



# INTERNATIONAL CONFERENCE ON FAN NOISE, TECHNOLOGY AND NUMERICAL METHODS

## PROGRAMME AND REGISTRATION BROCHURE

15-17 APRIL 2015

L'Espace Tête d'Or, Lyon, France

[www.fan2015.org](http://www.fan2015.org)



Institution of  
**MECHANICAL  
ENGINEERS**

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Over the last three years the fan industry has been regulated more directly than at any other time. Europe is at Tier two of fan peak efficiency regulation, with a third Tier under discussion. The American Department of Energy is evaluating design point efficiency minimums which restrict the operating range of all fans. China, Malaysia and Taiwan have rules in effect, while the rest of the world is considering alternatives. Manufacturers must respond, improving peak efficiency to remain on the market, expanding their compliant range of products.

Fan 2015 offers you a unique opportunity to learn about the regulatory process in each global region. It also offers you the opportunity to learn how to design more-efficient fans by integrating computational methods developed by the aerospace industry into the design process. The design of fans will continue to evolve to meet the ever-increasing demands for higher-efficiency machines, combined with the requirements for lower noise and high availability.

Fan 2015 is an event that will be a forum for fan and system designers, manufacturers and operators, with the aim of improving our understanding of fans and their system interaction. The conference combines the next in the series of the Institution of Mechanical Engineers' international conferences on Fan Technology and the CETIAT/ Cetim International Symposium on Fan Noise.

## BENEFITS OF ATTENDANCE:

- **Hear** from the key thought leaders in our industry who will give keynote speeches on regulation, design and aero-acoustic computational methods.
- **Engage** in engineering-based discussions with designers.
- **Learn** about developing computational methods as part of a broad drive to increase fan efficiency.
- **Find** solutions and collaborators for future projects.
- **Address** the issues associated with implementation of aerospace design methods in the design process of fans for non-aerospace applications.



## SUPPORTING ORGANISATIONS:



European  
Air Movement &  
Control Association



## SPONSORSHIP & EXHIBITION OPPORTUNITIES

Get into the minds of key decision-makers. Become a Fan 2015 sponsor or exhibitor and capture your chosen audience at the only dedicated international fan event.

Our flexible opportunities allow you to:

- Showcase new products
- Raise awareness of your operation
- Improve perception of your brand
- Influence other organisations' spending plans

To discuss how to get the best from our event, contact Aman Duggal on  
+44 (0)20 7973 1309 or  
[a\\_duggal@imeche.org](mailto:a_duggal@imeche.org)

## ORGANISING COMMITTEE

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Fläkt Woods, UK  
**Alain Guédel**  
Fan Noise Track Chairman  
CETIAT, France

**Alessandro Corsini**  
Theoretical Methods and CFD Track  
Chairman  
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**Paul Wenden**  
Twin City Fan & Blower, UK  
**Henrik Witt**  
Witt & Sohn, Germany

## EXHIBITION AND SPONSORSHIP

There will be an exhibition supporting the event, which delegates will be free to attend throughout the duration of the conference. Exhibitors include:

- Advanced Design Technologies
- ANSYS
- AMCA
- Brüel & Kjaer
- CD-adapco
- CETIAT
- Cetim
- CFturbo
- Exa Corporation
- Free Field Technologies
- HEAD acoustics
- MicrodB
- NUMECA
- OROS
- Siemens

A limited number of exhibition stands are still available. To reserve your space or enquire about sponsorship opportunities please contact Aman Duggal on +44 (0)20 7973 1309 or [a\\_duggal@imeche.org](mailto:a_duggal@imeche.org)

## SOCIAL PROGRAMME

The two social events are organised on days one and two of the conference. Attendance to these events is included in the registration fee but you must indicate on the booking form if you wish to attend them. Guests may attend if they pay the 'Guest' fee.

## EXHIBITION DRINKS RECEPTION

A drinks reception will take place in the Tokyo, Toronto and Washington areas immediately following the last technical session on Wednesday 15 April. The exhibition stands will stay open for delegates to visit.

## CONFERENCE BANQUET

On the evening of Thursday 16 April there will be a conference banquet. This event will take place at Château de Janzé, an ancient chateau fort dating back to the 12th century. The dinner will commence at 19:00 with a pre-dinner drinks reception. Transport to the venue will be provided.



