oil applications. This novel ZDP was designed to minimize the amount ...

2009-32-7178 / 20097178

Test Method for Evaluating Gear Fatigue Life of 4-Stroke Motorcycle Engine Oils

Hitoshi Hamaguchi, Hideo Tanaka (Evonik Degussa Japan Co., Ltd.),
Thorsten Bartels (Evonik RohMax Additives GmbH)

Abstract: A new test method for evaluating gear fatigue life of 4-stroke motorcycle engine oil is proposed. A newly developed rolling 4-ball type apparatus demonstrated good discrimination of anti-fatigue performance of known motorcycle engine oils with relatively shorter test duration, smaller sample size and reasonably good precision in comparison with the conventional fatigue tests available in the industry. The effects of operating parameters on test accuracy and repeatability have been studied. The parameters studied are oil temperature, contact pressure, speed and the test specimen batch.

Abstract of Technical Session

November 4th Wednesday

〈Teratai / Raya〉

8:30 - 9:30

Alternative Fuels II

Chair : Koji Yoshida (Nihon University)

Co-Chair : Dalibor Jajcevic (Graz University of Technology)

2009-32-0040 / 20097040

Experimental Studies of Bio-Diesel Fuels on Pollutant Emissions from Small Diesel Engine

Nafis Ahmad, A Y F Bokhary (King Abdulaziz University),
M Ashar, U Akhtar (Aligarh Muslim University)

Abstract: A nt study to measure emissions such as nitrogen di on deposits, operating under pure diesel mode and anj biodiesel oils. Results indicate that the biodies and diesel particulate matters, although sulfur diox d to pure diesel. The diesel engine has a little higher thermal efficiency and lower specific fuel consumption, although air fuel ratio approximately remains the same. It appears that biodiesel fuel is ...

Canceled

2009-32-0111 / 20097111

Investigations on Operation of CI Engine Using Liquefied Petroleum Gas and Mahua Oil in Mixed Fuel Mode

N. Kapilan (Nagarjuna College of Engg. & Technology), T. P. Ashok Babu (NITK University),
R. P. Reddy (Reva Institute of Technology)

Abstract: In st. Hence, use of Liquefied Petroleum Gas (LPG) be the most interesting option. In the present stu gine was modified to work in dual fuel mode. The nal way and LPG was inducted into the cylinder th found that the dual fuel operation results in efficiency comparable to the diesel operation with significant reduction in NOx and smoke emissions.

Canceled

Abstract of Technical Session

November 4th Wednesday

〈Teratai / Raya〉

10:00 - 11:00

Alternative Fuels III

Chair : Koji Yoshida (Nihon University)
Co-Chair : Tao Bo (Ricardo UK Ltd.)

2009-32-0115 / 20097115

Feasibility Study of Simarouba Glauca Oil and Its Biodiesel Blends as Alternative Fuel in a CI Engine

Naga S. Sarada, Raju A. V. S, Kalyani K. Radha, Shailaja. M (Jawaharlal Nehru Technological University), Gupta. J. N (S.G.M.Government Polytechnic)

Abstract: In Simarouba glauca. Performance tests are conducted eed, naturally aspirated, stationary diesel engine wi uca biodiesel, straight oil and Simarouba glauca bi er efficiency was observed at 75% load. The brake DO and 25% SBD blend with a BSFC of 0.346Kg/KWhr at three-fourth load. The lower blends of biodiesel increase the brake thermal efficiency and reduce the fuel consumption. The experimental ...

Canceled

2009-32-0117 / 20097117

Performance Evaluation of Low Heat Rejection Diesel Engine with Waste Fried Vegetable Oil

Naga. S. Sarada, Kalyani K. Radha, Reddy T. K. K (Jawaharlal Nehru Technological University), M. V. S. Murali Krishna, Periah. R. Chowdary, Shanker (Chaitanya Bharathi Institute of Technology)

Abstract: I esel engine, with 3mm air gap insulated piston wi erni insert and ceramic coated cylinder head at va ps of 40 bars). Vegetable oil operation at 27 deg. b in the performance, while LHR engine showed i eration on conventional engine. Increase of injection pressure increased efficiency from 24% to 29% for LHR engine and deceased pollution levels of NOx and smoke.

Canceled

Abstract of Technical Session

November 4th Wednesday

〈Teratai / Raya〉

13:00 - 14:00

Alternative Fuels IV

Chair : Toru Nakazono (YANMAR Co., Ltd.)

