ASME 2022 TURBO EXPO

Advance Program

June 13-17, 2022
Rotterdam, The Netherlands

The American Society of
Mechanical Engineers® (ASME®)


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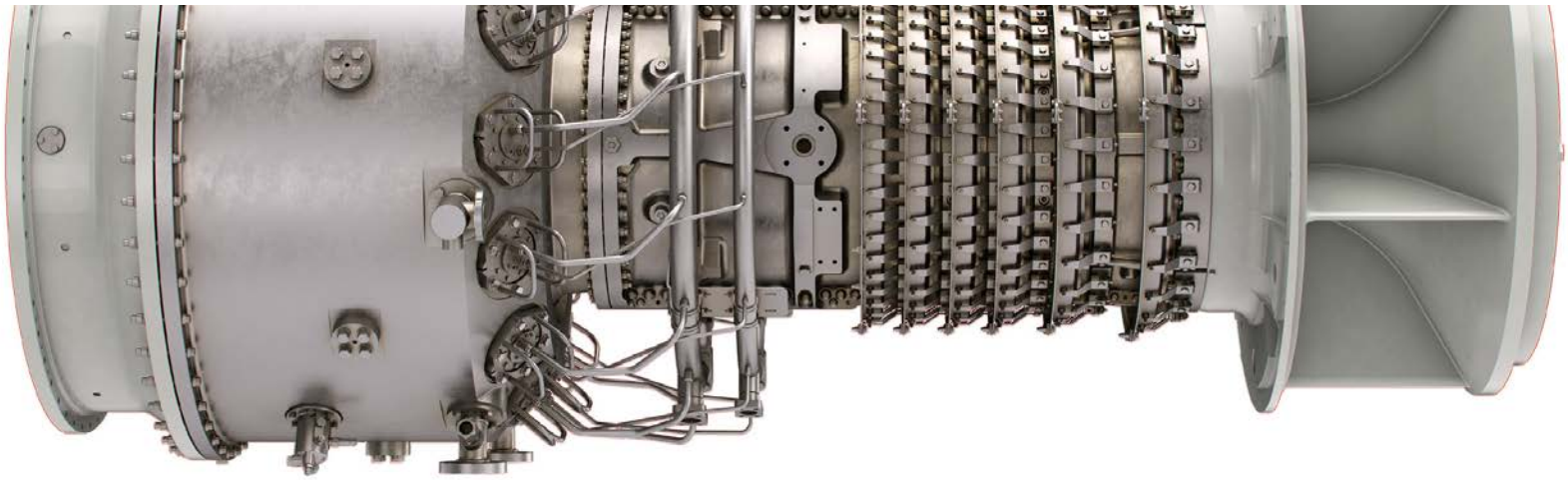

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modern power systems

Gas Turbine World

MECHANICAL ENGINEERING

THE ENERGY INDUSTRY TIMES
www.teitimes.com

Exhibitors

Be sure to plan time to visit the exhibition during the Conference.
Click here for details.

Advanced Design Technology Ltd.

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ASME Recharge and Relax Station

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Modern Power Systems

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Notre Dame Turbomachinery Laboratory

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Turbocam International

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Tutco SureHeat

VBR Turbine Partners

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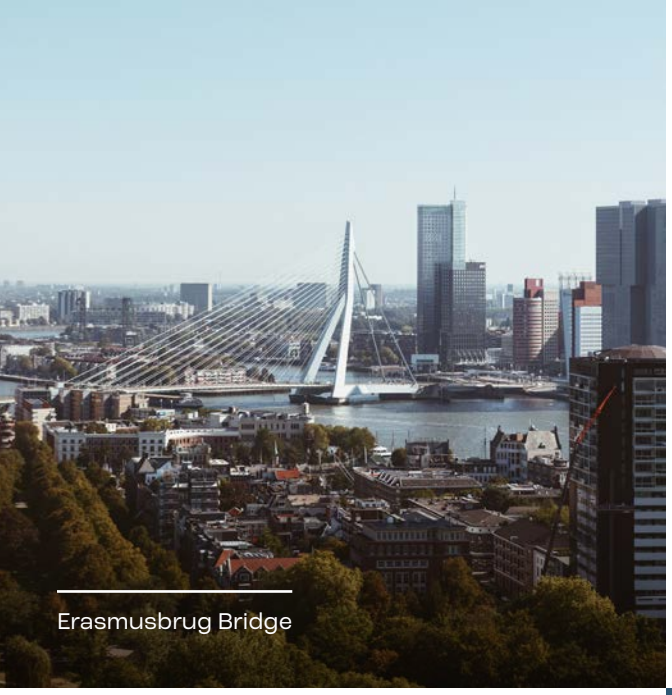
Waukesha Bearings Corporation

Yaskawa Environmental Energy / The Switch



Erasmusbrug Bridge

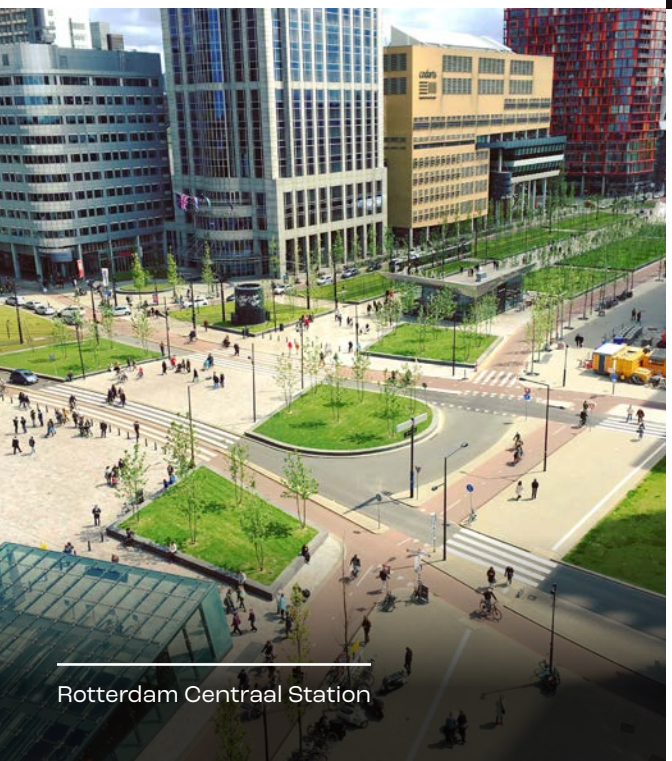
Rotterdam,
The Netherlands

Rotterdam is a city of many faces: a tough port city, a trendy nightlife city, a sophisticated shopping city, and a hip artistic city. Above all, Rotterdam is the architecture city of Holland that stimulates innovation. Its skyline is always changing. There are many things to do amid Rotterdam's skyscrapers. You can go on a shopping spree, enjoy some excellent food, and visit a range of museums and attractions in and around the city centre.

10 Must-See Sights and Activities in Rotterdam:

1. Depot Boijmans Van Beuningen
2. Rotterdam Centraal Station
3. Euromast
4. Markthal
5. S.S. Rotterdam
6. Historisch Delfshaven
7. Spido
8. Cube Houses
9. Erasmusbrug
10. Museumpark

Cube Houses



Rotterdam Centraal Station

Do Rotterdam like a Local

For local delicacies, visit the Rotterdamse Oogstmarkt, a delicious and sustainable farmers' market on Noordplein. Look for yourself in the 1664 mirrors of Depot Boijmans Van Beuningen, the very first public art depot in the world. Take a watertaxi to Marconistraat: the port industry can still be felt here, alongside the new Makers District M4H, which houses a lot of creatives (Studio Roosegaarde, Atelier Van Lieshout). Rent a bike to explore the area, take a look at the Floating Farm where futuristic farming takes place. Then visit the nearby Weelde, a creative free state where you can stop for a drink and a snack. The most beautiful park is Het Park at the Euromast, where lush greenery and iconic architecture meet right next to the city centre. When visiting Het Park, don't forget to stop by the hidden historic gardens of Schoonoord. **More local tips? Check www.dorotterdam.com.**

Markthal

Historisch Delfshaven

Transportation

Within Rotterdam you can travel well with public transport, bicycle, car and on foot. In the city with the largest port in Europe, water transport is of course also an option. Note that everyone travelling on public transport might be required to wear a non-medical face mask so be sure to have one as guidelines frequently change.

It is easy to travel by metro or tram in Rotterdam. The water taxi is a special means of transport, taking you at high speed to over 50 spots in Rotterdam and the surrounding area. The basic metro fare is around €3.50 and is valid for two hours. The Rotterdam Metro schedule runs from approximately 5:45 AM to 12:45 AM. The website for more information is www.ret.nl. (English version button found at bottom left corner of page.)

Rotterdam Ahoy is easily accessible by bus, metro & train. From bus and metro station Zuidplein, it is approximately a 5-minute walk to Ahoy.

Currency

The Netherlands, like most of Europe uses the euro as its form of currency. The euro symbol is €. Euros are divided into euro cents; each euro cent is one one-hundredth of a euro. There are seven denominations: €5, €10, €20, €50, €100, €200, and €500.

You can use a credit card in Rotterdam, but keep in mind not everywhere will accept credit cards. Ask before being seated at a restaurant if all you have is a credit card. Another important thing to notice is that you have to use a credit card with a pin. You are not allowed to sign with a credit card as that's not secure enough.

The Netherlands has a system that is built on Maestro and V- Pay. So, if a debit card is from VISA it is on the VISA network. This means, if a store doesn't accept credit cards, they won't accept your debit card from a credit card company either. If a store accepts credit cards, then you can use your VISA debit card.

Tipping

In Rotterdam, tipping is not compulsory. It is, however, usual to leave a tip in restaurants and bars if the customer is happy about the service. If you received good service or thoroughly enjoyed the food, it's customary to give a small tip — around 5-10% of the bill. If your service was just average, round up the bill or leave some change. It is not required, but one may also tip for taxi and hotel services.

