



International Conference on Fan Noise,  
Technology and Numerical Methods

Programme and Registration Brochure

18-20 April 2012  
Senlis, France

[www.fan2012.org](http://www.fan2012.org)

images copyright of Office Tourisme Senlis



PLATINUM SPONSOR



GOLD SPONSOR



SILVER SPONSOR





Fan 2012 offers you a unique opportunity to network with those working in the global fan industry. This three-day conference includes keynote lectures and technical presentations organised as three parallel sessions, focusing on fan technology, fan noise and theoretical methods. Panel sessions will also give you the chance to learn more about the forthcoming Energy using Product (EuP) Directive and how computational methods are impacting the fan design process.

The design of fans has evolved to meet the ever-increasing demands for higher-efficiency machines, combined with the requirements for lower noise and high availability. In addition, many fans are now being used in safety-related duties, such as for smoke control in buildings in the event of a fire. Variable speed is now much more common, leading to some additional design problems, and many existing users are revisiting their plant to look at ways to upgrade the fans. The use of CFD is also becoming much more common.



Conference Chair

**THIS EVENT WILL ATTRACT:**

Fan and system design engineers, manufacturers and operators from across the fan industry the event will be of particular interest to Chief engineers, development Engineers, aerodynamic and mechanical design specialists.

**BENEFITS OF ATTENDANCE:**

- Engage in engineering-based discussions with designers
- Learn about developing computational methods as part of a broader drive to increase fan efficiency
- Enhance your knowledge base
- Operate at the cutting edge; push the boundaries
- 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

**SPONSORSHIP AND EXHIBITION OPPORTUNITIES**

Get into the minds of key decision-makers. Become a Fan 2012 sponsor or exhibitor and capture your chosen audience when they are in the frame of mind to do business.

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 talk through how to get the best from our event, contact Aman Duggal on +44(0)20 7973 1309, [a\\_duggal@imeche.org](mailto:a_duggal@imeche.org) or [sponsorship@fan2012conference.org](mailto:sponsorship@fan2012conference.org)

**SUPPORTING ORGANISATIONS**





### Organising Committee

Geoff Sheard (Fläkt Woods, UK) – Conference Chairman  
Alessandro Corsini (Sapienza University of Rome, Italy) –  
Theoretical Methods & CFD Track Chairman  
Alain Guédel (CETIAT, France) – Fan Noise Track Chairman  
Ron Mulholland (Howden, UK) – Fan Technology Track Chairman  
François Bessac (CETIAT, France)  
Amelia Brunt (IMEchE, UK)  
Xavier Carniel (Cetim, France)

### Scientific Advisory Committee

Mats Åbom (KTH – The Marcus Wallenberg Laboratory, Sweden)  
Didier Amor (Fläkt Woods, France)  
Roberto Arias (Zitron, Spain)  
Guido Banzi (Maico Italia, Italy)  
Mike Barry (Twin City, USA)  
Stefano Bianchi (Sapienza University of Rome, Italy)  
Domenico Borello (Sapienza University of Rome, Italy)  
Tony Breen (Nuair, UK)  
Dario Brivio (Nicotra, Italy)  
Klaus Brun (IGTI Board of Directors, USA)  
Guy Caignaert (ENSAM, France)  
Thomas Carolus (University of Siegen, Germany)  
Jan Cermak (ACME Fan, USA)  
Bill Cory (Consultant, UK)  
Alice Debonnet-Lambert (CIDB, France)  
Marius Gamissans (Soler & Palau, Germany)  
Alain Godichon (Fläkt Woods, France)  
Yvon Goth (Cetim, France)  
Mohamed Hamdi (University of Compiègne, France)  
Lixi Huang (Hong Kong University, China)  
Johannes Hyrynen (VTT, Finland)  
Iain Kinghorn (Fläkt Woods, UK)  
Chris Lawn (Journal of Power & Energy, UK)  
Geoff Lockwood (ebm-papst, UK)  
Alan Macklin (ELTA Group, UK)  
Costantino Mogentale (Ferrari Ventilatori Industriali, Italy)  
Young Moon (Korea University, Korea)  
Stéphane Moreau (University of Sherbrooke, Canada)  
Said Naji (Valéo, France)  
Ralf Neumeier (Ziehl-Abegg, Germany)  
Franco Rispoli (Sapienza University of Rome, Italy)  
Michel Roger (Ecole Centrale de Lyon, France)  
Omar Sadi (Ziehl-Abegg, Germany)  
Mats Sandor (System Air, Sweden)  
Jürgen Schöne (ebm-papst, Germany)  
Colin Scrivener (ETC Organising Committee, UK)  
Mark Stevens (AMCA International, USA)  
Jean Turret (INCE Europe, France)  
János Vad (Budapest University, Hungary)  
Paul Wenden (Fläkt Woods, UK)  
Henrik Witt (Witt & Sohn, Germany)

## EXHIBITION AND SPONSORSHIP

There will be an exhibition supporting this event, which delegates will be free to attend throughout the duration of the conference, as well as a Welcome Reception on Wednesday 18 April. Exhibitors include:

Advanced Design Technologies	Exa Corporation
CETIAT	Free Field Technologies
Cetim	Howden
CFturbo Software	IMEchE
and Engineering	LMS Int

A limited number of exhibition stands are still available; to reserve your space or enquire about the sponsorship opportunities please contact Aman Duggal on +44(0)20 7973 1309, [a\\_duggal@imeche.org](mailto:a_duggal@imeche.org) or [sponsorship@fan2012conference.org](mailto:sponsorship@fan2012conference.org). Visit [www.fan2012.org](http://www.fan2012.org) for an updated list of sponsors and exhibitors.