Co-Chair : Roy Douglas (Queens University of Belfast)

2009-32-0120 / 20097120

Stability, Performance and Emission Characteristics of Diesel-Ethanol Blend with Castor Oil as Additive in Variable Compression Ratio Engine

Arul Mozhi Selvan. V, Anand. R. B., Udayakumar. M. (National Institute of Technology)

Abstract: Experimental investigations are carried out to establish the stability characteristics of various diesel-ethanol blends with the use of neat castor oil and its methyl esters as additive. After a series of analysis, it is found that the blended fuel is stable with 10% castor oil up to E10 blends and with castor oil methyl esters; the stability is maintained up to E25. The performance and emission tests are carried out using the stable fuel blends on a computerised variable compression ratio engine and compared with neat diesel. The tests revealed that castor oil and its methyl esters can be used as ...

2009-32-0168 / 20097168

Combustion Characteristics of an Alternative Charcoal Slurry Fuel in a Diesel Engine

Valentin Soloiu (Georgia Southern University),

Yoshinobu Yoshihara, Kazuie Nishiwaki (Ritsumeikan University)

Abstract: Th ble biomass charcoal-diesel slurries and their use a ants. The employment of charcoal slurry fuel intend se fossil green house emissions into the atmospher on, injection, combustion and emissions of charcoa used for the production of charcoal that was successfully emulsified with diesel oil. The results of the laser investigations in sprays of the 25% charcoal slurry show that the fuel, a non-Newtonian fluid, is able ...

Canceled

Abstract of Technical Session

November 4th Wednesday

〈Serindit〉

8:00 - 9:30

Collegiate Event I

Chair : Takashi Mitome (SUZUKI MOTOR CORPORATION)
Co-Chair : Glenn R Bower (University of Wisconsin)

2009-32-0092 / 20097092

Space frame design for Formula SAE

Ryo Masutani, Daisuke Ito, Yasufumi Oguri, Takashi Suzuki (Sophia University)

Abstract: High rigidity and lightweight are important factors in every frame of vehicles. In Formula SAE vehicle design, to achieve this purpose the target value of the torsional rigidity of the frame was determined in the test run, and the conditions of analysis were also developed to be able to measure the compartment of the frame which concerns the actual driving conditions of the vehicle. Additionally focusing on the dynamic conditions of the vehicle, special devices for the frame were employed. Finally, the weight of 2008 year's model was saved by up to 29% from 2005 year's model, in spite of the ...

2009-32-7103 / 20097103

Improving Vehicle Performance by Aerodynamic Devices in Formula SAE

Mitsuru Wakabayashi, Kanako Komuro, Olivier Pedoussaut, Yasufumi Oguri, Takashi Suzuki (Sophia University)

Abstract: In this study, we have evaluated the performance of undertray and rear wing in formula SAE. The undertray was adopted to increase the driving force transmission. And in order to further increase the driving force and prevent the car from oversteering in high speed areas, a rear wing was mounted. Finally, by mounting these aerodynamic devices, driving force increased by 41% (undertray 14%, rear wing 27%) at the speed of 90km/h, and by calculating the value of stability factor measured by cornering power, improvement of the vehicle's oversteering tendency was confirmed.

2009-32-0107 / 20097107

Inspiring a College Campus to Design, Create, and Build Green Small Engine Vehicles

Robert D. Garrick, Clark G. Hochgraf, Anson Wong, Sakhawat Hossain (Rochester Institute of Technology)

Abstract: Challenges to engineering and technology students change with the times. Prior generations were faced with the challenge of transporting astronauts to the moon, or sending a spacecraft to the limits of the solar system. Using their training and talent, they created innovative designs empowering the earth to explore the universe. To them, only the sky was the limit. Our current generation of students is faced with a different challenge. Now, the earth seems to be the limit, with students devoting their creative energy to solve problems related to global climate change and to find alternative non-petroleum-based sources of energy. To harness ...

Abstract of Technical Session

November 4th Wednesday

〈Serindit〉

10:00 - 11:30

Collegiate Event II

Chair : Takashi Mitome (SUZUKI MOTOR CORPORATION)
Co-Chair : Glenn R Bower (University of Wisconsin)

2009-32-0147 / 20097147

A Study on Improvement of Road Ability of a Formula SAE Vehicle

Hiroyuki Oda, Takanori Furumido, Yusuke Ohira, Tomoaki Kodama, Yasuhiro Honda, Katsuhiko Wakabayashi (Kokushikan University)

Abstract: This study refers to the dynamic stabilities of pitching and rolling of our manufactured Formula SAE vehicle by numerical analysis and dynamic experiments. Formula SAE Competitions are the events of design and manufacture of the Formula SAE vehicles for university students under the auspices of SAE (Society of Automotive Engineers in U.S.A.). This competition consists of static and dynamic events. The abilities for the engineering design, cost and presentation of the students are judged in the static events. The driving reliability and durability of the competition vehicle are judged in the dynamic events. For the higher winning prize at this competition, ...