Electrical Outlet

The Netherlands uses the Type F electrical plug. This plug has two round pins, spaced about 2 cm apart, and is the same as those used in many countries in Continental Europe. The standard voltage is 230-volts, but some hotels have special plugs for 110 or 120-volt shavers.

Visa Requirements

Whether you can enter the Netherlands without a visa depends on your nationality. The Schengen Visa Advisor helps you determine whether you need a visa to travel to or via the Netherlands. If the Visa Advisor shows you do not need a visa, you can enter the Netherlands and the Schengen Area without one. You will, however, still need to meet certain requirements:

- You must hold a passport or travel document issued within the last 10 years.
- Your passport or travel document must be valid for at least 3 months after your date of departure.
- You must have proof that you have enough money to cover your costs for the duration of your stay (€55 per day). If you cannot meet this requirement, you can ask someone to act as a guarantor for you.
- You must be able to demonstrate the purpose of your stay to customs and immigration officials.
- You must be able to prove you have travel insurance that covers medical expenses.
- You must have a return or onward ticket.
- You must not be considered a threat to public order, national security or international relations.

Markthal

S.S. Rotterdam

Rotterdam AHOY Parking

Currently, you can park your car at Ahoy for only €5 per day.* Via ParkNBike you can use a reduced weekly parking ticket at a rate of €20. View more information here. Rotterdam Ahoy has 2000 parking spaces.

Weather

In Rotterdam, the summers are comfortable and partly cloudy. Average temperature in June ranging between minimum 12.3°C (54.1°F) and maximum 19.7°C (67.5°F). Bring a light jacket for cool evenings and temperature variances in meeting rooms. June is the month with the most rainfall. Be sure to pack an umbrella.

Restaurants

Rotterdam is the only Dutch city to boast a real skyline. It is devoted to fashionable trends and modernity. Countless culinary developments follow each other in quick succession, so this is definitely the place for you if you are looking for trendy, flavourful eating establishments. It goes without saying that no day or evening is complete without good food and drink.

At Rotterdam Ahoy there are two restaurants where foodies can sit back and enjoy culinary delights before, during and/or after an event.

Location and Venue

The ASME 2022 Conference and Exhibition will be held at the Rotterdam Ahoy, Ahoyweg 10, 3084BA Rotterdam.

Rotterdam Ahoy is ideally located just off the motorway, with the Zuidplein metro and bus stop nearby and Rotterdam The Hague Airport just a short distance away. And since the Ahoy has space for 2,000 vehicles, you can always find secure parking.

For more information on transport, visit ahoy.nl/en/accessibility.

Local Liaison Committee

Piero Colonna, Chair
Delft University of Technology

Paul Chün
KLM

Okko Ebens
Dutch Gas Turbine Association

Sikke Klein
Delft University of Technology

Jim Kok
University of Twente

Michèle Konkol
Thomassen

Geert Laagland
Vattenfall

Yolande Verbeek
Uniper

Rotterdam Ahoy

Erasmusbrug Bridge

Euromast

Travel in Rotterdam

Big City on a Small Scale

Airport to Conference Centre

The Rotterdam Ahoy Convention Centre can be easily reached from both Rotterdam The Hague Airport as Schiphol International Airport.

Rotterdam The Hague Airport

- Bus & Metro (30 min)
- Taxi (30 min)

Schiphol International Airport

- Train & Metro (40 min)
- Taxi (55 min)

City Centre to Conference Centre

Rotterdam has a very compact city centre. Rotterdam Ahoy can be reached by a direct metro line (8 min). Most hotels are situated near the same metro line (D/E) between Rotterdam Ahoy and Rotterdam Central Station (11 min).

The metro in Rotterdam runs from 06:00 AM up to 01:00 AM.

Hotels Near Metro Line

BW Art Hotel
★ ★ ★ ★

ss Rotterdam
★ ★ ★ ★

nhow Rotterdam
★ ★ ★ ★

Room Mate Rotterdam
★ ★ ★ ★

Hotel new York
★ ★ ★ ★

Thon Hotel
★ ★ ★

Inntel Hotel Rotterdam
★ ★ ★ ★

Mainport by Inntel Hotel
★ ★ ★ ★ ★

City hub
BUDGET

Bilderberg Parkhotel
★ ★ ★ ★

Ibis Rotterdam City Centre
★ ★ ★

CitizenM
★ ★ ★ ★

Easyhotel Rotterdam
★ ★ ★

NH Atlanta
★ ★ ★ ★

The Student Hotel
BUDGET

Hilton Rotterdam
★ ★ ★ ★ ★

Hotel Rotterdam
★ ★ ★ ★

Holiday Inn Express
★ ★ ★

Rotterdam Marriott Hotel
★ ★ ★ ★ ★

Rotterdam Central Station

Click here to view a full detailed map.

Ansys

Providing the best-in-class simulation software to design the next generation of sustainable turbomachinery

- Empowering the net-zero movement
- Enabling more efficient aircraft
- Leveraging hydrogen combustion for decarbonization
- Optimizing overall performance

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Grand Opening & Awards Information

2022 Conference Theme

Road-Mapping the Future of Propulsion and Power

The need for zero-emissions is molding the future energy panorama. This year's ASME Turbo Expo Conference in Rotterdam, The Netherlands June 13-17, 2022, aims to accelerate the transition of the energy and propulsion sector to meet a carbon-neutral future by 2050.

Top experts and decision-makers will gather in-person to exchange ideas and experiences to develop and discuss the implementation of safe, reliable carbon neutral solutions while shaping the future of the turbomachinery industry. Turbo Expo will serve as a synergetic platform for government, academic, research, and industry professionals to discuss multidisciplinary approaches for decarbonization.

The 5-day conference will include hundreds of live presenting authors as well as recorded video presentations on-demand. The conference will feature a spotlighted Hydrogen and Energy Storage Day, a 3-day engaging exhibition, various networking opportunities and dedicated student events.

Plenary Session Themes

Industrializing Terabytes for Propulsion and Power

Hydrogen & Energy Storage for Propulsion and Power

Wednesday, June 15th will be Hydrogen and Energy Storage Day.

All tutorials, technical papers and plenary speakers will focus on the future of turbomachinery and its role in decarbonization.

Awards & Scholarships

THE ASME TURBO EXPO

Early Career Engineer Travel Award (Formerly YETEP)

The **Turbo Expo Early Career Engineer Travel Award (TEECE)** is intended for early career engineers working in industry, in government or in academia to obtain travel funding to attend ASME Turbo Expo to present a paper which they have authored or co-authored. The purpose is to provide a way for more to participate in the annual Turbo Expo.

The nominee must have obtained an academic degree (Bachelor, Master, PhD, or equivalent degrees) in an engineering discipline related to turbomachinery within five years from the year of the Turbo Expo that the applicant wishes to attend. The paper or poster being presented can be research results from work completed either while pursuing an academic degree, or after leaving school and entering the job field. **Post-doctoral researchers in academic institutions are eligible so long as they have been in post no longer than five years full time equivalent.**

For 2022, ASME IGTI will provide TEECE Award winners with:

- One Complimentary ASME Turbo Expo Technical Conference Registration
- Complimentary hotel accommodations (Sunday to Friday)
- Up to $1,000 toward approved travel expenses

Congratulations to the 2021 Award Winners

Amrita Basak
Pennsylvania State University

Eva van Beurden
Cooll Sustainable Energy Solutions B.V

Xiao He
Imperial College

Richard Hollenbach
Duke University

Nikola Kafedzhiyski
Siemens Energy AB

Amit Kumar
Indian Institute of Technology Bombay

Marcel Otto
University of Central Florida

Ajey Singh
Indian Institute of Technology Kharagpur

Alberto Vannoni
University of Genoa

Peter Warren
University of Central Florida

Tingcheng Wu
Texas A&M University

Awards & Scholarships

ASME IGTI Student Scholarship Program

ASME IGTI has a long and proud history of providing scholarships to students who show promise for their future profession in the turbomachinery field. The aim is to attract young talent to the profession and reward their commitment, favoring their upcoming enrollment and active participation. The scholarship is to be used for tuition, books, and other University expenses. The check will be made out to the University on the student's behalf.

Undergraduate Student
APPLICATION DEADLINE
February 17, 2022

Graduate Student
APPLICATION DEADLINE
March 3, 2022

Eligibility of the Applicants

ASME Scholarships are awarded annually to eligible ASME Student Members. **You must be a current ASME student member in good standing** (for login to the ASME online scholarship application). Click here to Join ASME or to Renew your dues.

To be eligible, you must be a community college, college, or university student who is enrolled full-time in Mechanical Engineering (ME), Mechanical Engineering Technology (MET), or closely related engineering studies.

For your major to be considered closely related to a Mechanical Engineering major, you must be taking at least 25% of your credits each semester in courses from the Mechanical Engineering Department.

When you complete the online application, you will be considered for all ASME scholarships for which you qualify, not just the ASME IGTI scholarship.

CLICK HERE FOR COMPLETE INFORMATION ON THE SCHOLARSHIP PROGRAM & APPLICATION PROCESS

Congratulations to the 2021-2022 Student Scholarship Winners

Bain T Baiju
Federal Institute of Science and Technology

Ashley K. Ball
Indiana State University

Eric Boucher
University of Souhern Maine

Joe Evans
Montana Technological University

Isaac Foster
Texas A&M University

Tanashki Frater
Kettering University

Sabella Gayoso
Pennsylvania State University

Charles Kerry Griffith
The University of Alabama

William Gunn Worcester
Polytechnic Institute

Muhammad Ibraheem
Warsaw University of Technology

Zachary W. Karg
South Dakota School of Mines and Technology

Bridgette Kim
Johns Hopkins University

Dhruvin Patel Aditya
Silver Oak Institute Of Technology

Jean Carlos Pena
The City College of New York

Sean Russell
University of Connecticut

Connor Silvia
Drexel University

Saujan Siwakoti
Gannon University

Lucien Wallace
Worcester Polytechnic Institute

Chelsea Wright
Kettering University

Christina Wright
University of Central Oklahoma

The IGTI scholarship of $2,000 USD is awarded to 20 honorees. Completing the application one time will afford you the opportunity to be considered for all of the scholarships – so do not delay and complete the application today! **More details can be found at** go.asme.org/scholarships.