## SPONSORS

### Platinum Sponsor



### Gold Sponsor



### Silver Sponsor



### CD and Abstract Book Sponsor



### Delegate Bag Sponsor



## SOCIAL PROGRAMME

Two social events are organised, on days one and two of the conference. Attendance to these events (listed below) 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/Accompanying People' attendance fee.

## EXHIBITION DRINKS RECEPTION

A drinks reception will take place in the Exhibition Hall immediately following the last technical sessions on Wednesday 18 April (19:15 until 20:30). The exhibition stands will be open for delegates to visit.

## CONFERENCE BANQUET

On the evening of Thursday 19 April there will be a conference banquet. This event will take place at La Grange de Montmartre, a tithe barn dating back to the XIII century, originally belonging to Montmartre Abbey. Having undergone sympathetic renovation this building is a superb venue in a wonderful setting. The dinner will commence at 19:00 with pre-dinner drinks.



# CONFERENCE PROGRAMME OVERVIEW



## Wednesday 18 April

08:30 – 09:30	Registration		
09:30 – 10:00	Opening Address		
10:00 – 10:45	Keynote Address – Thomas Carolus Noise Proves Nothing – Sources of Fan Noise and their Prediction		
10:45 – 11:15	Coffee and Exhibition		
11:15 – 12:45	Session A1 Tonal Noise Control with Flow Obstructions	Session A2 Fan Mechanical Design	Session A3 Numerical Optimisation of Centrifugal Fan Performances
12:45 – 14:15	Lunch		
14:15 – 16:15	Session B1 Computational Aeroacoustics	Session B2 HVAC and Condenser Fans	Session B3 Unsteady Aerodynamics and Flow Simulations
16:15 – 16:45	Coffee and Exhibition		
16:45 – 19:15	Session C1a Tonal Noise Reduction  Session C1b Noise Control by Passive Means	Session C2 Performance Measurements	Session C3 CFD Validation Studies
19:15 – 20:30	Exhibition Drinks Reception		

## Thursday 19 April

08:00 – 08:30	Registration		
08:30 – 09:15	Keynote Address – Guido de Wilt EU Policies on Energy Efficiency and the Impact on Fan Manufacturers		
09:15 – 10:00	Keynote Address – Cengiz Camci Inlet Flow Distortion and Lip Separation in Ducted Fans used in VTOL UAV Systems		
10:00 – 10:30	Coffee and Exhibition		
10:30 – 12:30	Session D1 Computational Aeroacoustics	Session D2 Aerodynamic Design	Session D3 Design and Optimisation
12:30 – 14:00	Lunch		
14:00 – 15:30	Sponsor/Exhibitor Presentation Session		
15:30 – 16:00	Coffee and Exhibition		
16:00 – 18:00	Panel Session 1 EU Policies on Energy Efficiency and the Impact on Fan Manufacturers	Panel Session 2 Numerical Methods for the Prediction of Fan Aerodynamic and Acoustic Performances. Where are we today?	
19:00 – 22:30	Conference Banquet		

## Friday 20 April

08:00 – 08:30	Registration		
08:30 – 10:30	Session E1 Noise of Cooling Fans in Automotive Applications	Session E2 Codes, Standards and Legislation	Session E3 Flow Characteristics of Centrifugal Fans
10:30 – 11:00	Coffee and Exhibition		
11:00 – 12:30	Session F1 Noise prediction and Investigation for Axial Fans	Session F2 Vibrations and Failure Analysis	Session F3 Active Noise Control and Noise Analysis
12:30 – 12:45	Closing Address		
12:45	Close of Conference		

Please note this programme is subject to change

# KEYNOTE ADDRESSES

## **NOISE PROVES NOTHING – SOURCES OF FAN NOISE AND THEIR PREDICTION**

**10:00 WEDNESDAY 18 APRIL 2012**

**THOMAS CAROLUS, PROFESSOR  
OF APPLIED FLUID MECHANICS &  
TURBOMACHINERY, UNIVERSITY OF  
SIEGEN, GERMANY**

Thomas is well known for his experience with fan and blower aerodynamics and aeroacoustics and turbomachinery systems. His book on these topics is widely used in academia and industry. He is a Visiting Professor in England, USA, France, Laos and Albania and serves as a reviewer for numerous journals and conferences.

Prior to his position at the University, Thomas was Senior Engineer at Bosch GmbH in charge of heating, ventilation and air conditioning components for automotive application. He graduated from Karlsruhe Institute of Technology and the Georgia Institute of Technology, receiving his PhD from the former.