2009-32-0154 / 20097154

A Trial of Engine Performance Improvement by Adopting A Turbocharger in Consideration of Intake and Exhaust Systems

Atsushi Kawamura, Shinya Matsumoto, Shuhei Yamamoto, Yusuke Ohira, Tomoaki Kodama, Yasuhiro Honda, Katsuhiko Wakabayashi (Kokushikan University)

Abstract: The main purpose of Formula SAE competition (hereafter called “FSAE”) is to let students learn the basic ability necessary for engineers through design, fabrication and test projects[1],[3],[5]-[9]. In this study the authors decided to adopt Honda CBR 600 RR which was an engine for motor cycles. Then the engine have strength enough for the light weight design[2],[4]. As the course of the competition consists of short straights and many corners for running within equal to or less than middle speed range, the engine must have excellent acceleration performance to reduce the lap times in the corners. The effective engine performance is ...

2009-32-0177 / 20097177

Development of the Kettering University Snowmobile for the 2009 SAE Clean Snowmobile Challenge

Andrew Baker, Gregory W. Davis (Kettering University)

Abstract: Affordable clean snowmobile technology has been developed. The goals of this design included reducing exhaust emissions to levels which are below the U.S Environmental Protection Agency (EPA) 2012 standard. Additionally, noise levels were to be reduced to below the noise mandates of 78 dB(A). Further, this snowmobile can operate using any blend of gasoline and ethanol from E0 to E85. Finally, achieving these goals would be a hollow victory if the cost and performance of the snowmobile were severely compromised. Snowmobiling is, after all, a recreational sport; thus the snowmobile must remain fun to drive and cost effective to produce. The ...

Abstract of Technical Session

November 4th Wednesday

〈Serindit〉

13:00 - 14:30

Collegiate Event III

Chair : Mikio Kato (Honda R&D Co.,LTD.)

Co-Chair : Gregory W. Davis (Kettering University)

2009-32-0169 / 20097169

Torque Control of a Small Gasoline Engine with a Variable Nozzle Turbine Turbocharger

Kenichi Shimizu, Wataru Sato, Hiroshi Enomoto (Kanazawa University), Masahiko Yashiro (Honeywell)

Abstract: The ideal torque curve of automotive engines should be high and flat from low engine speed. To achieve this, we installed a variable nozzle turbine (VNT) turbocharger to a retail natural aspirated (NA) small gasoline engine. In the VNT turbocharger, variable vanes are set around the turbine wheel and form nozzles that changed the flow velocity of the exhaust gas. The vane position was controlled to adjust intake pressure at a target. As a result, the maximum torque improved by 27% and the engine speed at maximum torque was lowered by 1550rpm. A flat torque curve was achieved from 5450rpm to 8000rpm.

2009-32-0170 / 20097170

Effect of Seat Belt Positions on Passenger Injury during Low Speed Front-end Impact

Tatsuya Fukui, Hiroshi Enomoto, Yusuke Miyazaki, Shinobu Sakai (Kanazawa University)

Abstract: The objective of this study was to determine the risk of injury to the driver during frontal impact in amateur car races. In this study, FSAE (Formula SAE, organized by Society of Automotive Engineers) was focused as car races for amateurs. In FSAE rules, the IA (impact attenuator) has to fulfill the requirements under frontal impact condition and the driver has to be held with appropriate safety harness positions. This study examined the driver's risk of injury with regard to head and chest acceleration, neck and femur loads, and chest displacement using MADYMO. Injury criteria were presented and compared for various ...

2009-32-0108 / 20097108

Initial Design and Refinement of a High-Efficiency Electric Drivetrain for a Zero-Emissions Snowmobile

Ethan K. Brodsky, Nicholas J. Rakovec, Kevin R. King, Daniel J. Bocci, Jared Olsen, Adam R. Schumacher, Glenn R. Bower (University of Wisconsin)

Abstract: The University of Wisconsin - Madison Clean Snowmobile team has designed, constructed and now refined an electric snowmobile with 40 km (24 mi) range and acceleration comparable to a 75 kW (100 hp) internal-combustion-powered snowmobile. Starting with a Polaris IQ Fusion chassis, a direct-drive chain-case was engineered to couple a General Motors EV1 copper-bar rotor AC induction electric motor to the track drive shaft. The battery pack uses 104 28 V, 2.8 A-hr Lithium-Ion battery modules supplied by Milwaukee Tool to store 8.2 kW-hr of energy at a nominal voltage of 364 V. Power is transmitted to the electric motor via an ...

Abstract of Technical Session

November 5th Thursday

〈Cempaka / Anggerik〉

8:30- 10:00

HCCI II

Chair : Minoru Iida (Yamaha Motor Co,Ltd.)