Awards & Scholarships

Student Advisory Committee Travel Award

The SAC is pleased to announce that the **Student Advisory Committee Travel Awards (SACTA)** have been made available for students in 2022, with priority given to students who both participate in the conference and actively contribute to the growth of the SAC. The award will consist of reimbursement of approved expenses to attend and participate in ASME Turbo Expo up to $2,000 USD. Applicants for these awards must be seeking a degree. Preference will be given to students who have previously worked and/or have applied to work as a student liaison for Turbo-Expo.

The applicant must agree to participate in the SAC Annual Meeting and be willing to help the SAC leadership team review student posters. Communication with the SAC leadership team may be requested prior to, during, and following Turbo Expo.

Student Advisory Committee Travel Award (SACTA)

APPLICATION DEADLINE

January 31, 2022

Technical Committee Student Liaison Subcommittee

APPLICATION DEADLINE

January 31, 2022

ASME IGTI Student Scholarship Program

The ASME Foundation and ASME Auxiliary distributed over $500,000 to over 100 students in scholarships for the 2021-22 academic school year and we would like to continue the trend for next September 2022-23 enrollments. We have over 80 scholarships with one-application to access and students can be awarded more than one scholarship.

Scholarship recipients are selected based on scholastic ability, character, integrity, leadership, and potential contribution to the mechanical engineering profession. Students must be:

- An ASME student member
- Be a full-time student enrolled at an ABET accredited institution
- And have a financial need

THE ONLINE APPLICATION IS NOW OPEN. CLICK HERE TO ACCESS.

Undergraduate Students

APPLICATION DEADLINE

February 17, 2022

RECOMMENDATION DEADLINE

February 24, 2022

Graduate Students

APPLICATION DEADLINE

March 3, 2022

RECOMMENDATION DEADLINE

March 10, 2022

The IGTI scholarship of $2,000 USD is awarded to 20 honorees. Completing the application one time will afford you the opportunity to be considered for all of the scholarships – so do not delay and complete the application today! **More details can be found at** go.asme.org/scholarships.

Awards & Scholarships

The 2023 ASME R. Tom Sawyer Award

The **R. Tom Sawyer Award** is bestowed on an individual who has made important contributions to advance the purpose of the Gas Turbine Industry and to the International Gas Turbine Institute over a substantial period of time.

The contribution may be in any area of institute activity but must be marked by sustained forthright efforts. The award was established in 1972 to honor R. Tom Sawyer who, for over four decades, toiled zealously to advance gas turbine technology in all of its aspects and includes a US $1000 honorarium and a plaque presented during ASME Turbo Expo.

The nomination must be complete and accompanied by three to five Letters of Recommendation from individuals who are well acquainted with the nominees' qualifications. Candidate nominations remain in effect for three years and are automatically carried over. The completed reference form from a minimum of 3 people will need to be sent in with the nomination package. It is up to the "Nominator" to submit all required information.

Email nomination packages to igtiawards@asme.org on or before:

NOMINATION DEADLINE

August 15, 2022

Congratulations to the 2021 ASME R. Tom Sawyer Award Winner

Robert E. Kielb

The ASME Gas Turbine Award

The Gas Turbine Award is given in recognition of an outstanding individual--or multiple--author contribution to the literature of combustion gas turbines or gas turbines thermally combined with nuclear or steam power plants.

The paper may be devoted to design aspects or overall gas turbines or individual components and/or systems such as compressors, combustion systems, turbines, controls and accessories, bearings, regenerators, inlet air filters, silencers, etc. It may cover topics specifically related to gas turbines such as high temperature materials or fuel considerations, including erosion and corrosion complications. It can also be devoted to application or operational aspects of gas turbines for aircraft propulsion and ground power units, or automotive, electric utility, gas pipeline pumping, locomotive, marine, oil field pumping, petrochemical, space power, steel, and similar uses.

This award was established in 1963 and includes a US $1000 honorarium and a plaque presented during ASME Turbo Expo.

Congratulations to the 2019 ASME Gas Turbine Award Winners

Masha Folk

Robert J. Miller

John D. Coull

Awards & Scholarships

THE ASME IGTI

2023 Aircraft Engine Technology Award

The **Aircraft Engine Technology Award** recognizes sustained personal creative contributions to aircraft gas turbine engine technology. Eligible areas of accomplishment are aircraft engine design, and/or research and development performed in an industrial, academic or research laboratory environment in one or more of the following fields:

- Aircraft Engine Propulsion
- Airframe-Propulsion Integration
- Combustion & Fuels
- Controls
- Diagnostics
- Heat Transfer
- Manufacturing Materials & Metallurgy
- Operability
- Structures & Dynamics
- Turbomachinery

The Aircraft Engine Technology Award will include an optional opportunity to deliver a lecture or present an invited technical paper on the work for which the award is being bestowed, at ASME Turbo Expo. The recipient of the award will very desirably, but not necessarily, be a member of The American Society of Mechanical Engineers. The award will be made to a single individual.

Email completed nominating and supporting letters to igtiawards@asme.org on or before:

NOMINATION DEADLINE

October 15, 2022

Nominating letters should contain all information on the nominee's relevant qualifications. The Award Committee will not solicit or consider materials other than those described below. The selection committee will hold nominations active for a period of three years.

A minimum of two supporting letters from individuals, other than the nominator, must accompany the nominating letter. Supporting letters should reflect peer recognition of the nominee's breadth of experience with various aspects of industrial gas turbine technology.

Congratulations to the 2021 Aircraft Engine Technology Award Winner

Dr. Guillermo Paniagua
Purdue University

Awards & Scholarships

THE ASME IGTI

2023 Industrial Gas Turbine Technology Award

The **Industrial Gas Turbine Award** recognizes sustained personal creative scientific or technological contributions unique to electric power or mechanical drive industrial gas turbine technology. Eligible areas of accomplishment are gas turbine design, application, operations/maintenance, and research/development/deployment, performed in an industrial, academic or research laboratory environment in one or more of the following fields:

- Combustion, Fuels, & Emissions Abatement
- Controls
- Diagnostics
- Electric Power Plant Integration
- Fluid Dynamics & Thermal Sciences
- Operation, Maintenance, & Life Cycle Cost
- Manufacturing, Materials, & Metallurgy
- Structures & Dynamics
- Thermodynamic Cycles
- Turbomachinery

The Industrial Gas Turbine Technology Award will include an optional opportunity to deliver a lecture or present an invited technical paper on the work for which the award is being bestowed, at ASME Turbo Expo. The recipient of the award will very desirably, but not necessarily, be a member of The American Society of Mechanical Engineers. The award will be made to a single individual.

Email completed nominating and supporting letters to igtiawards@asme.org on or before:

NOMINATION DEADLINE

October 15, 2022

Nominating letters should contain all information on the nominee's relevant qualifications. The Award Committee will not solicit or consider materials other than those described below. The selection committee will hold nominations active for a period of three years.

A minimum of two supporting letters from individuals, other than the nominator, must accompany the nominating letter. Supporting letters should reflect peer recognition of the nominee's breadth of experience with various aspects of industrial gas turbine technology.

Congratulations to the 2021 Industrial Gas Turbine Technology Award Winner

Richard Dennis
US DOE NETL

Awards & Scholarships

THE ASME IGTI

2023 Dilip R. Ballal Early Career Award

Early Career Awards are intended to honor individuals who have outstanding accomplishments during the beginning of their careers. Historically, there has been no such award to recognize early career engineers working in the area of turbomachinery.

An early career award is intended for those starting a professional career, which is typically after a relevant terminal degree: BS, MS, or PhD. A criterion of seven-years-from-degree will be used to define the nominee's eligibility. The nominee must receive the award prior to the completion of the seventh year beyond the terminal degree.

The recipient of the **Dilip Ballal Early Career Award** will be presented with the award at Turbo Expo. The award consists of a plaque, funds to support the travel and registration costs to Turbo Expo, free ASME membership registration for five years, and a US $2000 honorarium.

Nomination Requirements

The nomination package should include the following:

1. A paragraph (less than 50 words) from the nominator highlighting nominee's contributions
2. Nomination letter
3. Two supporting letters
4. Current resume of the nominee

Email completed nomination packets to igtiawards@asme.org on or before:

NOMINATION DEADLINE

August 1, 2022

Congratulations to the 2021 Dilip R. Ballal Early Career Award Winner

Lt. Col. Brian T. Bohan, PhD

Awards & Scholarships

John P. Davis Award

Awarded to a paper that focuses on new or continuing gas turbine applications, identifies planning, installation, operating and/or maintenance problems and their solutions, and exemplifies candid exposure of real-world problems and solutions.

Congratulations to the 2019 ASME John P. Davis Award Winners

Dr. David John Rajendran

Dr. Vassilios Pachidis

*For their **GT2019-91039** paper: Fan Flow Field in an Installed Variable Pitch Fan Operating in Reverse Thrust for a Range of Aircraft Landing Speeds.*

ASME Dedicated Service Award

The **ASME Dedicated Service Award** honors unusual dedicated voluntary service to the Society marked by outstanding performance, demonstrated effective leadership, prolonged and committed service, devotion, enthusiasm and faithfulness.