## **EU POLICES ON ENERGY EFFICIENCY AND THE IMPACT ON FAN MANUFACTURERS**

**08:30 THURSDAY 19 APRIL 2012**

**GUIDO DE WILT, POLICY OFFICER –  
ENERGY EFFICIENCY, EUROPEAN  
COMMISSION, BELGIUM**

Guido is a policy officer in the team responsible for the efficiency of energy-related products. He is working on legislation for ecodesign minimum requirements and energy labelling for industrial products such as fans and pumps, as well as for heating products. He is also responsible for the work on standardisation of the unit.

He joined the European Commission in 2003 to work in the field of energy efficiency, starting as a policy officer responsible for developing and implementing legislation and state aid guidelines for high-efficiency cogeneration. He has also worked on existing energy efficiency legislation on lighting and boilers and contributed to new legislation on energy services and energy efficiency in buildings. Later his responsibilities shifted towards energy efficiency in international relations and standardisation.

Guido graduated from Eindhoven University of Technology and went on to work as a lecturer there in the field of ceramics and thermodynamics. He also lectured in physics and environmental science at Brabant Polytechnic.



## **INLET FLOW DISTORTION AND LIP SEPARATION IN DUCTED FANS USED IN VERTICAL TAKE-OFF AND LANDING UNMANNED AERIAL VEHICLE (VTOL UAV) SYSTEMS**

**09:15 THURSDAY 19 APRIL 2012**

**CENGIZ CAMCI, PROFESSOR  
OF AEROSPACE ENGINEERING,  
PENNSYLVANIA STATE UNIVERSITY, USA**

Cengiz has worked at Pennsylvania State University since 1986 and currently directs his research activities in his 'Turbomachinery Aero-heat Transfer Laboratory'. Following his doctoral degree (awarded by the von Karman Institute for Fluid Dynamics) in 1985, Cengiz has been an invited lecturer at the VKI Lecture Series and a mission consultant to NATO/AGARD RTO Research Technology Organisation. His research interests include aerothermodynamics of turbomachinery, analytical and experimental fluid mechanics, heat transfer in air breathing propulsion systems, turbine cooling, ducted fan aerodynamics for VTOL UAV systems and san erosion of helicopter rotor blade tips.

Cengiz has received three best paper awards from the ASME Heat Transfer Division, Fluids Engineering Division and IGTI Education Committee throughout his career and became a fellow of ASME in 2007. He completed many research programmes sponsored by NSF, NASA, DOE, AGTSR, General Electric (GE), Pratt&Whitney (P&W), Solar Turbines, Siemens Energy, Sikorsky Aircraft Company (SAC) and United Technologies Research Center (UTRC). He has also published more than 140 technical papers in his research areas.





Please note that only one author is listed against each presentation/paper. A full list of authors is available from the conference website [www.fan2012.org](http://www.fan2012.org)

---

## WEDNESDAY 18 APRIL 2012

---

### 08:30 REGISTRATION

### 09:30 OPENING ADDRESS

Geoff Sheard, Fläkt Woods, UK and Emmanuel DeLauzon, Cetim, France

### 10:00 KEYNOTE ADDRESS – NOISE PROVES NOTHING – SOURCES OF FAN NOISE AND THEIR PREDICTION

Thomas Carolus, Professor of Applied Fluid Mechanics & Turbomachinery, University of Siegen, Germany

### 10:45 COFFEE AND EXHIBITION

### 11:15 SESSION A1 – TONAL NOISE CONTROL WITH FLOW OBSTRUCTIONS

Chair: Lixi Huang, Hong Kong University, China

#### FAN TONAL NOISE REDUCTION USING CALIBRATED OBSTRUCTIONS IN THE FLOW – AN EXPERIMENTAL APPROACH

Yvon Goth, Cetim, France

#### NUMERICAL OPTIMISATION OF THE NOISE REDUCTION OF A CENTRIFUGAL FAN USING FLOW OBSTRUCTIONS

Franck Perot, Exa Corporation, USA

#### TONAL NOISE CONTROL FROM CENTRIFUGAL FANS USING FLOW CONTROL OBSTRUCTIONS

Anthony Gerard, University of Sherbrooke, Canada

### 11:15 SESSION A2 – FAN MECHANICAL DESIGN

Chair: Roberto Arias, Zitron, Spain

#### INNOVATIVE FAN DRIVES FOR HYBRID TRUCKS

Thomas Justin, Volvo 3P, France

#### DESIGNING A CENTRIFUGAL FAN OF CARBON- FIBER FIBRE LAMINATE FOR HIGH CIRCUMFERENTIAL SPEED

Heiko Ratter, Karlsruhe Institute of Technology, Germany

#### USE OF GRADE 80 STEEL IN FABRICATED CENTRIFUGAL IMPELLER

Nicholas Brunck, American Fan Company, USA

### 11:15 SESSION A3 – NUMERICAL OPTIMISATION OF CENTRIFUGAL FAN PERFORMANCES

Chair: János Vad, Budapest University, Hungary

#### MAXIMUM ACHIEVABLE EFFICIENCY OF CENTRIFUGAL FANS WITHOUT HOUSING

Yingan Xia, Punker, Germany

#### DESIGN IMPROVEMENTS OF SIROCCO TYPE FANS BY MEANS OF COMPUTATIONAL FLUID DYNAMICS AND STEREO PARTICLE IMAGE VELOCIMETRY