Co-Chair : Roland Kirchberger (Graz University of Technology)

2009-32-0085 / 20097085

An Investigation of the Potential of Thermal and Mixing Stratifications for Reducing Pressure Rise Rate on HCCI Combustion by using Rapid Compression Machine

Daisuke Shirota, Norimasa Iida (Keio University)

Abstract: Thermal and mixing stratifications have been thought as one of the ways to avoid an excessive pressure rise on HCCI combustion. The purpose of this research is to investigate the potential of thermal and mixing stratifications for reducing PRR (Pressure Rise Rate) on HCCI combustion. The pre-mixture with thermal and mixing stratifications is charged in RCM (Rapid Compression Machine). After that, the pre-mixture is compressed and in that process, in-cylinder gas pressure and chemiluminescence images are obtained and analyzed. Furthermore, experimental results are compared with the computational results calculated by using multi-zone model for analyzing these mechanisms.

2009-32-0086/20097086

Analysis of the combustion dispersion mechanism in HCCI Engine

Chao Shi, Kenichiro Nagai, Norimasa Iida (Keio University)

Abstract: Delaying CA50(Crank Angle of 50% Heat Release) of the HCCI engine to expansion stroke can lead to high indicated thermal efficiency as well as the avoidance of knocking. However, this method could induce the problem of cycle variability. In this study, the cycle-to-cycle variation of a HCCI engine fueled with DME was investigated. Experimental parameters of each cycle, such as in-cylinder temperature, pressure and gas flow rate, were recorded by fast response system, and analyzed consequently. Moreover, the interdependency between the combustion and the performance parameters were evaluated.

2009-32-0087/20097087

Mechanism Analysis of Influence of Engine Speed on HCCI Combustion by using Numerical Calculation

Hiroki Iino, Kenji Shigetoyo, Mari Nagae, Norimasa Iida (Keio University)

Abstract: In HCCI Engine, HCCI combustion characteristics come under the influence of change of compression speed corresponding to engine speed. The purpose of this study is to investigate mechanism of influence of engine speed on HCCI combustion characteristics by using numerical analysis. At first, the Influence of engine speed was showed. And then, In order to clarified the mechanism of influence of engine speed, results of kinetics computations were analyzed to investigate the elementary reaction path for heat release at transient temperatures by using contribution matrix.

Abstract of Technical Session

November 5th Thursday

〈Cempaka / Anggerik〉

10:30 - 12:00

HCCI III

Chair : Minoru Iida (Yamaha Motor Co,Ltd.)

Co-Chair : Roland Kirchberger (Graz University of Technology)

2009-32-0072 / 20097072

Spark ignition and spark-assisted controlled auto-ignition in an optical gasoline engine

S. M. Begg, D. J. Mason, M. R. Heikal (University of Brighton)

Abstract: The results of an experimental study of the low speed and low load operation of an optical research engine are presented for spark-ignition (SI) and sparkassisted, controlled auto-ignition (SA-CAI). A direct injection gasoline engine was modified for optical access into the combustion chamber. At 1000 rpm and 3 bar NIMEP, stable SA-CAI combustion was achieved with predicted EGR rates in excess of 45%. The coefficient of variation (CoV) in NIMEP was 4.8% compared to 6.5% recorded in the SI case, with no EGR. Particle image velocimetry measurements of the airflow showed lower mean and turbulent velocities in the SA-CAI case at ...

2009-32-0021 / 20097021

Effect of spark assistance on improving cyclic stability of auto-ignition at light load in a small two-stroke engine

Janitha Wijesinghe (University of Technology, Sydney), Guang Hong (University of Technology, Sydney)

Abstract: Cyclic instability is a common problem in the operation of conventional two-stroke spark-ignition engines. Previous research has shown that auto-ignition (AI) could help solve this problem. However, at light engine loads, even under AI, the cyclic instability may still be significant due to the difficulty in maintaining the minimum temperature required by AI. Despite the benefits brought by AI in fuel consumption and emission reduction, the high level of cycle-to-cycle variation at light load may delay the realization of AI operation in engine products. To solve this problem, spark assistance has been identified as a cost effective and convenient way to ...

2009-32-0141/20097141

The Research about Thermal Stratification with Booster pressure Effect on Pressure Rise Rate in HCCI Engine using multi-zone model

O Seok Kwon, Dong Won Jeong, Ock Taeck Lim (University of ULSAN), Norimasa Iida (Keio University)

Abstract: The HCCI engine is a next generation engine, with high efficiency and low emissions. However a rate of pressure rise is a major limitation for high load range. Recently, we are able to reduce the rate of pressure rise using thermal stratification. Nevertheless, this was insufficient to produce high power. Without the higher equivalent ratio, one way to improve the power is to increase the intake boost pressure. It is suggested that the rate of pressure rise is reduced by thermal stratification and the power is increased by boost pressure at the same time. The objective of this work is to ...

Abstract of Technical Session

November 5th Thursday

〈Bayan I/ Bayan II〉

8:30 - 10:00

Fuel Supply Systems I

Chair : Yasuyuki Muramatsu (Yamaha Motor Co.,Ltd.)
Co-Chair : Jeffrey Allen (Scion-Sprays Ltd.)