# CONFERENCE PROGRAMME OVERVIEW

WEDNESDAY 15 APRIL			
08:30-09:30	Registration		
09:30-09:45	Opening Address		
09:45-10:15	Keynote Address – Marcos González Álvarez Ecodesign Requirements on Fans: Current Situation and Future Developments		
10:15-10:45	Networking Refreshment Break		
10:45-12:45	<b>Session A1</b>	<b>Session A2</b>	<b>Session A3</b>
	CEVAS Project: Noise of HVAC	Optimisation & Design Methods	Tip Leakage Noise of Axial Fans
12:45-14:15	Lunch		
14:15-15:30	Exhibitors Session		
15:30-16:00	Networking Refreshment Break		
16:00-18:30	<b>Session B1</b>	<b>Session B2</b>	<b>Session B3</b>
	Signal Processing for Noise Source Location/Characterisation	Theoretical & Numerical Methods for Axial Fans	Measurement & Test
18:30-19:30	Exhibition Welcome Cocktails		

THURSDAY 16 APRIL			
08:30-09:15	Keynote Address – Alain Godichon Fan Design: Past, Present and Future		
09:15-10:00	Keynote Address – Stéphane Moreau Numerical and Analytical Predictions of Low-Speed Fan Aero-acoustics		
10:00-10:30	Networking Refreshment Break		
10:30-12:30	Session C1	Session C2	Session C3
	Noise of Centrifugal Fans	Numerical Methods	Motors
12:30-14:00	Lunch		
14:00-15:30	Panel Session 1		Panel Session 2
	Sound Quality: A New Requirement for Fan Manufacturers?		Numerical: How to use Commercial Software?
15:30-16:00	Networking Refreshment Break		
16:00-17:15	Session D1	Session D2	Session D3
	Predictions of Axial Fan Noise by Hybrid Methods (i)	Theoretical & Numerical Methods for Centrifugal Fans	Fan Performance (i)
		Session E2	
		Sound Quality	
17:15-18:30			
19:00	Conference Banquet		

FRIDAY 17 APRIL			
08:30-10:00	Session F1	Session F2	Session F3
	Lattice Boltzmann Methods (i)	Tonal Noise Modelling	Fan Design Methods
10:00-10:30	Networking Refreshment Break		
10:30-12:30	Session G1	Session G2	Session G3
	Installation Effect	Predictions of Axial Fan Noise by Hybrid Methods (ii)	Fan Efficiency
12:30-14:00	Lunch		
14:00-15:00	Session H1		Session H2
	Lattice Boltzmann Methods (ii)		Fan Performance (ii)
15:00	Farewell Cocktail		

Please note this programme is subject to change.

## KEYNOTE ADDRESSES



### **ECODESIGN REQUIREMENTS ON FANS: CURRENT SITUATION AND FUTURE DEVELOPMENTS**

**09:45 WEDNESDAY 15 APRIL 2015**

**MARCOS GONZÁLEZ ÁLVAREZ, EUROPEAN COMMISSION, BRUSSELS – BELGIUM**

Marcos González Álvarez is currently working at the Energy Efficiency Unit of the Directorate General for Energy (European Commission). He is in charge of several Ecodesign and Energy Labelling Regulations or proposals covering several product groups including motor-driven systems and heating equipment. Before joining the Commission he worked at the Institute for Energy Saving and Diversification, the Spanish Energy Agency, where he collaborated on the transposition of the Energy Efficiency in Buildings Directive into the Spanish legislation. He has also worked as a consultant specializing in energy efficiency in London and Madrid. He studied industrial engineering at the Universidad de Oviedo and the École Nationale Supérieure d'Arts et Métiers (Paris).



### **FAN DESIGN: PAST, PRESENT AND FUTURE**

**08:30 THURSDAY 16 APRIL 2015**

**ALAIN GODICHON, CONSULTANT, FRANCE**

Alain Godichon is an engineering graduate from the École Nationale Supérieure de la Métallurgie et de l'Industrie des Mines, located in Nancy, France. While studying for his degree he specialised in Fluid Mechanics. In 1972 Alain started work as a Research and Development Engineer at Solyvent-Ventec. He went on to become the Technical Director of Fläkt Solyvent-Ventec, taking an active role in research and development projects worldwide within the Fläkt Woods Group. In a career spanning 42 years Alain has studied all aspects of fan design, with a particular focus on aerodynamics, acoustics, mechanical design and vibration analysis. This broad-based background enabled Alain to troubleshoot in-service issues, further contributing to his experience. He has leveraged this experience, developing software systems that systematically capture his knowledge.