Stefan Frank, University of Applied Sciences HTW Berlin, Germany

#### FLUID DYNAMIC DESIGN AND OPTIMISATION OF A DOUBLE-ENTRY FAN DRIVEN BY TRACTOR POWER TAKE-OFF FOR MIST SPRAYER APPLICATION

Michele Pinelli, University of Ferrara, Italy

### 12:45 LUNCH

### 14:15 SESSION B1 – COMPUTATIONAL AEROACOUSTICS

Chair: Michel Roger, Ecole Centrale de Lyon, France

#### COMPUTATIONAL AEROACOUSTIC ANALYSIS OF AN INDUSTRIAL FAN APPLICATION USING A HYBRID APPROACH

Marie Cabrol, Free Field Technologies, Belgium

#### 3D COMPUTATION OF AXIAL-FLOW FAN NOISE BY LPCE – BRINKMAN PENALISATION METHOD

Hoyeon Kim, Korea University, South Korea

#### NUMERICAL PREDICTIONS OF FLOW RATES AND AEROACOUSTICS FROM SMALL RADIAL NOTEBOOK BLOWERS

Jessica Gullbrand, Intel Corporation, USA

#### OPTIMISATION OF FAN NOISE BY COUPLING 3D INVERSE DESIGN AND AUTOMATIC OPTIMISER

Mehrdad Zangeneh, University College London, UK

### 14:15 SESSION B2 – HVAC AND CONDENSER FANS

Chair: Tony Breen, Nuaire, UK

#### FAN-SYSTEM INTERACTION AND BLOCKAGE EFFECTS FOR HVAC MULTI-FAN UNITS

Sandra Velarde-Suarez, University of Oviedo, Spain

#### SIMULTANEOUS MEASUREMENT OF AIR FLOW AND BLADE LOADING CONDITIONS IN AN AIR-COOLED STEAM CONDENSER FAN

Jacques Muiyser, University of Stellenbosch, South Africa

#### TESTING AN AXIAL FLOW FAN DESIGNED FOR AIR-COOLED STEAM CONDENSER APPLICATION

Sybrand Van Der Spuy, University of Stellenbosch, South Africa

#### SIMPLIFIED THEORY OF A RISK OF THERMAL CATASTROPHE IN AIR-COOLED ELECTRONIC CIRCUITS

Roman Vinokur, Resmed Motor Technologies, USA

**14:15 SESSION B3 – UNSTEADY AERODYNAMICS AND FLOW SIMULATIONS**

Chair: Cengiz Camci, Pennsylvania State University, USA

**ON THE ROLE OF LEADING-EDGE BUMPS IN THE CONTROL OF STALL ON-SET IN AXIAL FAN BLADES**

Alessandro Corsini, Sapienza University of Rome, Italy

**3D UNSTEADY CFD SIMULATION OF THE UNSTEADY FLOW IN A CENTRIFUGAL FAN**

Yang Yang, Clausthal University of Technology, Germany

**INVESTIGATION OF UNSTEADY FLOWS IN A CENTRIFUGAL FAN USING HIGH-SPEED PIV AND NUMERICAL SIMULATIONS**

Andreas Lucius, Clausthal University of Technology, Germany

**THE IMPACT OF PRESSURE PULSES ON THE UNSTEADY AERODYNAMICS OF A TUNNEL VENTILATION FAN**

Domenico Borello, Sapienza University of Rome, Italy

---

**16:15 COFFEE AND EXHIBITION**

---

**16:45 SESSION C1A – TONAL NOISE REDUCTION**

Chair: Johannes Hyrynen, VTT, Finland

**TONAL NOISE OF AN ISOLATED AXIAL FAN ROTOR DUE TO INHOMOGENEOUS COHERENT FLOW STRUCTURES AT THE INTAKE**

Michael Sturm, University of Siegen, Germany

**IMPROVING BLADE PASSING FREQUENCY TONE FOR MIXED-FLOW IMPELLERS**

Ludovic Desvard, Dyson, UK

---

**SESSION C1B – NOISE CONTROL BY PASSIVE MEANS**

Chair: Thomas Carolus, University of Siegen, Germany

**INVESTIGATION INTO THE SOUND POWER LEVEL REDUCTION ACHIEVED USING ACOUSTIC JACKETS ON A CENTRIFUGAL FAN AND AN AXIAL FAN**