2009-32-0044 / 20097044

Flexible-Fuel System for Small Motorcycles

Atsushi Ito, Hiroshi Yamada, Hideya Horie, Toshiyuki Kubota, Shiro Kokubu, Yoichi Takahashi
(Honda R&D Co., Ltd.)

Abstract: A flexible-fuel system for small motorcycles has been developed that can utilize both gasoline, and ethanol as an alternative to fossil fuel. For practicality, we aimed to develop a system that uses a minimum of additional parts. As a method to make both ethanol and gasoline available with the system, a control algorithm that estimates the ethanol concentration by utilizing the output voltage of an OXYGEN SENSOR and selects the appropriate injection quantity is employed. Usually, in automotive flexible-fuel vehicles (FFV), sub-tanks are mounted to ensure engine startability in cold temperatures. However, in small motorcycles, limitations of mounting space must be ...

2009-32-0055 / 20097055

Development of a Small Low-cost Fuel Injector to Overcome Diversification of Requirements in Global Markets

Daisuke Matsuo, Akihiko Haramai, Kazuhiko Sato, Minoru Ueda (Keihin Corporation)

Abstract: The applicability in adverse environment is essential for an injector for engines to use in motorcycles or power products. In view of that, what was considered most important in the development of this product was the applicability in diversifying environment, which was assumed to become even more adverse in the future. Accordingly developed is the injector that is more corrosion-resistant and waterproof. To improve corrosion resistance, an oxide layer is created by the surface reforming referred to as passivation. To attain steady coating, optimum passivation conditions such as the temperature, time and chemical-substance concentration are selected. Thus, the new injector that ...

2009-32-0056 / 20097056

Development of DBW Throttle Body for V4 Engines

Daisuke Shiraida, Takefumi Maruyama, Minoru Ueda (Keihin Corporation)

Abstract: For the throttle bodies for sport motorcycles, there is a need for a design giving importance to drivability and precise control. At the same time, various devices such as idle control and duct control are necessary in order to conform to recent environmental regulations. However, these added functions lead to an increase in the number of components, thus leading to disadvantages in both cost and weight. Therefore we have developed a throttle body where DBW (Drive By Wire) has been used to consolidate such parts, and functions. For the drive actuator, a modified actuator device from a passenger car DBW system ...

Abstract of Technical Session

November 5th Thursday

〈Bayan I/ Bayan II〉

10:30 -12:00

Fuel Supply Systems II

Chair : Yasuyuki Muramatsu (Yamaha Motor Co.,Ltd.)

Co-Chair : Juergen Tromayer (Graz University of Technology)

2009-32-0074 / 20097074

Variable Density Distribution of CNG Jet Injected at Small Injection Pressure

Emishaw D. Iffa, A. Rashid A. Aziz (Universiti Teknologi Petronas)

Abstract: The complicated In-cylinder varying density field behavior of gaseous fuels makes the air fuel mixing process difficult to study. This problem urges to find out the injected gaseous fuel density distribution. This paper tries to find out the normalized injected CNG density distribution at small injection pressure. Background oriented schlieren and image processing techniques are implemented to find the variable density distribution on a constant volume chamber during injection.

2009-32-0149 / 20097149

LOW COST ELECTRONIC FUEL INJECTION FOR MOTORCYCLES AND UTILITY ENGINES

P. Ravenhill, T. Drake, R.Hoolahan, B.Smither, I.McFarlane, J. Allen, G.Farmer (Scion-Sprays Ltd)

Abstract: As a result of environmental pressures and end-user demands several companies are working on low cost fuel injection systems specifically for small motorcycles and utility engines. A common approach to this application is to take an existing engine management system derived from automotive or high end motorcycle applications and to re-design it to reduce its complexity and cost for the small engine market. This paper introduces and discusses the latest development and application of a novel engine management system designed from the outset specifically for low cost small engines for motorcycles and utility applications (Pulse Count Injection, PCI [ref 2, 3]). ...

2009-32-0112 / 20097112

Ethanol Impacts on Fuel Supply Parts of Gasoline Engines in Thailand

Chinda Charoenphonphanich, Kalong Buanak, Panya Kansuwan
(King Mongkut's Institute of Technology Ladkrabang)

Abstract: In Thailand, gasoline mixtures with 85% ethanol by volume so called E85 recently available with guaranteed lower selling price are expected to replace the former types of gasoline. The looming change leads to certain concerns on material compatibility with E85 for automobiles deliberately not designed to run by the blends. Fluid immersion tests complying with SAE and ASTM standard were performed to the parts. The metallic and polymeric parts were submersed in test fluids inside an oven in which temperature had been maintained at 55 ± 2°C for at least 2000 hours. Weekly collected data, i.e. physical appearances and physical properties, ...