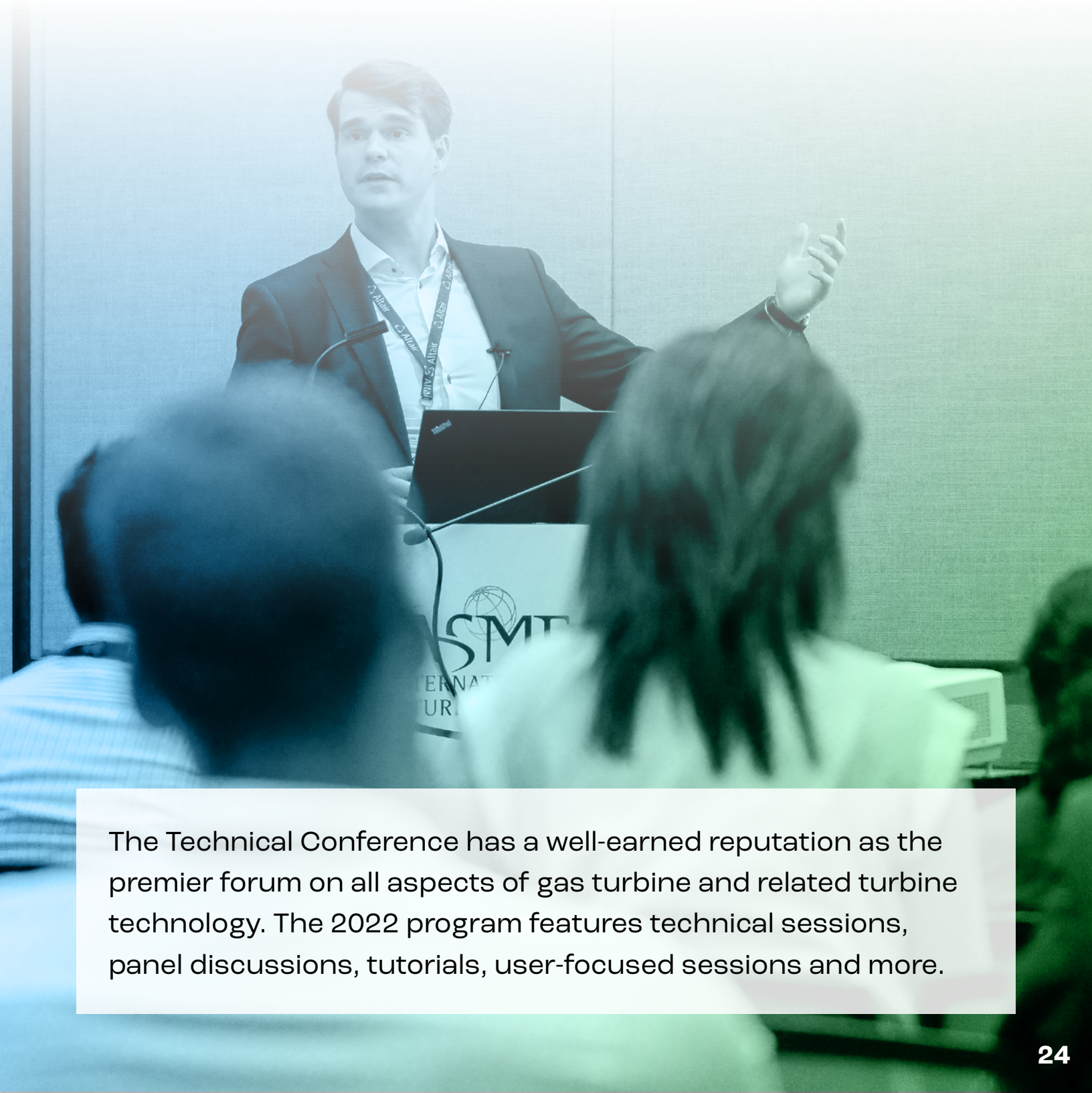
Congratulations to the 2021 Award Winners

Richard Dennis

Dr. Damian Vogt

For details on the 2022 award winners, please refer to the 2022 Awards Program. Programs will be available during the Turbo Expo Grand Opening: Keynote and Awards Program on Monday, June 13 in Rotterdam, the Netherlands.

Technical Sessions



The Technical Conference has a well-earned reputation as the premier forum on all aspects of gas turbine and related turbine technology. The 2022 program features technical sessions, panel discussions, tutorials, user-focused sessions and more.

Technical Sessions

Track 01 – Aircraft Engine

Sessions within this track address issues of interest across a broad spectrum of aircraft engine technology subjects. Presenters will cover a range of topics including:

- Conceptual Design and Optimization
- Modeling, Simulation and Validation
- Whole Engine Performance and Novel Concepts
- Operability (inlet distortion, fan-inlet interaction)
- Environmental Effects (ice, rain, sand, and volcanic ash)
- Thermal Management Systems
- Inlets, Nozzles, Mixers and Nacelles
- Propellers and Open Rotors

Track 02 - Ceramics and Ceramic Composites

Ceramics are important materials for consideration in the extreme environments found in the gas turbine engine hot sections due to their high temperature mechanical and physical properties as well as lower density than metals.

The advantages of utilizing ceramic hot section components include weight reduction, improved efficiency as well as enhanced power output and lower emissions. In order to realize the potential of rotating and static ceramic components, some unique technical challenges are being overcome by the engineering community. Specific areas of research and development include:

- Design, development, and processing of monolithic ceramic and ceramic matrix composite (CMC) Materials
- Development, processing, and characterization of Thermal and Environmental Barrier Coatings (TBCs / EBCs)
- Modeling and validation of material performance
- Life Prediction
- Non-Destructive Evaluation (NDE) of ceramics and CMCs
- Test Methods and standards
- Design and fabrication of components
- Engine & laboratory testing of components
- Ceramic Matrix Composites: Properties and Performance
- Ceramic Matrix Composites: Modeling and Life Prediction

Track 03 - Coal, Biomass, Hydrogen & Alternative Fuels

Sessions focus on high-interest topics in the area of alternative fuel systems for gas turbines, including Hydrogen fuel systems, steam turbines and other turbomachinery technologies.

Alternative and renewable fuels including gaseous and liquid hydrocarbon fuels, alcohols and ethers; as well as pure hydrogen, or high hydrogen content fuels. Alternative liquid hydrocarbon fuels derived from coal or biomass feedstocks or other technologies.

Technical, tutorial, and panel sessions will cover the fundamental physical and chemical properties of alternate and renewable fuels, important to their use in gas-turbine engines and other power systems, as well as their application in different power systems.

Sessions will be of interest to researchers/technologists/computational methods involved in the generation and utilization of non-conventional fuels in gas-turbine-based energy systems and for those wishing to start a new activity in this field.

- Hydrogen Fuel delivery systems
- Hydrogen and hydrogen content fuels for Gas Turbine Applications
- Alternative Fuel Chemistry and Fundamentals
- Alternative Fuel Use in Gas-Turbine Engines
- Basics of Hydrogen and Alternative Fuels
- Liquid Fuel Atomization and Combustion
- Computational Methods for Hydrogen and other Alternate Fuels
- Basics of Combustion Computational Fluid Dynamics
- Gas turbine in coal-biomass integrated cycles
- Life cycle assessment of gas turbine cycles, engines and components

Track 04 - Combustion, Fuels & Emissions

Aero and Industrial Gas turbines with low specific fuel consumption and reduced CO_2 emissions require high combustor outlet temperatures with a continued emphasis on reducing emissions, without sacrificing operability or durability.

Technical Sessions

In addition, Combustion systems are increasingly expected to operate with synthetic gaseous fuels or alternative liquid fuels. The Combustion, Fuels & Emissions sessions will highlight new technology and design approaches, using both experimental and computational techniques, employed to achieve improved combustor performance including ultra-low pollutant emissions and enhanced operability such as turndown and transient response.

Broad trends for the 2017 conference include a continued focus on combustion dynamics for lean-staged combustion systems, significant innovation in the development of combustion system such as Dry Low NOx or novel rotary detonation, maturation of large eddy simulation analyses, as well as continued research of fundamental and applied topics in automation, mixing, ignition, autoignition, blowout and chemical kinetics. Technical sessions include:

- Ignition & Auto ignition
- Atomization & Sprays
- Fundamental Combustion
- Novel Combustion Concepts
- Flashback & Blowout
- Pollutant Emissions Formation & Control: Combustor Performance
- Combustor Design & Development
- Chemical Kinetics
- Combustion Noise
- Pollutant Emissions: Modeling, Soot and Particulates
- Combustion Dynamics: Basic Mechanisms, Flame Response to Perturbations, Instability, Analysis, Model Development and Damping & Control
- Combustion Modeling: Combustor Simulations and Large Eddy Simulations
- High Hydrogen Combustion
- Dry Low-NOx Combustor Development
- Micro Devices
- Jet-in-crossflow & Swirling Flows
- Combustor Diagnostics

Track 05 - Controls, Diagnostics & Instrumentation

The Controls, Diagnostics & Instrumentation Committee will host technical, panel and tutorial sessions that will closely examine the global challenges associated with Gas Turbine Engine Technology.