Mark Simms, Ventac Group, Ireland

**FAN NOISE CONTROL: CASE OF DATA CENTRES**

Jean-Marie Verlhac, Cetim, France

**SUPPRESSION OF FAN NOISE OF HIGH CIRCUMFERENTIAL MODE USING OPTIMISED DUCT WALL PROPERTIES**

Lixi Huang, University of Hong Kong, China

**16:45 SESSION C2 – PERFORMANCE MEASUREMENTS**

Chair: Mark Stevens, AMCA International, USA

**A PHYSICAL-BASED CORRECTION METHOD FOR REYNOLDS NUMBER, ROUGHNESS AND SIZE AT PART – AND OVERLOAD – PROVED APPLICATION FOR AXIAL AND CENTRIFUGAL FANS**

Peter Pelz, Technical University of Darmstadt, Germany

**STRESSED-STRAIN STATE AND VIBRATION FREQUENCIES OF BLADES OF THE MAIN MINE FAN IMPELLER**

Nester Petrov, The Institute of Mining SB RAS, Russia

**EXPERIMENTS ON THE USE OF SYMMETRISED DOT PATTERNS FOR IN-SERVICE STALL DETECTION IN INDUSTRIAL FANS**

Stefano Bianchi, Sapienza University of Rome, Italy

**INLET INSTALLATION EFFECTS ON DIFFERENT TYPES OF FAN AND DUCTWORK DESIGN**

Alain Guédel, CETIAT, France

---

**16:45 SESSION C3 – CFD VALIDATION STUDIES**

Chair: Domenico Borello, Sapienza University of Rome, Italy

**CFD ELECTRIC MOTOR EXTERNAL FAN SYSTEM COMPARISON AND VALIDATION**

Cassiano Cezario, WEG Equipamentos Eletricos, Brazil

**NUMERICAL INVESTIGATION OF TWO-STAGE ARRANGEMENTS OF COMPACT FANS AND COMPARISON TO EXPERIMENTS**

Gabriel Axtmann, University of Stuttgart, Germany

**CFD TECHNIQUES APPLIED TO AXIAL FANS DESIGN OF ELECTRIC MOTORS**

Samuel Santos Borges, WEG Equipamentos Eletricos, Brazil

**NUMERICAL AND EXPERIMENTAL INVESTIGATIONS OF FAN AND BYPASS FAN**

Sergey Pankov, Central Institute of Aviation Motors (CIAM), Russia

**A NUMERICAL STUDY ON THE AERODYNAMIC NOISE OF CROSS-FLOW FAN BY USING UNSTEADY REYNOLDS-AVERAGED NAVIER-STOKES (URANS) AND ACOUSTIC ANALOGY**

Myungsung Lee, Sogang University, Korea

---

**19:15 EXHIBITION DRINKS RECEPTION**

---

**20:30 CLOSE OF DAY ONE**

---

# CONFERENCE PROGRAMME



THURSDAY 19 APRIL 2012

---

## 08:00 REGISTRATION

---

### 08:30 KEYNOTE – EU POLICES ON ENERGY EFFICIENCY AND THE IMPACT ON FAN MANUFACTURERS

Guido de Wilt, European Commission, Belgium

---

### 09:15 KEYNOTE – INLET FLOW DISTORTION AND LIP SEPARATION IN DUCTED FANS USED IN VTOL UAV SYSTEMS

Cengiz Camci, Pennsylvania State University, USA

---

## 10:00 COFFEE AND EXHIBITION

---

### 10:30 SESSION D1 – COMPUTATIONAL AEROACOUSTICS

Chair: Stéphane Moreau, University of Sherbrooke, Canada

---

#### INFLUENCE OF BLADE NUMBER ON AERODYNAMIC NOISE OF PROPELLER FANS FOR OUTDOOR UNIT OF AIR-CONDITIONER

Taku Iwase, Hitachi Research Laboratory, Japan

---

#### OPTIMISATION OF AXIAL FANS WITH HIGHLY SWEEPED BLADES WITH RESPECT TO LOSSES AND NOISE REDUCTION

Konrad Bamberger, University of Siegen, Germany

---

#### STATIONARY AND MOVING SURFACE FLOW WILLIAMS AND HAWKINGS COMPUTATIONS OF AN ISOLATED RADIAL IMPELLER

Till Heinemann, University Erlangen-Nuremberg, Germany

---

#### NUMERICAL METHOD FOR 3D COMPUTATION OF TURBOMACHINERY TONE NOISE

Anton Rossikhin, Central Institute of Aviation Motors (CIAM), Russia

---

### 10:30 SESSION D2 – AERODYNAMIC DESIGN

Chair: Stefano Bianchi, Sapienza University of Rome, Italy

---

#### EVALUATION OF SQUIRREL-CAGE FANS FOR HVAC APPLICATIONS IN PUBLIC TRANSPORT: KEY PARAMETERS AND DESIGN GUIDELINES

Sandra Velarde-Suarez, University of Oviedo, Spain

---

#### A DESIGN OF EXPERIMENT FOR EVALUATING INSTALLATION EFFECTS AND THE INFLUENCE OF BLADE LOADING ON THE AEROACOUSTICS OF AN AUTOMOTIVE ENGINE COOLING FAN