Abstract of Technical Session

November 5th Thursday

〈Tekukur〉

8:30 - 10:00

Collegiate Event IV

Chair : Mikio Kato (Honda R&D Co.,LTD.)

Co-Chair : Gregory W. Davis (Kettering University)

2009-32-0171 / 20097171

Decreasing of the Engine Idle Speed of a Small Gasoline Engine with Feedback Control

Tatsuya Fukui, Hiroshi Enomoto (Kanazawa University)

Abstract: This study proposes a method of decreasing the engine idle speed for the engine of FSAE race car. In general, the engine is controlled by map-based method. However, this method requires much time and cost to create a fuel injection map and an ignition timing map [1]. In addition to this, creating these maps at idle speed is much harder because the engine speed is cranky at idling. In this study, ON/OFF control and PID control were used for idle speed control without creating maps. As a result, idle speed was decreased drastically compared with map-based control. The PID control was ...

2009-32-0185 / 20097185

Combustion System Development and Analysis of a Downsized Highly Turbocharged PFI Small Engine

William P. Attard, Elisa Toulson, Ferenc Hamori, Harry C. Watson (University of Melbourne)

Abstract: T ection for developing smaller capacity downsized rgets and the world's future powertrain requireme lopment and combustion analysis results for a down two cylinder engine used in experiments was specif EP. Producing this specific output is one way forward for future passenger vehicle powertrains, enabling in excess of 50% swept capacity reduction whilst maintaining comparable vehicle performance. Previous experiments and analysis have found that ...

Canceled

2009-32-0188 / 20097188

Combustion System Development and Analysis of a Carbureted and PFI Normally Aspirated Small Engine

William P. Attard, Elisa Toulson, Ferenc Hamori, Harry C. Watson (University of Melbourne)

Abstract: Th nt and combustion analysis results for a normally a der engine used in experiments has been tested in a ump gasoline. Test modes were defined by alterati ion and port fuel injection fuel delivery systems. T he combustion effects for small cylinder normally aspirated spark ignition engines. This information provides future direction for the development of smaller engines as oil prices fluctuate and CO2 emissions begin ...

Canceled

Abstract of Technical Session

November 5th Thursday

〈Tekukur〉

10:30 -12:00

Design & Simulation III

Chair : Yoshihiko Sunayama (Suzuki Motor Corporations)
Co-Chair : Roy Douglas (Queens University of Belfast)

2009-32-0024 / 20097024

Symmetry and Time Delayed Boundary Condition for CFD Simulation and its Application in a Two-Cylinder Two-Stroke Engine

Dalibor Jajcevic, Raimund A. Almbauer, Stephan P. Schmidt (Graz University of Technology), Karl Glinsner (BRP-Powertrain GmbH & Co KG)

Abstract: Computational Fluid Dynamic (CFD) is the state of the art tool for the development of an internal combustion engine (IC engine), especially for the scavenging process, internal mixture preparation, and combustion. CFD simulation is apt for the detailed simulation of the processes inside the IC engine and consequently it consumes a lot of computer resources. The time for a calculation can be decreased by a reduction of the full three-dimensional (3D) calculated domain. The omitted domain parts can be either replaced by a simplified model or by the smart exploitation of symmetryconditions. The corresponding boundary conditions for the 3D domain often ...

2009-32-0164 / 20097164

Multiple-Cylinder Diesel Engine CFD Simulation Using VECTIS

Tao Bo, Gang Li, Jawahar Palaniyandi, Robert Hunt, Chris Rowe (Ricardo UK Ltd)

Abstract: This paper presents the CFD simulation performed on a 4-cylinder in-line Diesel engine using Ricardo's engine focused commercial CFD code VECTIS. Simulation run through multiple cycles and covered processes of intake, compression, spray, combustion and exhaust. The cyclically test data for cylinder pressure, charge distribution and EGR distribution, etc... Technical issues concerning multiple-cylinder analysis are discussed.

2009-32-0101 / 20097101

Early stage development of a 4-stroke gas exchange process by the use of a coupled 1D / 3D simulation strategy

Oliver Schögl, Stephan Schmidt, Martin Abart, Roland Kirchberger (Graz University of Technology), Matthias Fitl, Philipp Gschwantner (BRP-Powertrain GmbH & Co KG)

Abstract: In the early phase of an engine development process, the main characteristics of an engine setup, such as lengths, diameter and volumes, are usually defined by means of 1D CFD simulation technologies. Only single flow situations are modeled in 3D due to the high expenditure of time and money. This paper presents a new efficient development methodology using 1D, 3D as well as coupled 1D/3D simulation techniques - the described simulation strategy leads to a more realistic and more comparable reproduction of the flow situation, especially in the critical areas of the simulation domain, while avoiding the restrictions and disadvantages of 1D ...