These will include the latest developments in gas turbine engine control, prognostics, diagnostics and health management, artificial intelligence, and instrumentation technology, and the impact these technologies have in enabling more efficient and reliable engines, lowering engine emissions, and reducing engine operating costs. More precisely, the exchange of information between experts from Government, Academia, and Industry is promoted on the following topics:

- Control System Technology
- Optimal and Intelligent Controls
- Active Component Control
- Distributed Engine Control
- Engine Health Management
- Gas Path Performance Diagnostics
- Diagnostics of Gas Turbine Systems
- Structural and Mechanical Component Health Management
- Early Detection of Combustion Instabilities
- On-Board Engine Monitoring and Diagnostics
- Life Usage Monitoring and Prognostics for Gas Turbine Engines
- Machine Learning for Gas Turbine Diagnostics
- Modeling for Controls and Diagnostic Applications
- Integrated Controls and Diagnostics
- Novel Sensors and Sensor Technologies
- Development of Test Rigs and Probes
- Optical and Non-intrusive Measurement Techniques
- Flow, Temperature, Pressure and Acoustic Instrumentation
- Heat Transfer Measurement
- Blade Tip Timing and Tip Gap Measurement

Track 06 - Cycle Innovations

The Cycle Innovations Committee is dedicated to the advancement of technology and innovation, with a particular focus on the thermodynamic cycles of gas turbine-based plants for power generation and propulsion. Special attention is also devoted to energy storage technology and management aspects. The Committee traditionally attracts paper submissions from a wide range of disciplines and scientific areas. Some of the thematic areas the Committee currently encompasses are listed below:

Technical Sessions

- Low or no emissions thermal cycles and advanced CO_2 handling
- Supercritical CO_2 cycles
- H2 production and utilization
- Polygeneration cycles and process integration (power, heat, cooling, fuels, chemicals)
- Advanced steam and humid air cycles
- Steam and water injection gas turbine cycles
- Closed cycle gas turbine technology
- Novel aero propulsion systems for aircraft and rotorcraft
- Novel marine propulsion systems
- Innovative heat recovery steam generators & once-through steam generators
- Renewable and bio-energy concepts and innovative cycles
- Concentrated Solar Power systems incorporating gas turbine technology
- Fuel cell driven cycles and hybrid systems
- Externally fired gas turbines and high-temperature heat exchangers
- New cycles for distributed power generation
- Thermo-economic and environmental impact analysis
- Cycle simulation and analysis for performance and health assessment
- Low-temperature heat recovery cycles
- Geothermal cycles
- Innovative control systems for power plants
- Optimization of traditional and innovative energy and propulsion systems

Authors and presenters are invited to participate in this event to expand international cooperation, understanding, and promotion of efforts and disciplines in the area of Cycle Innovations. Dissemination of knowledge by presenting research results, new developments, and novel concepts in Cycle Innovations will serve as the foundation upon which the conference program of this area will be developed.

A variety of sessions are available for presentations as it allows flexibility to the authors. All sessions are quality-driven.

Track 07 - Cycle Innovations: Energy Storage

- Overview of Grid-Scale Energy Storage Systems and Technologies
- Hydrogen for Power and Energy Storage

Track 08 – Education

Sessions encompass gas turbine/ turbomachinery education both in the university and in industry. Specific teaching tools and techniques will be discussed, including web-based and large-scale remote education, along with industry opportunities for gas turbine engineers.

Anyone interested in gas turbine/turbomachinery engineering education is welcome, from students to PhDs. Academics will be exposed to ideas and best practices being used at other institutions as well as innovative approaches for gas turbine/turbomachinery education. Industry will have an opportunity to interact with educators to discuss relevant topic areas and to express the expectations with regard to changing needs. Discussions here have the potential to influence engineering education for a positive impact on future engineers.

The sessions provide an active and constructive dialogue about gas turbine/turbomachinery education among practitioners from the industry, students, educators, and researchers.

- Education Issues
- Professional Development Workshop for Mid and Late Career Engineers on Transition Coaching

Track 09 - Electric Power

The Electric Power Committee promotes the exchange of significant technical information about the application and operation of gas turbine power plant systems. This committee organizes panels and technical sessions that deal with the gas turbine as a major component of a power plant, its integration into the power plant including overall plant optimization, as well as the gas turbine's role in decarbonizing power generation.

Paper sessions on these topics will be complemented by panel sessions to address current topics of the gas turbine industry. Presenters will include owner/operators, original equipment manufacturers and industry service providers. The EPC sessions will include the following topics:

- The Pathway Forward: Future Gas Turbine Products & Technologies– OEM Perspective
- Voice of the Customer: User Experience with Gas Turbine Technology
- Gas Turbine Developments
- Combined Cycle Power Plants

Technical Sessions

- Enabling Technologies
- Gas Turbine Industry Updates

Track 10 - Fans and Blowers

Improvements in fans and blowers are means to address the global energy challenge, with manufacturers increasingly focusing on improvement in fan efficiency under legislative pressure and as a part of their response to global climate change. The academia-industry collaboration and the up-front use of Computational Fluid Dynamics (CFD) and Experimental Fluid Dynamics (EFD) and Machine Learning (ML) are the key ingredients to facilitate the advancement from traditional empirical design methodologies.

In response to these challenges, the ASME-IGTI Fans and Blowers Technical Committee consider all technical aspects associated with fans and blowers, with a special emphasis on:

- Design and optimization
- CFD and Artificial Intelligence methods for unsteady aerodynamics
- Noise generation, prediction, innovative noise reduction design
- Experimental challenges in- and out-of-lab
- Structural mechanical aspects (vibration, fatigue and flutter)
- Operations and system effects and interactions
- Maintenance, repair & life-time management
- Standards, compliance with legislation & regulations
- Smart industrial applications of fans and blowers
- Fan solutions for improved indoor air quality

Track 11 - Heat Transfer: Combustors

This track is jointly sponsored by the Heat Transfer and Combustion, Fuels & Emissions committees and includes all research activities in the area of combustor related heat transfer and cooling as well as topics related to combustor-turbine interactions. Papers describing research and technical advances in this area are invited to be submitted to this track. Relevant topic areas include:

- Experimental, analytical, and numerical studies of heat transfer in combustors, including combustor liners, dome/splash plate, injector tip, and backside cooling of combustor liners
- Studies on new cooling designs for low-NOx combustors, liners, and dome/splash plate
- Combustor simulators to study the impact of hot combustor exit flow on hot gas path components

Track 12 - Heat Transfer: Film Cooling

Track papers include research and technical advances in application of gas turbine film cooling. Topics include:

- Vane Film Cooling
- Film Cooled Rotor Blades
- Endwall Film Cooling
- Film Cooling of Blade Tips and Trailing Edges
- Shaped Holes
- Effusion Cooling
- Optimization of Film Cooling Geometries
- Conjugate Heat Transfer
- Advanced Materials with Film Cooling Flows
- Film Cooling with Thermal Barrier Coatings
- Code Development
- Computational Techniques
- General Film Cooling I
- General Film Cooling II

Track 13 - Heat Transfer: General Interest

Papers describing research and technical advances in the area of heat transfer in turbines which do not fit into blades/vanes internal and film cooling applications are invited to be submitted to this track. Relevant topic areas include:

- Gas-path heat transfer
- Vane end-wall and blade tip/platform heat transfer
- Probabilistic methods in heat transfer analysis
- Experimental methods for heat transfer
- Numerical analysis of heat transfer
- Design tool development and validation
- Rotational effects on heat transfer
- Aspect of Additive Manufacturing
- Radiation heat transfer
- Multimode heat transfer
- Heat exchangers and recuperators
- Underwater Turbine
- Innovative concepts relating to heat transfer

Technical Sessions

Track 14 - Heat Transfer: Internal Air Systems

This track is jointly sponsored by the Heat Transfer and Turbomachinery committees and includes both fluid dynamics and heat transfer aspects of turbomachinery internal air systems and seals. Papers describing research and technical advances in this area are invited to be submitted to this track. Relevant topic areas include:

- Actively controlled sealing systems
- Internal air & seal, experimental, analytical, and numerical studies of flow and heat transfer phenomena in rotating cavities, rotor/stator systems and seals
- Heat transfer in rotor support and oil systems
- Secondary air systems analysis involving component interactions and system performance
- Two-phase flow phenomena in internal air systems involving oil jet and oil film disintegration, oil migration in secondary air systems and air/oil interaction including heat transfer, oil fires, film flows, bearing chamber and gearbox flows.

Track 15 - Heat Transfer: Internal Cooling

Papers describing research and technical advances in internal cooling schemes for turbomachinery components are invited to be submitted to this track. Relevant topic areas include:

- Blade/vane internal cooling
- Effect of rotation on internal blade cooling
- Internal cooling with impingement
- Internal cooling with heat transfer augmentation devices such as turbulators/pin-fins
- Internal cooling design, analysis, and optimization
- Innovative internal cooling designs
- Numerical studies of internal cooling
- Cooling in supercritical CO_2 cycles

Track 16 - Heat Transfer: Tutorials

"Tutorials are offered by leading experts in topics relevant to turbomachinery with this year covering rotating cavities, mist cooling, and high efficiency turbine design."

Track 17 - Industrial & Cogeneration

Representing gas turbine applications within the cogeneration and process industries, technical sessions in this track cover a wide range of topics on cogeneration/CHP (Combined Heat & Power) systems, including but not limited to the following: thermo-economic analysis, optimization & simulation methods, design, operation & maintenance aspect of Heat Recovery Steam Generators, operation & maintenance issues of cogeneration plants, gas turbine power augmentation technologies (inlet chilling, high pressure fogging, wet compression, overspray, dry/humid air injection, steam injection, etc.), compressor fouling, inlet air filtration systems, compressor washing, gas turbine upgrades & modifications, environmental & regulatory issues, as well as lessons learned from field experiences.

Other applications such as non-gas turbine-based cogeneration/CHP systems (steam turbine and reciprocating engine based systems, solar energy based systems, etc.), cogeneration and cold energy recovery in LNG plants, hybrid cogeneration systems (combined with fuel cells), and organic Rankine cycle based systems are also included. Panel/Tutorial sessions cover similar topics.

- Design and Evaluation Considerations of Waste Heat Recovery
- Technologies Thermo-Economic Analysis of CHP/Cogeneration Systems
- Techno-Economic Analysis of CHP Systems
- Operational & Maintenance Aspects
- Gas Turbine Power Augmentation Technologies
- HRSG's Design & Operational Issues
- Inlet Air Filtration for Gas Turbines
- Combustion & Emissions
- Gas Turbine Applications Involving Heavy Fuel Oils & Crude Oils
- Dynamic Modeling of CHP Systems
- Condition monitoring and diagnostics for CHP Systems

Technical Sessions

Track 18 - Manufacturing Materials & Metallurgy

The field of materials and metallurgy associated with gas turbine manufacturing has traditionally been the source of numerous disruptive technologies such as the development of superalloys, precision single-crystal investment casting and ceramic coatings. These in turn have allowed an incredibly accelerated pace of innovation. Next generation materials and processes will allow even higher efficiency and reliability as well as greater flexibility operational mode. A major goal is to balance these with lower emissions and lower life-cycle cost of turbomachinery. Materials with higher strength, lighter weight and improved durability are required for these applications.