Elias Tannoury, Valeo Thermal Systems, France

---

#### DESIGN AND AERODYNAMIC PERFORMANCE OF HIGH-PRESSURE AXIAL FLOW FAN

Vaclav Cyrus, AHT Energetika, Czech Republic

---

#### DESIGN AND EXPERIMENTAL STUDY OF COUNTER-ROTATING AXIAL-FLOW FANS

Hussain Nouri, DynFluid Laboratory, France

---

### 10:30 SESSION D3 – DESIGN AND OPTIMISATION

Chair: Alessandro Corsini, Sapienza University of Roma, Italy

---

#### A PARAMETRIC STUDY OF JET-FAN BLADES AERO-MECHANICAL PERFORMANCE

Kasra Daneshkhan, Fläkt Woods, UK

---

#### CFD SIMULATIONS TO PREDICT THE ENERGY EFFICIENCY OF AN AXIAL FAN FOR VARIOUS CASING CONFIGURATIONS

Alain Guédel, CETIAT, France

---

#### PRELIMINARY STUDY ON A DESIGN METHODOLOGY FOR EFFICIENT ROTOR-ONLY AXIAL-FLOW INDUSTRIAL FANS

Massimo Masi, University of Padova, Italy

---

#### EXPERIMENTAL AND NUMERICAL INVESTIGATION OF BLADES EFFECT IN AERODYNAMIC PERFORMANCE OF SMALL AXIAL FAN

Jin Yingzi, Zhejiang SciTech University, China

---

## 12:30 LUNCH

---

### 14:00 SPONSOR/EXHIBITOR PRESENTATION SESSION

---

## 15:30 COFFEE AND EXHIBITION

---

### 16:00 PANEL SESSION A1 – EU POLICIES ON ENERGY EFFICIENCY AND THE IMPACT ON FAN MANUFACTURERS

Geoff Sheard, Fläkt Wood, UK

Guido de Wilt, European Commission, Belgium

Bill Cory, Consultant, UK

Wade Smith, AMCA International, USA

---

### 16:00 PANEL SESSION A2 – NUMERICAL METHODS FOR THE PREDICTION OF FAN AERODYNAMIC AND ACOUSTIC PERFORMANCES. WHERE ARE WE TODAY?

