



DIRECT INJECTION 2-STROKE ENGINES INTERNATIONAL WORKSHOP & CONFERENCE

On water, on land, in the air, between the hands
Crossed views on the future of DI 2-Stroke Engine applications



Program

DI 2-Stroke Engines Conference

February 13-14, 2020

IFP School – Rueil-Malmaison - France

Dear Colleagues,

It is with great pleasure that I am announcing the 3rd Edition of the New Direct Injection 2-Stroke Engines International Workshop and Conference taking place on February 13-14, 2020 at IFP School.

The 2nd Edition was already organized by IFP School on February 15, 2018 with the help of a team of highly-motivated students. We were able to bring together 80 professionals and 30 students from 14 different countries. According to the participants feedback, what was mostly appreciated were first, the opportunity of networking within the scientific and technical 2-Stroke community; second, the high quality of the presentations and speakers, and the possibility to have a global up to date overview on the 2-stroke engine topic and on its various applications. The participants also enjoyed being part of an enthusiastic assembly, with a positive energy focused on the future of 2-stroke engines. Finally, almost 100 % of them expressed their interest in attending a 3rd Edition.

The success of the 2018 event confirmed the worldwide interest in DI two-stroke engines for some specific and well adapted applications, thanks to its advantages of lightweight, compactness, high efficiency and high specific power. This encouraged us to decide to organize this new 2020 edition.

Like the previous editions, the aim of this conference is again to share the latest research and development results on the new generation of DI 2-stroke engines from several companies (manufacturers, suppliers, engineering companies) and research institutions and to develop the networking in this field.

When you will discover this 2-day Conference program, you will see the new dimension of this 2020 event. Compared to 2018, the number of presentations almost doubled, and the international dimension has been greatly increased with speakers from all over the world (Europe, Israel, USA, Canada, Japan, China, India, Australia). We also introduced new important topics such as the aerial application, low speed large marine engines, and a new panel session on the “Crossed views on the future of 2-stroke engines applications”.

During the last 30 years, the conventional carbureted 2-stroke engine started to progressively disappear because of its high pollution. In parallel, number of worldwide researchers worked to develop a new generation of clean and efficient 2-stroke engines while keeping the 2-stroke cycle’s inherent advantages of simplicity, light weightiness, compactness, low friction and pumping losses, double cycle frequency, high specific power, etc. These new 2-stroke engines are generally based on the use of direct fuel injection technology combined with innovative combustion processes. Thanks to these technologies, the 2-stroke engine can meet the most stringent emissions limits while demonstrating for some application significant fuel consumption advantages compared to its 4-stroke counterpart.

This new international workshop and conference is then expected to cover all the main current directions in the development of new DI 2-stroke engines for almost every possible application, on water, on land, in the air, between the hands; from the smallest hand-held engines to the biggest marine engines in the world.

Therefore, with my colleagues of the Organizing and Technical Committees, we are pleased to invite you to attend the third edition of this unique international event.

We are looking forward to seeing you next February 2020 at IFP School.



Workshop & Conference Chair

Pierre DURET

Director, Powertrains & Sustainable Mobility, IFP School

Technical Committee

- Michael BARGENDE – FKFS Forschungsinstitut für Kraftfahrwesen und Fahrzeugmotoren Stuttgart
- Geoffrey CATHCART – Orbital UAV
- Gilles COMA – Renault
- Giovanni FERRARA – Firenze University
- Nigel FOXHALL – BRP-Rotax
- Roland KIRCHBERGER - TU Graz
- J. Javier LOPEZ – CMT-UPV
- Sylvain MATTE – BRP
- Kohei NAKASHIMA - Meijo University
- Keiya NISHIDA - Hiroshima University
- Ricardo NOVELLA – CMT-UPV
- Fabien REDON – Achates Power
- Eran SHER – Technion - Israel Institute of Technology
- Tomonori URUSHIHARA – Mazda Motor Corporation
- Stéphane VENTURI – IFP Energies Nouvelles
- Paul WESTHOFF – BRP Evinrude
- Wolfgang ZAHN –Andreas Stihl AG & Co. KG
- Hua ZHAO – Brunel University