Alain is the inventor of patents relating to fan technology and fan application. During the course of his long career he has taken part in the EUROVENT Working Group, "Fans". He has published technical papers at conferences focused on fan technology. He has also collaborated with the Sapienza University of Rome on the development of computational methods and their application to the design of air movement fans. Alain is currently working as an Independent Consultant.



### **NUMERICAL AND ANALYTICAL PREDICTIONS OF LOW-SPEED FAN AERO-ACOUSTICS**

**09:15 THURSDAY 16 APRIL 2015**

**STÉPHANE MOREAU, UNIVERSITÉ DE SHERBROOKE CANADA**

Stéphane Moreau obtained his engineering degree and MSc from ISAE- Sup'Aéro (France) in 1988. He then achieved his PhD in Mechanical Engineering with a minor in Aeronautics and Astronautics from Stanford University in 1993.

He worked for a start-up company, AC2, on plasma physics in 1994 where he developed the plasma micro-thruster concept used on most satellites today. He then worked for a year at the turbo-engine builder Snecma on nozzle designs (Safran group). In late 1995 he joined the automotive Tier-1 supplier Valeo where he worked for 13 years on engine-cooling fan system design. He joined the Mechanical Engineering faculty of Université de Sherbrooke in 2009 as an Associate Professor. He became a full Professor in 2011. Since 2014, he also has a joint-appointment at Ecole Centrale de Lyon.

His research topics include aero-acoustics, turbomachinery design and CFD (Computational Fluid Dynamics). He has more than 300 scientific publications with more than half in aero-acoustics with significant contributions in analytical noise modelling, experimental noise measurements and large-scale numerical aero-acoustic simulations (requiring high-power computing for instance).

# CONFERENCE PROGRAMME

This programme is subject to change

WEDNESDAY 15 APRIL	
08:00-09:30	Registration
09:30-09:45	Opening Address
09:45-10:15	Keynote Address – Marcos González Álvarez Ecodesign Requirements on Fans: Current Situation and Future Developments
10:15-10:45	Networking Refreshment Break
10:45-12:45	SESSION A1 CEVAS Project
	The Noise Prediction of Automotive Axial Fan with Different Blade Sweep Angle using Unsteady CFD Analysis Wooyoul Jung, Halla Visteon Climate Control Corporation, (South Korea)
	Inverse Method to Predict Fan Noise Maxime Legros, Cetim (France)
	Acoustic Synthesis of an Automotive HVAC Maxime Legros, Cetim (France)
	Aero-Acoustic Measurement of Automotive HVAC In-Duct Elements Saâd Bennouna, Valeo Thermal Systems, Université de Technologie de Compiègne (France)
	SESSION A2 Optimisation & Design Methods
	Optimisation of Low-Pressure Axial Fans and Effect of Subsequent Geometrical Modifications Konrad Bamberger, University of Siegen (Germany)
	Advanced Integrated Design Optimisation System Using 3D Aerodynamic and Aero-Acoustic Analyses for Design of an Axial Fan Man-Woong Heo, Inha University (South Korea)
	Automated Design, Simulation and Optimisation of Axial Fans Gero Kreuzfeld, CFTurbo Software & Engineering GmbH (Germany)
	CFD-based Fan Optimisation Considering the System Integration in a Heat Pump Frieder Lörcher, Ziehl-Abegg SE (Germany)
	SESSION A3 Tip Leakage Noise of Axial Fans
	Experimental and Numerical Investigation of Tip Clearance Noise of an Axial Fan Using a Lattice Boltzmann Method Tao Zhu, University of Siegen, Institute of Fluid and Thermodynamic (Germany)
	Noise Reduction for Automotive Radiator Cooling Fans Sabry Allam, Helwan University (Egypt)
	The Application of Microperforated Material to Control Axial Fan Tip Clearance Noise Seungkyu Lee, Ray W. Herrick Laboratories, School of Mechanical Engineering, Purdue University (USA)
12:45-14:15	Lunch
14:15-15:30	Exhibitors Session
15:30-16:00	Networking Refreshment Break
16:00-18:30	SESSION B1 Signal Processing for Noise Source Location/Characterisation
	Broadband Mode Decomposition of Ducted Fan Noise Using Cross-Spectral Matrix Denoising Arthur Finez, MicrodB (France)
	Re-evaluating Noise Sources Appearing on the Axis for Beamforming Maps of Rotating Sources Csaba Horváth, Department of Fluid Mechanics, Faculty of Mechanical Engineering, Budapest University of Technology and Economics (Hungary)
	Full Characterisation of Fans as Aero-Acoustic Sources Using Multi-Port Models Stefan Sack, KTH Royal Institute of Technology (Sweden)
	Microphone Array Method for the Characterisation of Rotating Sound Sources in Axial Fans Gert Herold, Brandenburg University of Technology (Germany)