Alain Guédel, CETIAT, France

Thomas Carolus, University of Siegen, Germany

Cengiz Camci, Pennsylvania State University, USA

Stéphane Moreau, University of Sherbrooke, Canada

Alessandro Corsini, Sapienza University of Rome, Italy

---

## 18:00 CLOSE OF DAY TWO

---

### 19:00 CONFERENCE BANQUET

Le Grange de Montmartre

FRIDAY 20 APRIL 2012

---

**08:00 REGISTRATION**

---

**08:30 SESSION E1 – NOISE OF COOLING FANS IN AUTOMOTIVE APPLICATIONS**

Mats Åbom, KTH, The Marcus Wallenberg Laboratory, Sweden

**ACOUSTIC CHARACTERISATION OF A CENTRIFUGAL FAN IN AN AUTOMOTIVE VENTILATION UNIT SOUND PREDICTING MODEL**

Ali Al Mezzawi, Cetim & UTC, France

**CETIM\_VENTIL: A SOFTWARE TO PREDICT THE NOISE OF A COOLING FAN UNDER A HOOD**

Yvon Goth, Cetim France

**AEROACOUSTICAL INVESTIGATIONS ON AXIAL FANS FOR AUTOMOTIVE COOLING SYSTEMS**

Mohamed Zayani, Karlsruhe Institute of Technology, Germany

**NOISE CONTROL FOR COOLING FANS ON HEAVY VEHICLES**

Sabry Allam, KTH, Competence Centre for Gas Exchange (CCGEx), Sweden

**08:00 SESSION E2 – CODES, STANDARDS AND LEGISLATION**

Bill Cory, Consultant, UK

**FAN SOUND PREDICTION FOR CERTIFIED PERFORMANCE**

Jan Cermak, ACME Engineering & Manufacturing Corporation, USA

**AN INITIAL ASSESSMENT OF THE CHANGES THAT WILL APPEAR IN A FORTHCOMING (2012) REVISION OF EN 12101-3**

Geoff Sheard, Fläkt Woods, UK

**INVESTIGATIONS ON THE SWIRL FLOW CAUSED BY AXIAL FANS – A CONTRIBUTION TO THE REVISION OF ISO 5801**

Đjordje Čantrak, University of Belgrade, Serbia

**08:00 SESSION E3 – FLOW CHARACTERISTICS OF CENTRIFUGAL FANS**

Michele Pinelli, University of Ferrara, Italy

**FLOW CHARACTERISTICS OF BACKWARD CURVED CENTRIFUGAL FAN WITH RECTANGULAR CASING**

Hidechito Hayashi, Nagasaki University, Japan

**CENTRIFUGAL FAN NOISE: COMPARISON OF TWO CAA METHODS WITH EXPERIMENTAL VALIDATION**

Antti Lehtinen, VTT Technical Research Centre of Finland, Finland

**SIROCCO FAN MODELLING: FROM SELECTING A PROPER TURBULENCE MODEL TO THE INFLUENCE OF THE CELL SHAPE**

Manoochehr Darvish, University of Applied Sciences, HTW Berlin, Germany

**EFFECTS OF HOUSING GEOMETRY ON THE PERFORMANCE AND NOISE OF A TWO-OUTLET CENTRIFUGAL FAN – A NUMERICAL STUDY**

Ian Wong, The Hong Kong Polytechnic University, China

**10:30 COFFEE AND EXHIBITION**

---

**11:00 SESSION F1 – NOISE PREDICTION AND INVESTIGATION FOR AXIAL FANS**

Didier Amor, Fläkt Woods, France

**FREE AND SCATTERED ACOUSTIC FIELD PREDICTIONS OF THE BROADBAND NOISE GENERATED BY A LOW-SPEED AXIAL FAN**

Korcan Kucukcoskun, Ecole Centrale Lyon, France

**BROADBAND NOISE MODELLING AND PREDICTION FOR AXIAL FANS**

Michele De Gennaro, Austrian Institute of Technology (AIT), Austria

**VORTEX GENERATION BEHIND THE CYLINDER CASCADE OF FAN GRILL**

Matej Milavec, Hidria Institute Klima, Slovenia

**11:00 SESSION F2 – VIBRATIONS AND FAILURE ANALYSIS**

Omar Sadi, Ziehl-Abegg, Germany

**FIN FAN VIBRATION REMEDIATION**

Richard Baldwin, Southwest Research Institute, USA

**FAILURE ANALYSIS OF IMPELLER BLADE CRACKING IN A MECHANICAL VAPOUR RECOMPRESSOR (MVR) FAN**

Brian Donohue, University of Canterbury, New Zealand

**AERODYNAMIC INDUCED STRUCTURAL VIBRATIONS OF A CENTRIFUGAL FAN CAUSED BY OUTLET DUCT FLOW SEPARATION**

Theodore Holm, Southern Company, USA

**11:00 SESSION F3 – ACTIVE NOISE CONTROL AND NOISE ANALYSIS**

Yvon Goth, Cetim, France

**25 YEARS AGO, ACTIVE CONTROL FIRST APPEARED AS A GREAT SOLUTION FOR FAN NOISE – WHAT HAS HAPPENED?**

Steve Wise, Wise Associates, USA

**IMPLEMENTATION OF ACTIVE NOISE CONTROL INTO DIFFERENT FAN APPLICATIONS**

Marc Schneider, ebm-papst Mulfingen, Germany

**FAN NOISE ANALYSIS USING MICROPHONE ARRAY**

Olivier Minck, Microdb, France

**12:30 CLOSING ADDRESS**

Geoff Sheard, Fläkt Woods, UK

**12:45 CLOSE OF CONFERENCE**

# GENERAL INFORMATION

## EXHIBITION AND SPONSORSHIP

Senlis is a French commune in the province of l'Oise, near Paris. It has a long and rich heritage, having traversed centuries of history. This medieval town has welcomed some of the most renowned figures in French history, including Hugh Capet, Louis

IX, the Marshall of France, Anne of Kiev and Seraphine de Senlis. The monarchs of the early French dynasties lived here, attracted by the proximity of the Chantilly forest. It is renowned for the gothic Senlis Cathedral and its vast historical monuments.



## CONFERENCE VENUE

The Fan 2012 conference and exhibition will take place in the Congress Centre of Cetim, situated at Senlis. Convenient for the Charles de Gaulle airport in Roissy (Paris), the conference centre is modern, well equipped and conveniently located for those travelling to the conference both within France and internationally.

## ACCOMMODATION

A list of local hotels has been produced by the Corporate Team; you can book online at [www.corporateteam.com/events/8488FAN](http://www.corporateteam.com/events/8488FAN) or by contacting them on:

Tel: (UK only) 0845 604 4060  
International: +44 (0)20 7592 3050  
Email: [events@corporateteam.com](mailto:events@corporateteam.com)



## CONFERENCE COACH SERVICE

A coach service will operate between Cetim Congress Centre and Roissy, Saint Witz and Senlis. Pick-ups will be from a central hotel in each area, exact timings to be announced. The service will operate first thing in the morning to arrive at Cetim for the start of the sessions each day and a return journey at the end of each day. There will also be a coach to and from the Exhibition Reception on day one. A return coach service will operate to and from the nominated hotels/Congress Centre and the Conference Banquet on day two. There is a charge of £20 for a coach ticket which will cover all journeys during the conference. You can purchase a ticket when registering online or using the attached booking form.

## GUESTS AND ACCOMPANYING PERSONS

Guest and Accompanying Persons may register to attend for £75. This fee will cover the cost to attend the Exhibition Reception and Conference Banquet including the coach transfers to and from these events. Please note that this fee does not cover admission to the conference exhibition, refreshments, lunch or technical sessions.