The continuing development in metallurgy and materials science has resulted in newer materials, better surface protecting methods, and more reliable component life. Development in manufacturing technologies, including better process planning/optimization, advance machining operations, additive manufacturing, newer coating and repair methods, helps to reduce the manufacturing cost and decrease overall operating cost of gas turbines. Condition assessment of parts after service and advanced repairs are required to further reduce life cycle cost and impact to the environment.

The MMM committee is organized to disseminate the latest developments and research results in the areas of manufacturing, materials and metallurgy to gas and steam turbine designers, manufacturers, users, repair and service vendors, researchers and consultants. In addition to technical paper sessions, panel sessions are planned where highly experienced panel members will discuss their latest experiences and knowledge in manufacturing methods, repair/coating processes and component inspections. Tutorials and lectures will be given on gas turbine materials.

- Additive Manufacturing
- Advanced Manufacturing Technologies
- Thermal Barrier Coatings
- Gas Turbine Component Degradation and Life Prediction
- Advances in Gas Turbine Materials
- Advanced Repair Technologies
- Metallurgy for Non-Metallurgists
- Advanced Turbomachinery Manufacturing

Track 19 - Marine

Gas turbines are increasingly being used in both naval and commercial marine applications. Marine sessions showcase the latest developments and best practices for gas turbines in marine electrical power and propulsion systems.

Paper subjects cover a variety of gas turbine related topics ranging among Advanced Repairs for LM2500 High Pressure Turbine Blades and Nozzles, Model 501-K34 Turbine Bearing Failure analysis, the Design of Reversing Gas Turbines and Intercooled Gas Turbine Modeling. Technical Paper Session Topics include:

- Design & Development
- Applications
- Testing

Track 20 - Microturbines, Turbochargers & Small Turbomachines

Small turbomachinery, generally kW-scale or smaller, have a wide range of applications from distributed power generation, transportation, auxiliary systems, and localized process systems. Turbomachinery at such a small scale requires overcoming technology challenges in acoustics, rotor-dynamics, combustion, aerodynamics, recuperation, materials, bearings, and complex control systems that must integrate with other equipment.

Alone, small turbomachinery can provide distributed power generation or mobile, backup power with long life. Combined with other equipment, small turbomachines can augment the performance, such as a turbocharger. The Microturbines, Turbochargers & Small-Turbomachines (MTST) committee organizes sessions that share technology advances in the systems that benefit from small turbomachinery and the machinery itself.

- Auxiliary and distributed power systems.
- Energy markets and the competitiveness of microturbines.
- Intelligent control, health monitoring, and life evaluation.
- Combustion and heat transfer.
- Materials.
- MTST integrated systems modeling.
- Turbomachinery testing and applications
- Turbomachinery component design, optimization, and trade studies.
- Novel applications and concepts.

Technical Sessions

Track 21 - Oil & Gas Applications

The Oil and Gas Industry is a large user of turbomachinery. The demand for oil and gas is consistently growing and changing market conditions require innovative solutions to combat carbon and methane emissions, machine reliability, and cost.

Operation and optimization of turbomachinery in a variety of Oil & Gas applications is therefore of great interest. Moreover, potentially extreme operating environments require the consideration of innovative design and operational attributes, as increased taxes and credits will likely to shape the economic construct that governs the oil and gas community.

Sessions in the Oil & Gas Applications Committee address both theoretical and practical Oil & Gas industry perspectives. The technical sessions provide the latest information on gas turbines and compressors in pipeline and compression stations.

Particular emphasis is given to design, operation and maintenance, management, dynamic behavior, diagnostics and vibration and noise, as well as to all engineering issues in Oil & Gas applications. New tracks will include sessions related to reducing the environmental impact of our oil and gas installations by considering carbon sequestration, waste heat recovery, and hydrogen compression and power generation.

Wet gas compression and multi-phase pumping are also addressed, due to the increasing interest in many installations. The Oil & Gas Applications Committee brings industry experts together in panel and tutorial sessions jointly held by both academic educators and industry professionals. Both basics of Oil & Gas installations and off-design operation issues will be covered, aimed to ensure improved efficiency and safe and reliable operation. The latest information about environmental impact, product upgrade, risk assessment, standards and legislation of gas turbines and compressors in Oil & Gas applications is also provided.

- LNG Liquefaction Plants
- Wet Gas and Multiphase Compression
- Gas Turbine Degradation and Water Washing
- Practical Behavior and Degradation
- Turbomachinery Performance Testing
- Design Details
- Compressor Stations
- Machinery Issues
- Oil and Gas Applications
- Surge Control and System Dynamics
- Hydrodynamic Torque Converters for Oil & Gas Compression and Pumping Applications: Basic Principles, Performance Characteristics and Applications
- Natural Gas Pipelines: Equipment Technology
- Wet Gas Compression
- Compact Compression
- Subsea Compression
- Waste Heat Recovery
- Carbon Sequestration and Reduction Techniques
- Hydrogen Blending
- Gas Turbine Upgrades and Uprates
- Turbomachinery Instrumentation Components, Practices, and Uncertainty

Track 23 - Steam Turbine

Turbo Expo 2022 includes a track dedicated to Steam Turbines. While many of the analyses, computational methods, and experimental techniques are common for steam turbines and gas turbines, there are some unique features on steam turbines that warrant special consideration.

Separate, co-located, steam turbine sessions at Turbo Expo provide a natural way of sharing many of the cutting-edge technologies while giving the steam turbine community a dedicated forum for the unique technical challenges associated with wet steam, long last stage blades, industrial and co-generation steam turbines, the unique mechanical integrity challenges for steam and more. The following topics will be addressed:

- Last Stage Blades and Exhausts
- Wet Steam
- Valves & Seals
- Operational Aspects of Steam Turbines
- General Design Aspects of Steam Turbines
- Tutorial of Basics for Steam Turbines
- Panel Session

Track 24 - Structures and Dynamics: Aerodynamics Excitation & Damping

Aerodynamic Forcing in Axial Fan and Compressors

Technical Sessions

- Aeroelastic Stability in Axial Fans and Compressors
- Non-synchronous Vibrations
- Non-Synchronous Vibrations in Fans
- Methods for Aerodynamic Forcing and Damping Prediction
- Aerodynamic Forcing and Damping in Radial Turbomachinery
- Turbine Aerodynamic Forcing and Damping
- Seal Aeroelastic Stability

Track 25 - Structures and Dynamics: Bearing & Seal Dynamics

The Bearings & Seal Dynamics Track focuses on the modeling and experimental characterization of turbomachinery and pump components with dynamic interfaces. The topics cover all of the aspects related to mechanical reliability and dynamic performance of components such as:

- Fluid film bearings
- Rolling element bearings
- Magnetic bearing
- Gas bearings
- Squeeze film dampers
- Annular seals
- Face seals

Track 26 - Structures and Dynamics: Emerging Methods in Design & Eng.

Authors and presenters are invited to share and promote efforts and methods in the area of Structures & Dynamics: Emerging Methods in Engineering Design, Analyses, also expanding on new approaches for additive manufacturing technology. Dissemination of knowledge by presenting research results, new developments, and novel concepts in Structures & Dynamics: Emerging Methods in Engineering Design, Analyses & Additive manufacturing will serve as the foundation for the conference program in this area. A variety of sessions are available for presentations, as it allows flexibility to the authors.

- 26-01 – Emerging Methods on Advanced Design & Analysis
- 26-02 – Emerging Methods on Additive Manufacturing

Track 27 - Structures and Dynamics: Fatigue, Fracture & Life Prediction

Structures & Dynamics: Fatigue, Fracture & Life Prediction Committee creates a forum to discuss theoretical and empirical approaches to determine the lifetime and maintenance requirements of turbo machinery. This includes theoretical prediction approaches for damage mechanisms which govern component lifetime; observations on material or component behavior which relate to component lifetime; experimental methods to generate data to support these topics; empirical approaches based on inspection and evaluation of part condition and damage during service and at end of life.

- Constitutive Materials Modelling
- Creep and TMF
- Fatigue Analysis of Real Components

Track 28 - Structures and Dynamics: Probabilistic Methods

Probabilistic methods & Applications Committee is focusing on probabilistic methods development and applications using probabilistic methods in the gas turbine engine industry in the areas of surrogate modeling, machine learning, uncertainty quantification, optimization and probabilistic design, model calibration and verification/ validation, design space exploration, sensitivity analysis, and Bayesian methods

- Probabilistic Methods
- Applications using Probabilistic Methods

Track 29 - Structures and Dynamics: Rotordynamics

Main topics of the Rotordynamics Track of the S&D Committee are related to:

- Dynamic Analysis and Stability
- Rotordynamic Modeling and Experiments
- Field Balancing and Rotor Bow
- Use of Active Components and Vibration Control with Rotor Systems
- Nonlinear Rotordynamics
- Rotordynamics of Rotating Machinery including Micro-machinery and Industrial Fans

Technical Sessions

- Condition Monitoring, Test Methods, and Malfunctions
- Case Studies of Rotating Machinery
- Rotordynamics of Abnormal Events and Operation
- Other Aspects of Dynamic Behavior of Rotor groups

Track 30 - Structures and Dynamics: Structural Mechanics & Vibration

- General topics related to structural and rotor system vibrations
- Data driven algorithms and modeling applied to structural dynamics
- Dynamic analysis of mistuned blades/blisks
- Design and development of new damping technologies for gas turbines and other rotating machinery
- Contact friction damping technologies and their effect on rotor/disk vibrations
- Blade-tip/casing interactions: modeling and experiment
- General numerical simulations and modeling methods applied to rotor/disk systems
- Sensing technologies and structural health monitoring systems

Track 31 - Student Advisory

The Student Advisory Committee organizes events at Turbo Expo aimed to engage all degree-seeking individuals in the conference. The Student Advisory Committee (SAC) sponsors a Student Poster Competition, Student and Early Career Engineer Mixer and panel sessions each year to promote the sharing of technical knowledge and encourage meaningful networking opportunities for students and professionals alike.