	<b>Noise Control for Two Axial-Flow Cooling Fans in Series</b> Weihao Zhang, Laboratory for Aerodynamics and Acoustics, Zhejiang Institute of Research and Innovation, and Department of Mechanical Engineering, The University of Hong Kong (China)
	<b>SESSION B2</b> <b>Theoretical &amp; Numerical Methods for Axial Fans</b>
	<b>Experimental and Numerical Investigation of a Gearless One-Motor Contra-Rotating Fan</b> Martin Heinrich, Technical University Bergakademie Freiberg (Germany)
	<b>Numerical and Experimental Investigation into the Accuracy of the Fan Scaling Laws Applied to Large Diameter Axial Flow Fans</b> Ockert Augustyn, Eskom (South Africa)
	<b>Computation of the Unsteady Fan-System Coupling Using Actuator Surface Approach</b> Alessandro Corsini, Department of Mechanical and Aerospace Engineering, Sapienza University of Rome (Italy)
	<b>Increase the Efficiency of Rotor-Only Axial Fans with Controlled Vortex Design Blading</b> Massimo Masi, University of Padova, Department of Management and Engineering (Italy)
	<b>Effect of Fan Arrangement and Air Flow Direction on Thermal Performance of Radiators in a Power Transformer using CFD Analysis</b> Sachin Paramane, Global R&D Centre, Crompton Greaves Ltd (India)
	<b>SESSION B3</b> <b>Measurement &amp; Test</b>
	<b>Lab-to-lab Variation in Testing Fans</b> Mark Stevens, AMCA International (USA)
	<b>Phase-Locked PIV Measurements in Wake of an Automotive Fan Model</b> Kaushik Sampath, Johns Hopkins University (USA)
	<b>Implementation of an Acoustic Stall Detection System Using Near-Field DIY Pressure Sensors</b> Alessandro Corsini, Sapienza University of Rome (Italy)
	<b>A Numerical and Experimental Test-Bed for Low-Speed Fans</b> Stéphane Moreau, Université de Sherbrooke (Canada)
	<b>18:30-19:30</b> <b>Exhibition Welcome Cocktails</b>

<b>THURSDAY 16 APRIL</b>	
<b>08:30-09:15</b>	<b>Keynote Address – Alain Godichon</b> <b>Fan Design: Past, Present and Future</b>
<b>09:15-10:00</b>	<b>Keynote Address – Stéphane Moreau</b> <b>Numerical and Analytical Predictions of Low-Speed Fan Aero-Acoustics</b>
<b>10:00-10:30</b>	<b>Networking Refreshment Break</b>
<b>10:30-12:30</b>	<b>SESSION C1</b> <b>Noise of Centrifugal Fans</b>
	<b>Prediction of Aerodynamic Noise for Centrifugal Fan of Air-Conditioner</b> Taku Iwase, Hitachi Ltd, Hitachi Research Laboratory (Japan)
	<b>Noise Generation Mechanism and Noise Reduction Design on Bi-Directional Radial Fan</b> Taihei Koyama, Toshiba (Japan)
	<b>Study of Aerodynamic Noise Generated from a Forward Curved Fan due to Rotating Stall Cell</b> Soichi Sasaki, Nagasaki University (Japan)
	<b>Reduction of Turbulent Noise from Backward Curved Centrifugal Fan with Square Casing</b> Hidechito Hayashi, Nagasaki University (Japan)
	<b>SESSION C2</b> <b>Numerical Methods</b>
	<b>Efficient Low Mach Number Axial Fan Flow Simulation using LES</b> Sergei Chumakov, Robert Bosch LLC, Research and Technology Centre (USA)
	<b>Aero-Acoustic Assessment of Leading Edge Bumps in Industrial Fans by Means of Hybrid LES/RANS</b> Alessandro Corsini, Department of Mechanical and Aerospace Engineering, Sapienza University of Rome (Italy)