Abstract of Technical Session

November 5th Thursday

〈Teratai / Raya〉

8:30 - 10:00

Alternative Fuels V

Chair : Tadao Okazaki (Kubota Corporation)

Co-Chair : Glenn R Bower (University of Wisconsin)

2009-32-0066 / 20097066

Study on Biomass Gas HCCI Engine

Yudai Yamasaki, Masanobu Kanno, Yasuhiro Taura, Shigehiko Kaneko (The University of Tokyo)

Abstract: Autoignition and combustion characteristics of biomass gas were investigated experimentally. A mock biomass gas consisting of H2, CH4, CO, N2 and CO2 was used as a wood pyrolysis gas. Experiments were carried out with a modified gas engine varying equivalence ratio and fuel composition. High hydrogen content increases the combustion speed, but it hardly affects ignition timing. High carbon monoxide content retards ignition timing, but it does not affect combustion speed. The autoignition temperature of biomass gas is about 1000K, which is the same as those of hydrocarbon fuels. The engine also realizes 42% of the indicated thermal efficiency and a ...

2009-32-0100 / 20097100

Influence of Various Biodiesel Fuels on Diesel Engine Performance

Masashi Ono, Masato Nakajima, Koji Yoshida, Hideo Shoji, Akira Iijima (Nihon University)

Abstract: The composition ratio of saturated and unsaturated fatty acid methyl esters (FAME) is depended on feedstock. Three FAMEs: soybean (SME), palm (PME) and coconut oil (CME) methyl esters were mixed to make fuels which have different composition ratio. The ignitability of fuel which mainly consisted of unsaturated FAME was inferior. Power was slightly reduced with increasing of mixing ratio of CME; however exhaust gas emissions were improved because CME contained a lot of oxygen atoms. Fuel which was equal mixture SME and CME indicated almost the same ignition characteristic as that of PME because they have same composition ratio.

2009-32-0132 / 20097132

Application of Newly Developed Cellulosic Liquefaction Fuel for Diesel Engine

Ren Yuan, Masashi Ono, Noritaka Yoshikawa, Hideo Shoji, Koji Yoshida, Akira Iijima (Nihon University)

Abstract: A new bio-fuel i.e. the cellulosic liquefaction fuel (CLF) was developed for diesel engines. CLF was made from woods by direct liquefaction process. When neat CLF was supplied to diesel engine, the compression ignition did not occur, so that blend of CLF and diesel fuel was used. The engine could be operated when the mixing ratio of CLF was up to 35 wt%. CO, HC and NOx emissions were almost the same as those of diesel fuel when the mixing ratio of CLF was less than 20 wt% whereas the thermal efficiency slightly decreases with increase in CLF mixing ratio.

Abstract of Technical Session

November 5th Thursday

〈Teratai / Raya〉

10:30 - 11:30

Alternative Fuels VI

Chair : Tadao Okazaki (Kubota Corporation)

Co-Chair : James Carroll (Southwest Research Institute)

2009-32-0063 / 20097063

A Study of IDI 2-Stroke Cycle Compression Ignition Engine with DME

Noritaka Yoshikawa, Koji Yoshida (Nihon University),

Tatsuaki Suzuki (Hiroshima Institute of Technology)

Abstract: DME is alternate fuel for diesel engines, however DME has defects such as small lower calorific value, inferior lubricity and weak fuel penetration. To compensate disadvantages, In-direct injection 2-stroke diesel engine with low pressure fuel injection system was proposed. The fuel injection timing near TDC gave good performance because the heat loss of low temperature oxidation reaction reduced. The brake torque and brake thermal efficiency of 2-stroke IDI diesel engine were lower than those of 4-stroke engine. However, the exhaust gas emissions were very low level because the intake air leaked through the exhaust port and the exhaust gas was diluted.

2009-32-0048 / 20097048

Study on Single Cylinder Engine for Performance and Exhaust Emission with Diesel, Bio Diesel, LPG and CNG.

Syed Kaleemuddin (Greaves Cotton Limited), G. Ambaprasad Rao (National Institute of Technology)

Abstract: The present work deals with Study of performance and emission on single cylinder air cooled naturally aspirated direct injection diesel engine. Same engine was converted into spark ignition engine with suitable compression ratio to adopt LPG and CNG as a dual fuel application. CFD analysis was done to review and subsequently increase the cooling capacity of the engine. Same spark ignition engine was further converted into water cool version to study improvement in engine performance. Engine performance comparison has shown 17% improvement in power with gasoline as compare to its parent diesel engine and there was drop in power by 12% ...

Abstract of Technical Session

November 5th Thursday

〈Serindit〉

8:30 - 10:00

Engine Control I

Chair : Ryozo Okita (Yamaha Motor Co.,Ltd.)