Track 32 - Student Poster

The Student Advisory Committee is once again sponsoring a student poster session at ASME Turbo Expo. Student posters will be on display on the main exposition floor.

Track 33 - Supercritical CO_2

Supercritical CO_2-based power cycles provide significant efficiency and cost of electricity benefits to waste heat, thermal solar, nuclear, ship-board propulsion, energy storage, and fossil fuel power generation applications. Supercritical CO_1 (sCO_2) is also useful in cooling applications and is present throughout CO_2 capture, utilization, and storage (CCUS) systems.

While the end goals of sCO_2-based power cycles, cooling applications, and CCUS applications are different, the properties of the working fluid, thermodynamics, technology and machinery used for these applications are very similar. The confluence of interests related to the use and management of sCO_2 has created an imperative to further the understanding of these applications. The Supercritical CO_2 Power Cycle committee organizes sessions that focus on the dissemination of machinery and cycle related technologies of sCO_2 applications.

- sCO_2 Fundamentals and Properties
- sCO_2 Cycle Analysis and Optimization
- sCO_2 Applications and Technoeconomics
- Materials for sCO_2 Cycles
- sCO_2 Heat Exchangers
- sCO_2 Turbomachinery
- sCO_2 Cycle Components
- sCO_2 Cycle Controls and Instrumentation
- sCO_2 Cycle Testing and Demonstration
- sCO_2 Oxy-Combustion
- sCO_2 in Carbon Capture, Utilization, and Storage
- sCO_2 for Energy Storage

Track 34 - Turbomachinery: Axial Flow Fan & Compressor Aerodynamics

The industry is always pushing to develop products with improved thrust specific fuel consumption. The Axial Flow Fan and Compressor Aerodynamics Track focuses on understanding the physics and develop the means to improve performance and stability.

- Water Ingestion, Fogging, Pre-Cooling
- Transition & Roughness Effects
- Compressor Experiments
- Manufacturing & Deterioration Effects
- Transonic Compressor Design
- Tandem Design

Technical Sessions

- Tip-Clearance Flows
- Design Concepts
- End-Wall Flows & Passage Contouring
- Seal & Leakage Flows
- Flow Control
- Casing Treatment
- Stall Inception
- Inlet Distortion
- Fan Design
- Test Rig & Facility Design
- Compressor Design
- Track 35 - Turbomachinery: Axial Flow Turbine Aerodynamics
- Loss Generation & Development
- High Fidelity CFD Studies
- Aerodynamic Analyses
- Wakes & Secondary Flows
- Purge & Leakage Flows
- Transition
- Flow Control & Surface Modifications
- Low Pressure Turbines
- High Pressure Turbines

Track 36 - Turbomachinery: Deposition, Erosion, Fouling, and Icing

- Deposition and Erosion Effects
- Hot Section Deposition
- Compressor Erosion
- Multi-phase (Water/Ice) Deposition in Gas Turbines

Track 37 - Turbomachinery: Design Methods & CFD Modeling for Turbomachinery

The design methods and CFD modeling technical focus covers design approaches, concepts, processes, experimental results, and analytical approaches for modeling with CFD and simpler models. Design topics include areas such as optimization strategies, technical approaches for modeling, end-wall profiling, leakage effects, tip clearance effects, flow control, casing treatment types, unsteady flows, and stall inception and control.

Modeling aspects include turbulence closures and transition, LES/DES, steady and unsteady solver formulations, and multi-stage steady CFD, as well as lower-order (non-CFD) models. The increasing emphasis on interaction effects between adjacent components and between multiple disciplines is reflected in specific sessions on these subjects. In addition, several sessions sponsored jointly with other committees focus on important areas of cross-disciplinary interest: with Heat Transfer, turbine cooling and secondary flow circuits; with Structures, on aeromechanics; and with Aircraft, on noise and acoustics. The technical sessions in this track will cover:

- Machine learning and Optimization methods
- Solver methods and applications
- Turbulence closure methods and applications
- Unsteady modeling techniques
- Whole engine/cycle, mean-line and throughflow methods and applications
- Pumps and Hydraulic systems modeling
- TURBINES Design methods and applications
- Fan and compressor design methods and applications
- Compressors stall and surge modeling methods and applications
- Cavities and secondary air systems modeling methods and applications
- Combustors design methods and applications
- LES and DES methods

Track 38 - Turbomachinery: Ducts, Noise & Component Interactions

- Compressor and Combustion Noise
- Fan and Engine Noise
- Gas Turbine Engine Intakes, Exhaust Diffusers, and Ejectors
- Gas Turbine Engine Transition Ducts and Flow Interactions

Track 39 - Turbomachinery: Multidisciplinary Design Approaches, Optimization, and Uncertainty Quantification

- Parameterization Approaches

Technical Sessions

- Manufacturing Tolerances and Uncertainties
- Surrogate-Assisted Approaches, including Sampling and Data Mining
- Axial Compressors, Propellers and Fans
- Turbine Design and Cooling
- Preliminary Design Systems and Approaches
- Adjoint Methods
- Multidisciplinary Optimization and Sensitivity Analysis (fluid, structure)
- Sensitivity Analysis and Design for AM

Track 40 - Turbomachinery: Radial Turbomachinery Aerodynamics

- Radial and Mixed Flow Turbines I
- Radial and Mixed Flow Turbines II
- Centrifugal Compressors 1
- Centrifugal Compressors 2
- Centrifugal Compressors 3
- Centrifugal Compressors 4
- Centrifugal Compressors 5
- Centrifugal Compressors 6

Track 42 - Turbomachinery: Tutorials

The Turbomachinery Tutorials track includes lectures by experts on background and fundamentals of turbomachinery areas of special interest. Examples from past years include guidelines for the design of turbomachinery modules, standard and advanced computational methods, discussions of specific turbomachinery flow regimes (e.g., secondary flows), or system-level topics such as cycle design approaches.

Track 43 - Turbomachinery: Unsteady Flows in Turbomachinery

Unsteady Flows in Turbomachinery consists of topics associated with unsteady fluid flow phenomena in compressors, turbines, and radial machines. Common topic areas include stall and surge, blade row interactions, boundary layers, secondary flows, and various advanced analysis techniques.

Track 44 - Wind Energy

The rapid expansion of wind power and the steady decrease in the cost of wind-generated electricity has consolidated the position of wind power as an indispensable part of the global energy mix. Thus, the Wind Energy Technical Program will focus on innovations that are driving technological advances in the wind industry.

The technical presentations cover aerodynamics, aeroelasticity, structures and condition monitoring aspects of wind turbines, as well as the interaction of wind turbines with other energy systems. These topics are addressed for small and large wind turbines, as well as vertical and horizontal axis wind turbines. Special panel sessions highlight the challenges that the industry is facing, as well as research being undertaken in universities and research laboratories.

For experts and beginners, tutorial sessions and workshops will be presented to detail developments and tools that are employed in the rapidly growing wind industry.

- Measurements and Simulations
- Structures and Aeroelastic Behavior
- Design and Optimization
- Wind Energy Systems
- Modelling of Wind Turbine Flows
- Vertical Axis Wind Turbines
- Operation & Condition Monitoring
- Small Wind Turbines
- Noise
- Blade Aerodynamics
- Reliability and Risk Analysis
- Data Analytics

Tutorials of Basics

This year, industry experts from several committees will present basic tutorials for their respective disciplines in a way that promises to engage and interest engineers from other fields. These tutorials are ideal for learning the fundamentals and key components of specific disciplines within the field of turbomachinery technology.

Tutorials of Basics

Aircraft Engine

- Climate Impact of Aviation Emissions and the Implications to Aircraft Engine Design
- Basics of Turboshaft Engine Cycle Design and Optimization
- Basics of Gas Turbine Engine Core

Ceramics and Ceramic Composites

- Environmental Barrier Coatings for Gas Turbine Applications
- Ceramic Matrix Composites: Variations and Properties

Coal, Biomass, Hydrogen & Alternative Fuels

- Design of Fuel Cells-Based Power & Propulsion Systems for Different Applications: Automotive, Aircraft, Power Generation
- Life Cycle Assessment Basics and Application to Optimize the Environmental Sustainability of Gas Turbines During New Product Development
- Challenges of Combustion Computational Fluid Dynamics for Industrial Gas Turbine Engines

Combustion, Fuels & Emissions

- Combustion Fundamentals
- Combustion Dynamics Tutorial

Cycle Innovations

- Power Plant Hybridization for Enhanced Flexibility and Energy Storage
- Micro-Gas Turbine: Technological Advancements and Market Research
- Closed Thermodynamic Cycle Analysis and Optimization

Cycle Innovations: Energy Storage

- Overview of Long-Duration Energy Storage Systems and Technologies
- Tutorial: Hydrogen for Power and Energy Storage

Electric Power

- Understanding Digital Twins & Machine Learning/AI for Gas Turbine Applications

Fans and Blowers

- Unsupervised Learning Methods for Design Space Exploration
- Introduction to the Aerodynamic Design of Axial Flow Industrial Fans

Heat Transfers

- Rotating Disc Cavity Flows
- Fundamental of Mist Cooling and Its Applications in Gas Turbine System
- Gas Turbine Design