	<b>A Deeper Insight into the Simulated Flow Characteristic of a Radial Blade Passage by Means of POD</b> Philipp Mattern, KIT/FSM (Germany)
	<b>Vortex Shedding Noise Reduction of a Mixed Flow Fan: Experimental and Numerical Investigation</b> Michael Collison, Dyson (United Kingdom)
	<b>SESSION C3 Motors</b>
	<b>Aerodynamic Characteristics of a Cooling Fan in a Low-Voltage Electric Motor</b> Man-Woong Heo, Inha University (South Korea)
	<b>The Study on Vibration and Noise Characteristics of Small Fan Motors</b> Masaki Ogushi, Minebea Co. Ltd. (Japan)
	<b>Process Chain for Quick, Efficient Thermal Assessment with Motor Designs of a Fan</b> Christian Pfaff, ebm-papst Mulfingen GmbH & Co. KG (Germany)
	<b>Identifying Torsional Resonance Problems Associated with VFD Driven Fans</b> Steven Kaufman, Flowcare Engineering Inc (Canada)
12:30-14:00	Lunch
14:00-15:30	<b>PANEL SESSION 1 Sound Quality: A New Requirement for Fan Manufacturers?</b>
	<b>PANEL SESSION 2 How to Use Commercial Software for Computational Fluid and Solid Mechanics</b>
15:30-16:00	Networking Refreshment Break
16:00-17:15	<b>SESSION D1 Predictions of Axial Fan Noise by Hybrid Methods (i)</b>
	<b>A Low-Pressure Axial Fan for Benchmarking Prediction Methods for Aerodynamic Performance and Sound</b> Thomas Carolus, University of Siegen (Germany)
	<b>Competing Broadband Noise Mechanisms of a Generic Low-Speed Axial Fan Including Acoustic Scattering</b> Korcan Kucukcoskun, von Karman Institute for Fluid Dynamics (Belgium)
	<b>Noise Prediction from a Low Mach Number Axial Fan with LES and BEM</b> Sergei Chumakov, Robert Bosch LLC, Research and Technology Centre (USA)
	<b>Numerical Investigation of the Influence of Skewness and Gap Geometry on Sound Radiation of Axial Vehicle Cooling Fans</b> Marcus Becher, Friedrich-Alexander University of Erlangen-Nuremberg (Germany)
	<b>An Industrial Methodology for Broadband Aero-Acoustics CFD Prediction of Axial Fans</b> Miguel Angel Rigo, NIDEC Motors and Actuators (Spain)
	<b>SESSION D2 Theoretical &amp; Numerical Methods for Centrifugal Fans</b>
	<b>Hump-Shaped Broadband Noise on a Fan at Off-Design Conditions</b> Manuel Henner, Valeo Thermal Systems (France)
	<b>Automotive Blower Design with Inverse Method Applied on Wheel and Volute</b> Manuel Henner, Valeo Thermal Systems (France)
	<b>CFD Optimisation of a Fan for Industrial Application</b> Carlo Buratto, University of Ferrara (Italy)
	<b>SESSION D3 Fan Performance (i)</b>
	<b>Use of High-Pressure Stages in the Design of New Axial Fans for High-Performance Blocks in Coal Electricity Power Plants</b> Vaclav Cyrus, AHT Energetika Ltd (Czech Republic)
	<b>Study on Air Conditioning Thermal Comfort with New Type Fan</b> Jianhuang Zou, Refrigeration Institute of Gree Electric Appliances, Inc. of Zhuhai (China)
	<b>Investigation of the Aerodynamic and Aero-Acoustic Performance of Cross Flow Fans</b> Özgür Bayrakdar, Vestel Beyaz Esya A.S. Air Conditioner R&D (Turkey)
	<b>Study of the Effect of Fan Tip Configuration on Air-Cooled Condenser Axial Flow Fan Performance</b> Michael Wilkinson, Stellenbosch University (South Africa)
	<b>Effect of Reduced Suction Side Volume on Cross-Flow Fan Performance</b> Matteo Spinola, University of Padova, Department of Industrial Engineering (Italy)