Co-Chair : Robert Kee (Queen's University of Belfast)

2009-32-0019/20097019

Intelligent Engine Management System for Small Handheld Low Emission Engines

Matthias Hehnke, Claus Naegele, Heinrich Leufen, Andreas Bähner (ANDREAS STIHL AG & CO. KG)

Abstract: In the handheld industry the carburetor controlled 2-stroke engine is still the mostly used power source. The current carburetor as a fixed geometric and hydraulic system is not capable of compensating varying fuel specifications. Electronic engine management systems offer the adjustment of varying ambient conditions and fuel qualities. State of the art systems of common vehicle applications use various sensors and actuators which increase the complexity and the costs of the engine. A smart alternative is an engine control based upon processing of already existing information in a small handheld engine. This paper presents the concept, the configuration and the design ...

2009-32-0034 / 20097034

Development of a Small Motorcycle EFI Retrofit System

TEOH Say Lai, Dr. Horizon GITANO-BRIGGS (University Science Malaysia)

Abstract: Carbureted small displacement motorcycles are the most common form of road transport in Asia. Small displacement motorcycles have historically been low-cost and low-tech. In order to achieve the best overall performance, economy and emissions, a more sophisticated fuel injection system is required. To address the fuel consumption and emissions of existing “legacy” vehicles, we have developed an Electronic Fuel Injection (EFI) retrofit for common small motorcycles in Asia. The system leverages existing components as much as possible allowing focus on integration into the host vehicle and overall system tuning. This paper details the overall system design, modeling, component selection and system ...

2009-70-0073 / 20097073

Cost Efficient Electronic Control Unit for Low-Emission Motorcycle Engines: A Solution Based on the Integration of Analog Functions

M. Sacchi, R. Ferrara, J. Beeker, Neng-Hau Ching (Freescale Semiconductor)

Abstract: The high level of pollution in urban areas and the growing significance of emissions from two-wheel vehicles is forcing many governments to enact stricter pollution regulations for these small motorcycle engines. In order to satisfy these new stringent exhaust emission levels, manufacturers are considering replacing traditional mechanical carburetors with electronic controls, but the strict target costs for twowheel vehicles requires manufacturers to develop innovative designs for these electronics. This paper presents a new solution to reduce the total cost of the small engine electronic control unit: It is based on the integration of many necessary analog functions into a single chip.

Abstract of Technical Session

November 5th Thursday

〈Serindit〉

10:30 - 12:00

Engine Control II

Chair : Ryozo Okita (Yamaha Motor Co.,Ltd.)

Co-Chair : Jay Meldrum (Michigan Technological University)

2009-32-0124 / 20097124

Development of Fail-safe Method for Motorcycle's Electronic Throttle Control System

Takuya Sakamoto, Takeru Oshima, Yoshiaki Tani, Masashi Fukuuchi, Shinichi Kuratani
(Kawasaki Heavy Industries, Ltd.)

Abstract: In recent years, even motorcycles impose demands for engine power controls that are more flexible and precise. The Electronic Throttle Control (ETC) system is one of the methods that addresses this need. However, the most important issue facing the installation of the ETC system on the motorcycle is handling failures. To avoid this problem, we developed an ETC system for motorcycles that can properly effect engine power control in case of a failure. This ETC system contains in duplicate the major components to detect failures and switch to a failure mode properly. To effect control that is optimally suited to the type ...

2009-32-0014 / 20097014

Modeling and Control of Variable Intake Valve Actuation in IC Engines

Chun-Hsien Wu, Pei-Jen Wang (National Tsing Hua University)

Abstract: This paper studies the dynamic model and associated control methods of a single cylinder four-stroke internal combustion (IC) engine attached with a variable intake-valve actuation mechanism. First, pertinent data of intake and exhaust ports, valve-timing cam, output torque, frictional torque, and crankshaft dynamics obtained from a 125 cc IC engine constitute the dynamic model for further control of the engine performance. Then, calculated data from specific conditions confined by volumetric efficiency and specific fuel consumption generate control commands for intake-valve actuation for various loads governed by a genetic algorithm. For quest of the best fuel economy, MatLab/Simulink programs simulate and evaluate ...

2009-32-0118 / 20097118

An Ionization Current based Cylinder Gas Pressure Estimation for Knock Detection and Control in a Single Cylinder SI Engine

Davinder Kumar (TVS Motor Company Ltd.),
A. Ramesh, M.K. Gajendra Babu, P.V. Manivannan (Indian Institute of Technology Madras)

Abstract: The ionization current across the spark plug gap is obtained by applying a constant voltage using DC power source across the spark gap after the high-voltage discharge. The methodology involves study and comparison of different knock detection methods (cylinder gas pressure, accelerometer and ion current) through literature survey, development of analytical models (ionization current, chemical equilibrium, kinetic NO) to estimate crank angle resolved cylinder gas pressure from the measured values of ionization current. Model refinements and validations, development of Ignition Coil integrated DC power source and ion current measurement circuit, Transistorized Coil Ignition and microcontroller based knock controller have been carried out. ...