# BOOKING FORM

One form per person only (forms may be photocopied)

For added convenience, you can also book online at:  
**www.fan2012.org**

## REGISTRATION (PLEASE COMPLETE IN CAPITALS)

Family Name \_\_\_\_\_ Title (Mr, Mrs, Miss etc) \_\_\_\_\_  
 First Name \_\_\_\_\_ Job Title \_\_\_\_\_  
 Classification of Member/Associate\*\* eg 'Cetim' or 'Speaker's Company' \_\_\_\_\_  
 Name of Organisation /Company (for name badge) \_\_\_\_\_  
 Address for Correspondence \_\_\_\_\_  
 \_\_\_\_\_  
 Town/City \_\_\_\_\_ Postcode \_\_\_\_\_  
 Country \_\_\_\_\_ Contact Telephone \_\_\_\_\_  
 Fax \_\_\_\_\_ Email \_\_\_\_\_  
 Do you have any special requirements? \_\_\_\_\_  
 \_\_\_\_\_  
 How did you hear about this event? Direct Mail  Website  Colleague  Other

## FEES AND CHARGES (PLEASE COMPLETE THE APPROPRIATE BOX)

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

	Fee	VAT	Total	£
Members and Associates <a href="#">Early Registration</a>	£520.00	£0.00	£520.00	_____
Non-Member <a href="#">Early Registration</a>	£620.00	£0.00	£620.00	_____
Presenting Author <a href="#">Must register before 15 March*</a>	£390.00	£0.00	£390.00	_____
Scientific Advisory Committee	£390.00	£0.00	£390.00	_____
Members and Associates**	£650.00	£0.00	£650.00	_____
Non-Member	£750.00	£0.00	£750.00	_____
Guest and Accompanying Persons	£75.00	£0.00	£75.00	_____
<b>Extra Items</b>				
Coach tickets to and from selected hotels to venue and dinner venue	£20.00	£0.00	£20.00	_____
Invoice Charging (if applicable)	£10.00	£2.00	£12.00	_____
			<b>Total</b>	_____

The following events are included in the registration fee but you must indicate below if you wish to attend

- Exhibition Drinks Reception (18 April 2012)  
 Conference Banquet (19 April 2012)

Please do not send payment separately from this booking form.

By submitting this registration form, you will be indicating your consent to periodically receiving information on our events and publications, unless you indicate an objection to receiving such information by ticking this box

**Early Registration rate finishes 05.03.2012**

## PAYMENT DETAILS

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

Please indicate method of payment: Cheque  Credit Card  BACS  Invoice  (see below)

Cheques should be made payable to IMechE and crossed. Please note overseas 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: 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 \_\_\_\_\_

## INVOICE DETAILS (UK DELEGATES 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 +VAT 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 \_\_\_\_\_

BACS bank transfers can be made to: IMechE Current Account, NatWest Charing Cross Branch.

Sort code: 60-40-05 Acc No: 00817767

A copy of the draft must accompany this form.

Swift Code: NWBKGB2L

IBAN Code: GB96NWBK60400500817767

Please complete and return this form to:

Event Registrations  
 Institution of Mechanical Engineers  
 1 Birdcage Walk  
 London SW1H 9JJ

Fax +44 (0)20 7222 9881

For registration enquiries call  
 Tina Churcher on +44 (0)20 7973 1258  
 or email [t\\_churcher@imeche.org](mailto:t_churcher@imeche.org)

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

### Conditions of Booking

Completed application forms should be returned to the address below, 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 + VAT admin charge), cancellations must be received at least 14 days prior to the event. Replacement delegates are welcome at any time. The IMechE 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 IMechE postpones an event for any reason and the delegate is unable or unwilling to attend on the rescheduled date, you will receive a full refund of the fee paid.

IMechE is not responsible for any loss or damage as a result of a substitution, alteration or cancellation/postponement of an event. IMechE shall assume no liability whatsoever in the event this conference 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 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. As such, IMechE 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 our web page as soon as possible.

### Supporting Organisations

Members of the supporting organisations can register at our members' rates.

\*\*Includes members of the following organisations: IMechE, CETIAT, Cetim, AMCA, CIBD, FETA, FMA, FMA-ANZ, HEVAC, IGTI, INCE, VDMA, AFM, ASHRAE, Academic Institutions, Sponsoring/Exhibiting Companies, Speaker Companies, Co-Authors

### \*Presenting Authors

Presenting authors must register before 15th March to have their papers accepted into the event proceedings.

### Venue

This event will be held at Cetim Congress Centre, 52, Avenue Félix-Louat, Senlis, France. Details will be sent upon registration.

### 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.

### Accommodation

We have arranged special discounted rates at local hotels via the Corporate Team.

Tel: (UK only) 0845 604 4060

International: +44 (0)20 7592 3050

Email: [events@corporateteam.com](mailto:events@corporateteam.com)

[www.corporateteam.com/events/8488FAN](http://www.corporateteam.com/events/8488FAN)

### Enquiries

For event enquiries please call  
 Amelia Brunt on +44 (0)20 7973 1294  
 or email [a\\_brunt@imeche.org](mailto:a_brunt@imeche.org)

The Institution of Mechanical Engineers is a registered charity (No 206882)  
 VAT No GB 299930493



*fan2012*