Organizing Committee

- Michel ALCHAHIR ALHAJJAR - IFP School student
- Vaibhav ARORA – IFP School student
- Brigitte DELAGE – IFP School
- Niranjan EDAPPADY – IFP School student
- Sava VUJIC – IFP School student
- Daniel ZALGHOUT – IFP School student



Venue

IFP School - IFP Énergies Nouvelles

4 Avenue de Bois-Préau

92852 Rueil-Malmaison, France

<http://www.ifp-school.com/>

Conference Website

<http://di2-stroke-engine.ifp-school.com/>



Conference Program

Thursday, February 13th, 2020

8:00 **Registration**

8:45 **Welcome and Keynote Opening**

Christine Travers – Dean - IFP School

Pierre Duret – Director Center for Powertrains & sustainable mobility – IFP School

9:20 **SESSION 1: SMALL 2-STROKE ENGINES AND HAND-HELD TOOLS**

Chaired by Roland Kirchberger – Graz University of Technology

9:20 **Visualization for Abnormal Combustion of Small 2-Stroke Engine with Practical Engine Speed Over 10000 RPM Using High Speed Video Camera**

- Kuniyoshi Eto, Takuo Yoshizaki, Yamaguchi Shiro, Toshiharu Sawada - Yamabiko Corp.

9:40 **Fast Response HC Measurements of Engine-Out and Tailpipe 2-Stroke Strimmer Engine Emissions**

- Mark Peckham, Jamie Parnell, Matthew Hammond - Cambustion

10:00 **A 2-Stroke Chainsaw with Injection: Development and Customer Experience**

- Wolfgang Zahn, Arno Kinnen - ANDREAS STIHL AG & Co. KG

10:20 **Q & A**

10:40 **Coffee Break**

11:10 **SESSION 2: DESIGN & IMPROVEMENT OF 2-STROKE ENGINES WITH HEAVY FUEL AND AERIAL APPLICATIONS**

Chaired by Wolfgang Zahn – ANDREAS STIHL AG & Co. KG

11:10 **Piston Ring Behavior in a 2-Stroke Engine**

- Kohei Nakashima, Shansuke Nakakuki – Meijo University

11:30 **Improving Reliability, Efficiency, and Endurance for Heavy-Fuel 2-Stroke Spark Ignition Engines**

- John Tubb– Orbital UAV

11:50 **2-Stroke Diesel Engine with In-Cylinder Steam Reforming for High Altitude Operation**

- Kadmiel Karsenty, Leonid Tartakovsky, Eran Sher - Technion – Israel Inst. of Technology

- Ilai Sher – Opuntia Ltd.

12:10 **Q & A**

12:30 **Lunch Break**

14:00 **SESSION 3: OPPOSED PISTON DI 2-STROKE ENGINES FOR AUTOMOTIVE APPLICATIONS**

Chaired by Michael BARGENDE – FKFS

14:00 **The Opposed-Piston Engine: Studies on Efficiency and Geometry and Some New Concepts to Further Improve Its Thermodynamics in Concert with Increased Powertrain Electrification**

- James W.G. Turner and Giovanni Vorraro - University of Bath

14:20 **Optimization of Main Specifications of 2-Stroke Opposed Piston Gasoline Engine for Dedicated Series Hybrid and Its Possibility**

- Koichi Hatamura - Hatamura Engine Research Office Ltd.