17:15-18:30	<b>SESSION E2</b> <b>Sound Quality</b>
	<b>Psychoacoustic Evaluation of Fan Noise</b> Marc Schneider, ebm-papst Mulfingen GmbH & Co. KG (Italy)
	<b>Sound Synthesis of Fan Noise and Modelling of its Perception in Car Passenger Compartment</b> Antoine Minard, Genesis (France)
19:00	<b>Conference Banquet</b>

## FRIDAY 17 APRIL

08:30-10.00	<b>SESSION F1</b> <b>Lattice Boltzmann Methods (i)</b>
	<b>Numerical Analysis of Unsteady Three-Dimensional Flow in a Propeller Fan Using Lattice Boltzmann Method</b> Kazuya Kusano, Hitachi, Ltd. (Japan)
	<b>Aero-Acoustic Simulation of an Axial Fan Including the Full Test Rig by Using the Lattice Boltzmann Method</b> Michael Sturm, University of Siegen (Germany)
	<b>Towards a Full Digital Approach for Aero-Acoustics Evaluation of Automotive Engine Cooling Fans and HVAC Blowers</b> Vincent Le Goff, Exa Corporation (France)
	<b>SESSION F2</b> <b>Tonal Noise Modelling</b>
	<b>A Uniform Rotor-Stator Wake-Interaction Noise Model Based on a Mode-Matching Technique</b> Simon Bouley, Ecole Centrale de Lyon (France)
	<b>Spectral Characterisations of Centrifugal Fan Noise via uRANS-based Noise Prediction Method</b> Ali Zamiri, Korea University (South Korea)
	<b>Tonal Fan Noise Prediction and Validation on the ANCF Configuration</b> Marlène Sanjose, Université de Sherbrooke (Canada)
	<b>SESSION F3</b> <b>Fan Design Methods</b>
	<b>Prediction of Noise Emission, Power Consumption and Airflow Performance using Multidimensional Fan Curves</b> David Nelson, Nelson Acoustics (USA)
10:00-10:30	<b>A General Inverse Design Method for Hydraulic Characteristics of Axial Fans Respecting Curved Streamlines</b> Matthias Semel, Institute of Fluid Dynamics, Friedrich-Alexander University of Erlangen-Nuremberg (Germany)
	<b>As Good As It Can Be – Ventilation System Design by a Combined Scaling and Discrete Optimisation Method</b> Christian Schaenzle, Technische Universität Darmstadt, Chair of Fluid Systems (Germany)
10:30-12:30	<b>SESSION G1</b> <b>Installation Effect</b>
	<b>Noise Prediction of Outdoor Unit of Air Conditioning with Different Sizes Based on CFD</b> Yadong Wu, Shanghai Jiao Tong University (China)
	<b>Experimental Investigation of the Effect of Grille Structure to the Outdoor Unit of Room Air Conditioner</b> Yadong Wu, Shanghai Jiao Tong University (China)
	<b>Challenges and Opportunities for Flow Noise Prediction in HVAC Systems</b> Oscar Kårekull, Fläkt Woods/KTH, Marcus Wallenberg Laboratory (Sweden)
	<b>Influence of Inflow Turbulence on Aero-Acoustic Noise of Low-Speed Axial Fans with Skewed and Unskewed Blades</b> Florian Zenger, Friedrich-Alexander University of Erlangen-Nuremberg (Germany)
	<b>SESSION G2</b> <b>Predictions of Axial Fan Noise by Hybrid Methods (ii)</b>
	<b>Numerical and Experimental Analyses on Aerodynamic Characteristic and Aero-Acoustic Noise of Propeller for UAV</b> Myungsung Lee, Korea Electronics Technology Institute (South Korea)