- Keiya Nishida - University of Hiroshima

14:40 **The Engine Imperative**

- Bruno Linsolas – Achates POWER

15:00 **Q & A**

15:20 **Coffee Break**

15:50 **SESSION 4: ADVANCED DI 2-STROKE ENGINE COMBUSTION PROCESSES**

Chaired by Hua ZHAO – Brunel University

15:50 **CAI – Controlled Auto Ignition for Future DI 2-Stroke Engines: Challenges and Potential**

- Pierre Duret – IFP School

- 16:10 **Analyses of Auto Ignition and Combustion Behavior in CAI Combustion Using a 2-Stroke Optically Accessible Engine**
 - Akira Iijima, Kojiro Yoshida, Yosuke Abe - Nihon University
- 16:30 **2-Stroke RCCI Engines for Passenger Cars**
 - Enrico Mattarelli - University of Modena and Reggio Emilia
 - Giovanni Ferrara - University of Florence
- 16:50 **Q & A**
- 17:10 **PANEL SESSION: ON WATER, ON LAND, IN THE AIR, BETWEEN THE HANDS... CROSSED VIEWS ON THE FUTURE OF DI 2-STROKE ENGINE APPLICATIONS**
 Chaired by Eran Sher – Technion – Israel Institute of Technology
- Panelists:**
- Bruno Linsolas Vice President Business Development Europe– Achates POWER
 - Patrice Flot – President TAMRIS études et conseils
 - John Tubb – Chief Engineer - Orbital UAV
 - Wolfgang Zahn – Retired Board member - ANDREAS STIHL AG & Co. KG
- 18:00 **END OF THE FIRST DAY OF THE CONFERENCE**
- 19:30 **GALA DINNER at Le Relais de la Malmaison**