	<b>Prediction of the Broadband Noise of a Low-Speed Axial Fan by CFD Simulations and an Empirical Wall-Pressure Spectral Model</b> Alain Guedel, CETIAT
	<b>Broadband Trailing-Edge Noise Prediction of a Four-Bladed Axial Fan Using a Semi-Analytical Method</b> Gabriele Grasso, von Karman Institute for Fluid Dynamics
	<b>Fan Noise Prediction from Local Experimental Source Terms and Numerical Sound Propagation</b> Maxime Legros, Cetim (France)
	<b>SESSION G3</b> <b>Fan Efficiency</b>
	<b>Energy Efficiency and Performance Analysis of Industrial (Textile Sector) Fans Based on the Associated Systems</b> Aftab Khan, National Productivity Organisation (NPO), Ministry of Industries & Production (Pakistan)
	<b>Achievable Total-to-Static Efficiencies of Low-Pressure Axial Fans</b> Konrad Bamberger, University of Siegen (Germany)
	<b>Ecodesign of a Small Size Industrial Fan for Ceramic Tile Cooling</b> Nicola Aldi, University of Ferrara (Italy)
	<b>Fan Retrofits to Achieve Improved Energy Efficiency: What is Required to Make This Work Effectively?</b> Vern Martin, Flowcare Engineering Inc. (Canada)
12:30-14:00	Lunch
14:00-15:00	<b>SESSION H1</b> <b>Lattice Boltzmann Methods (ii)</b>
	<b>Computational Analysis of Noise Generation and Propagation Mechanisms Using the Example of an HVAC Blower</b> Barbara Neuhierl, Exa GMBH (Germany)
	<b>Numerical Optimisation of the Tonal Noise of a Backward Centrifugal Fan Using a Flow Obstruction – Part II: Flow Obstruction Optimisation</b> Romain Pain, EuroXA (France)
	<b>SESSION H2</b> <b>Fan Performance (ii)</b>
	<b>Impact of a Skewed Inlet Boundary Layer on the Aerodynamic Performance of a Stator-Hub Equivalent High-Turning Compressor Cascade</b> Christoph Bode, Technische Universität Braunschweig Institut für Flugantriebe und Strömungsmaschinen (Germany)
	<b>Influence of Compressibility on Incidence Losses of Subsonic Turbomachinery</b> Sebastian Saul, Technical University Darmstadt, Chair of Fluid Systems (Germany)
15:00	Farewell Cocktail





# GENERAL INFORMATION

## CONFERENCE LOCATION

Lyon is in east-central France in the Rhône-Alpes region, situated between Paris and Marseille. Together with its suburbs and satellite towns, Lyon forms the largest conurbation in France outside Paris. The city is known for its historical and architectural landmarks and is a UNESCO World Heritage Site. Lyon was historically known as an important area for the production and weaving of silk and in modern times has developed a reputation as the capital of gastronomy in France.

## CONFERENCE VENUE

The Fan 2015 conference and exhibition will take place at L'Espace Tête d'Or, situated in Lyon. This conference centre is convenient for Lyon-Saint Exupéry airport, and for international travellers, Charles de Gaulle airport (Paris) is connected to central Lyon via the TGV high-speed rail link. This venue is modern, well equipped and conveniently located for those travelling to the event both within France and internationally.

### **L'Espace Tête d'Or**

103 Boulevard de Stalingrad  
69100 Villeurbanne  
France  
+33 (0)4 78 94 69 00

The conference dinner will be held at

### **Château de Janzé**

315 Chemin de Janzé  
69380 Marcilly-d'Azergues



# BOOKING FORM

EVENT CODE: C1406PDF

**EARLY BIRD ENDS 6 MARCH 2015**

**FAN 2015**

15-17 April 2015  
L'Espace Tête d'Or,  
Lyon, France

## REGISTRATION Please complete in capitals.

Family Name	Title (Mr, Mrs, Miss)
First Name	Job Title
Membership No	Institution
Name of Organisation (for name badge)	
Address for correspondence	
Town/City	
Postcode	
Contact Telephone	
Email	
Do you have any special requirements?	

How did you hear about this event? ☐ Direct mail ☐ Website ☐ Colleague ☐ Other

We would like to keep you informed of relevant services that may be of benefit to you.  
Please tick the boxes below to let us know what you're interested in:

- ☐ Events and training opportunities  
☐ News and updates from the Institution  
☐ Services and offers from our preferred partners

## FEES AND CHARGES Please complete the appropriate box.

Registration fees include entry to the sessions, refreshments, lunch and a copy of the event proceedings.