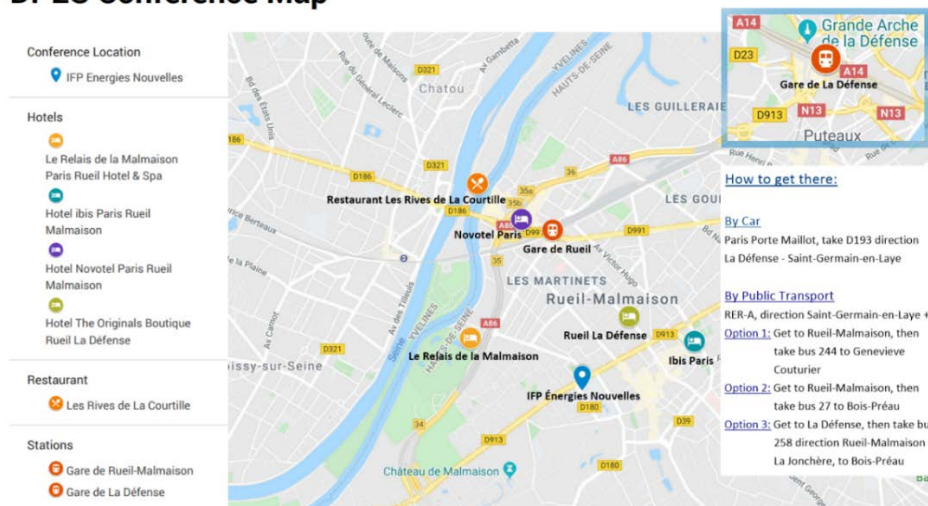
Friday, February 14th, 2020

- 8:45 **SESSION 5: DI 2-STROKE ENGINES FOR LAND TRANSPORT APPLICATIONS**
 Chaired by Pierre Duret – IFP School
- 8:45 **Design and Validation of Advanced Intake Ports in a Uniflow 2-Stroke CI Engine for Passenger Car Applications**
 - J. Javier López, Ricardo Novella, Kévin Thein, Gabriel Alcantarilla - CMT – Motores Térmicos
 - Florence Duffour, Ludovic Nowak, Gaetano De Paola, Emmanuel Rizzo - IFP Énergies Nouvelles
 - Fano Rampanarivo - Renault
- 9:05 **Evaluation and Optimization of the Boost System for a High Performance 2-Stroke Boosted Uniflow Scavenged Direct Injection Gasoline (BUSDIG) Engine**
 - Xinyan Wang, Hua Zhao - Brunel University
- 9:25 **Scavenge Concepts for Passenger Car Range Extenders, Fulfilling the Needs of 3-Way Catalyst Aftertreatment**
 - Roland Kirchberger, Stephan Schmidt, Oliver Schögl, Stefan Sturm, Martin Steyskall - Graz University of Technology
- 9:45 **2-Stroke Hybrid High Performance Motorcycles**
 - Francesco Scignoli - University of Modena and Reggio Emilia
- 10:05 **850cc BRP-Rotax 2 strokes DI snowmobile engine; the next evolution...**
 - Bruno Schuemacher, Sylvain Matte - BRP
- 10:25 **Q & A**
- 10:55 **Coffee Break**
- 11:25 **SESSION 6: THE MARINE APPLICATIONS OF DI 2-STROKE ENGINES**
 Chaired by J. Javier López - CMT – Motores Térmicos
- 11:25 **An overview of the Evinrude E-TEC direct fuel injection outboard engine: Technical, Regulatory, Environmental Leadership**
 - George Broughton – BRP Marine Group
- 11:45 **Today's technology and on-going development of low-speed 2-stroke marine engines, on the way to 2050**
 - Patrice Flot - TAMRIS études et conseils
- 12:05 **The New Fuels and a Change of Engine Paradigm**
 - Kjeld Aabo - MAN Energy Solutions
- 12:25 **Q & A**

12:45	Lunch Break
14:15	SESSION 7: INNOVATIVE DI 2-STROKE ENGINES CONCEPTS Chaired by Bruno Linsolas – Achates Power
14:15	Ultra-Low NOx HCCI Combustion in the Z Engine - Timo Janhunen - Aumet Oy
14:35	Testing and Modelling of a 2 Power Strokes per Revolution Opposed Piston Engine with an Innovative Kinematics - José R. Serrano, Héctor Climent, J. Javier López, Alejandro Gómez-Vilanova - CMT-Motores Térmicos. - Juan Garrido-Requena, Manuel J. Luna-Blanca, F. Javier Contreras-Anguita – INNEngine
14:55	Aquarius 2-Stroke Linear Engine Development - Henning Hoff – AVL Schrick GmbH - Shaul Yaakoby, Pierre Detré - Aquarius ERC GmbH
15:15	Q & A
15:35	Closing Remarks
15:45	END OF CONFERENCE

Venue Access (press on map to view)

DI-2S Conference Map



Hotels (approx. 15 min walk from IFP School)

- **Novotel Rueil-Malmaison:** 21 Ave. Edouard Belin (92500, Rueil-Malmaison), +33 1 47166060,
 - <https://www.accorhotels.com/fr/hotel-1609-novotel-paris-rueil-malmaison/index.shtml>
- **The Originals Boutique Rueil La Défense:** 20 Ave. Albert 1er (92500, Rueil-Malmaison), +33 170238163
 - <https://www.theoriginalshotels.com/en/hotels/paris-west-rueil-malmaison>
- **Ibis Paris Rueil-Malmaison:** 16 Blvd. De l'Hôpital Stell (92500, Rueil-Malmaison), +33 147329696
 - <https://www.accorhotels.com/gb/hotel-1407-ibis-paris-rueil-malmaison/index.shtml>
- **Le Relais de la Malmaison:** 93 Boulevard Franklin Roosevelt (92500 Rueil-Malmaison)
 - <https://www.relaismalmaison.fr/en/>

Ticketing Website for Online-Registration

<https://www.weezevent.com/direct-injection-two-stroke-engines-international-workshop-conference>

- **Registration Fees:** 160€
- Free Registration for the first 15 Students
- Optional Gala Dinner at Le Relais de la Malmaison's Restaurant (Thursday Feb. 13th at 19h30): 60€