	<b>EARLY BIRD RATE</b> Until 6 March 2015	<b>STANDARD RATE</b>	<b>TOTAL</b>
Member, Institution of Mechanical Engineers	£572.00+TVA	£747.50+TVA	£
Member, supporting organisation	£572.00+TVA	£747.50+TVA	£
Non-member	£682.00+TVA	£825.00+TVA	£
Presenting authors	£429.00+TVA	£429.00+TVA	£
Scientific Advisory Committee	£429.00+TVA	£429.00+TVA	£
Guest fee	£82.50+TVA	£82.50+TVA	£

- ☐ Will you be attending dinner at the Château de Janzé on Thursday 16 April?

## PAYMENT DETAILS

**Payment must accompany this registration form. Registration will be confirmed only on receipt of full payment.**

### PLEASE INDICATE METHOD OF PAYMENT:

- ☐ **Cheque** Cheques should be made payable to IMechE and crossed. Please note international delegates may pay only by credit card, BACS or banker's draft. A copy of the draft must accompany this form. It is the delegate's responsibility to pay any bank charges.
- ☐ **Credit Card**  
Card type: ☐ Visa ☐ MasterCard (please note we cannot accept American Express, Diners Club or Maestro)  
Card No Valid From / Expiry Date /  
Name of Cardholder  
Billing Address of Cardholder (if different from above)  
Postcode  
Amount to be Deducted Signature
- ☐ **BACS** BACS bank transfers can be made to:  
**IMechE Current Account, NatWest Charing Cross Branch.**  
Sort Code: **60-40-05** Acc No: **00817767**  
Swift Code: **NWBKGB2L** IBAN Code: **GB96NWBK60400500817767**  
A copy of the draft must accompany this form.
- ☐ **Invoice (UK residents only)** Delegates wishing to be invoiced must provide an order number.  
If your company does not use order numbers please include a formal request for invoicing on your company's letterhead. A charge of £10 + TVA will be made to cover additional administration costs. Invoices are payable on receipt and no alterations to these terms will be accepted.
- Order No  
Contact Name  
Name and Address for Invoicing  
Postcode  
Tel Fax

## FIVE WAYS TO BOOK

- 1 Online:  
**www.imeche.org/events/C1406**
- 2 Email:  
**eventenquiries@imeche.org**
- 3 Phone:  
**+44 (0)20 7973 1258**
- 4 Post completed booking form to:  
**Event Registrations  
Institution of Mechanical Engineers  
1 Birdcage Walk  
London SW1H 9JJ**
- 5 Fax:  
**+44 (0)20 7304 6845**

Please read the information listed below as each booking is subject to the Institution's standard terms and conditions.

### CONDITIONS OF BOOKING

Completed application forms should be returned to the address above, along with the correct payment. Attendance at the event will be confirmed on receipt of the full balance. All participants are advised to bring a copy of their confirmation with them on the day, to ensure the fastest possible entry.

### SPECIAL REQUIREMENTS

Please inform us of any special requirements, ie dietary or access, on the relevant section of this form.

### CANCELLATION

For a refund (minus £25 + TVA admin charge), cancellations must be received at least 14 days prior to the event. Replacement delegates are welcome at any time. The Institution reserves the right to cancel any event. In this case, the full fee will be refunded unless a mutually convenient transfer can be arranged. In the event that the Institution postpones an event for any reason and the delegate is unable or unwilling to attend on the rescheduled date, they will receive a full refund of the fee paid.

The Institution is not responsible for any loss or damage as a result of a substitution, alteration or cancellation/postponement of an event. The Institution shall assume no liability whatsoever if this event is cancelled, rescheduled or postponed due to a fortuitous event, Act of God, unforeseen occurrence or any other event that renders performance of this conference impracticable, illegal or impossible. For the purposes of this clause, a fortuitous event shall include, but not be limited to: war, fire, labour strike, extreme weather or other emergency.

Please note that while speakers and topics were confirmed at the time of publishing, circumstances beyond the control of the organisers may necessitate substitutions, alterations or cancellations of the speakers and/or topics. The Institution reserves the right to alter or modify the advertised speakers and/or topics if necessary without any liability to you whatsoever. Any substitutions or alterations will be updated on the event's webpage as soon as possible.

### LIABILITY

The organisers do not accept liability for any injuries or losses of any nature incurred by delegates and/or accompanying persons, nor for loss or damage to their luggage and/or personal belongings.

### ENQUIRIES

For event enquiries please call  
**+44 (0)20 7973 1258** or email  
**eventenquiries@imeche.org**

The Institution of Mechanical Engineers is a registered charity (no 206882)  
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