Industrial & Cogeneration

- Combustion and Emissions Tutorial

Manufacturing Materials & Metallurgy

- Metallurgy for the Non-Metallurgist
- Sustainable Production of Advanced Turbomachinery Components in a Digitized Environment

Microturbines, Turbochargers & Small Turbomachines

- Unsteady Flow in Small Radial Compressors: From Surge to Noise Emissions

Oil & Gas Applications

- Industrial Gas Turbines
- Oil and Gas Applications for Turbomachinery
- Demonstration of Possible Economic Benefit of Property Risk Mitigation at Gas Turbine Power Plants
- Basics of Rotordynamics Instrumentation and Data Acquisition

Tutorials of Basics

Steam Turbine

- Two Phase Flow in Steam Turbines

Structures and Dynamics: Structural Mechanics & Vibration

- Time-Frequency Spectral Analysis of Vibration Signals by Wavelet Transform
- Tutorial: Reduced Order Modeling and Identification of Mistuned Bladed Disks

Structures and Dynamics: Aerodynamics Excitation & Damping

- Introduction to Turbomachinery Aeromechanics (No Equations, Only Pictures and Movies)

Structures and Dynamics: Rotordynamics

- Introduction to Rotordynamic Fundamentals

Supercritical CO_2

- Turbo Machinery Design for Supercritical CO_2 Applications
- Heat Exchangers for Supercritical CO_2 Power Cycle Applications
- An Introduction to Supercritical CO_2: Basics, Cycles, and Applications
- Materials for Supercritical Carbon Dioxide Applications

Turbomachinery

- Introduction to Low Pressure Turbine Aerodynamic Design and Its Challenges
- Reduced Order Modelling Approach for Turbomachinery Secondary Flow Systems
- A Quick Method to Draw Dimensionless Velocity Diagrams for Axial-Flow Compressors and Turbines Directly from Their Flow Coefficient, Loading Coefficient, and Reaction
- Introduction to Large Eddy Simulations

Wind Energy

- Challenges in Developing the New Generation of Wind Turbines

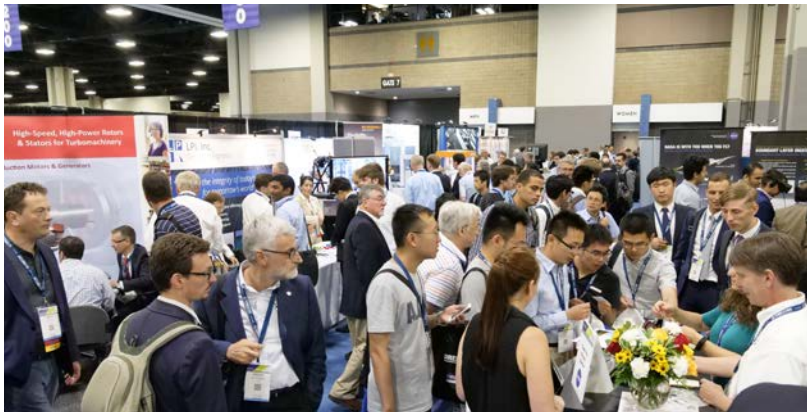
Click here to watch the Turbo Expo in Rotterdam 2022 Video

Exhibit at ASME Turbo Expo 2022

Exhibition Information

We are excited to be back to in-person and looking forward to seeing you in Rotterdam!

The 3-day exposition will be held June 14-16 during the 5-day technical conference. Click here for information on promoting your brand to the professionals attending.



Booth Space Pricing

BOOTH SPACE
3x3 (9 square meters)

BOOTH SPACE
$3,600 USD
plus NL VAT (when applicable)

Contact igtiexpo@asme.org for more information.

All Exhibitors Receive:

- Each exhibit space will have a rear 2.5-meter modular back wall and 1-meter-high dividing walls with a name board. Exhibitors can upgrade to a full wall space with the service contractor for an additional fee.
- 1 technical conference badge per 9 square meters of exhibit space including access to the technical conference final papers.
- 3 booth personnel badges per 9sm of exhibit space, each including the Monday evening Welcome Reception, Monday morning Keynote and Opening Luncheon and lunch in the Hall on Tuesday, Wednesday and Thursday.
- Complimentary exhibit hall passes to share with customers and prospects to drive awareness of your company's booth.
- Complimentary Lead Retrieval.
- Significantly discounted technical conference registration for company employees.
- Discounted advertising options to increase the effectiveness of this opportunity.
- Product category and company description in the online exhibitor directory with press releases, logo, brochure to promote your products.
- Opportunity to present on the exhibitor stage in the Hall.

Become a Sponsor

Featuring a variety of sponsorship opportunities designed to maximize your company's visibility, the sponsorship program provides even more ways to stand out from the crowd and make the most of your budget.

All Sponsors receive recognition:

- On the official Show Web
- In the Online Advance and Final Programs
- On signage posted during the Show
- In announcements made during the Show
- In the GGTN reaching over 135,000 ASME members
- Sponsor ribbons for employees

BECOME A SPONSOR TODAY! CLICK HERE TO COMPLETE AND RETURN THE SPONSORSHIP FORM TODAY

Power Package Prices

Platinum Club

$20,000.00 + APPLICABLE NL VAT

- 10% reduced exhibit space rate
- 5 complimentary 5-day Technical Conference badges
- Discounted Technical Conference registration for employees
- ASME IGTI Website ad promotion with Social Media posts
- Full-page, 4-color ad in Advance and Final Programs
- Attendee giveaway provided by Sponsor placed in attendee bags
- Special sign for booth
- Pre-show email to registered attendees
- Company-provided banner prominently displayed during the Show
- Complimentary exhibit booth cleaning during Show

Gold Club

$15,000.00 + APPLICABLE NL VAT

- 7% reduced exhibit space rate
- 4 complimentary 5-day Technical Conference badges
- Half-page, 4-color ad in Online Advance and Final Programs
- Attendee giveaway provided by Sponsor placed in attendee bags
- Special sign for booth
- Complimentary exhibit booth cleaning during Show
- Pre-show email to registered attendees

Silver Club

$10,000.00 + APPLICABLE NL VAT

- 5% reduced exhibit space rate
- 3 complimentary 5-day Technical Conference badges
- Quarter-page, 4-color ad in Online Advance and Final Programs
- Special sign for booth
- Complimentary exhibit booth cleaning during Show
- Pre-show email to registered attendees

Become a Sponsor

Power Package Prices *(Continued)*

Bronze Club

$5,000.00 + APPLICABLE NL VAT

- Reduced exhibit space rate by 2%
- 2 complimentary 5-day Technical Conference badges
- Quarter-page, 4-color ad in Online Advance and Final Programs
- Special sign for booth
- Complimentary exhibit booth cleaning during Show
- Pre-show email to registered attendees

Additional Sponsorship Opportunities

Attendee Bag Insert

$3,000.00 + GIVEAWAY(S)

Include company literature, promotional items or giveaways in the attendee registration packets. We will place up to two items in the tote bags for attendees as they register. Include invitations to visit your booth or announcements of product demonstrations or other promotional items. This is a great way to ensure you reach everyone in attendance at TURBO EXPO!

Conference Audio-Visual

$10,000.00 (LIMIT ONE SPONSOR)

For maximum visibility in over 300 sessions, your logo will be posted on the audio-visual screens in the session rooms prior to presentations. Don't miss this only opportunity to be visible in the technical conference sessions.

Conference Bag Check

$3,500.00 (LIMIT ONE SPONSOR)

Consider sponsoring the bag check during the Conference. Every attendee appreciates having a place to stow their luggage during their time at an event. Your company name and logo will be prominently displayed in the bag check area during the entire conference. Opportunity to place flyers at the space.

Conference Coffee Break

$5,000.00 (LIMIT ONE DAILY SPONSOR)

For great conference visibility, sponsor the session coffee breaks. Select the day of your choice. You may place literature or promotional items on the break stations for both breaks that day.

Become a Sponsor

Additional Sponsorship Opportunities *(Continued)*

Conference Wi-Fi

$15,000.00 (LIMIT ONE SPONSOR)

Wi-fi will be available for delegates in the conference area compliments of your company. This is a valuable sponsorship opportunity for high visibility to all registered attendees with a landing page with a prominent logo.

Delegate Lunches

$10,000.00 (LIMIT ONE SPONSOR DAILY)

This sponsorship will allow for you to provide brochures and/or promotional materials for the attendees on the lunch tables. Logo signage will be provided. Sponsor can have attendant at the entrance to hand out materials to attendees, if desired.

Exhibit Hall Reception

$3,500.00 (LIMIT TWO SPONSORS)

A refreshing way to get the visibility you want! Signage with your company name and logo will be included on the carts throughout the exhibit hall during the afternoon receptions. Promotional items can be included.

Recharge Station

$10,000.00 (LIMIT ONE SPONSOR)

Allow attendees to power up while visiting the exhibit hall. Place your literature next to the station that will have your logo.

Student/Early Career Engineer Mixer

$5,000.00 (LIMIT THREE SPONSORS)

Excellent opportunity to meet with rising engineers in the turbine industry. Sponsoring company may provide company literature at the event along with the company logo displayed on signage at the event. Perfect for organizations with open staff positions.

Water Stations

$6,500.00 (LIMIT ONE SPONSOR)

This sponsorship includes your company logo at all of the Show water stations (exhibit hall, conference area and Keynote). You are encouraged to showcase your "green" message by providing environmentally friendly cups with your company name or logo.

Become a Sponsor

Additional Sponsorship Opportunities *(Continued)*

Celebrating Women In Turbomachinery Event

$8,000.00 (LIMIT TWO SPONSORS)

Support and celebrate women in the industry at this growing event. This sponsorship includes the sponsoring company providing a speaker for the event.

Welcome Reception

$5,000.00 (LIMIT FIVE SPONSORS)

Support the Welcome Reception, the largest social event during ASME Turbo Expo. Opportunity to have promotional banner at the event.

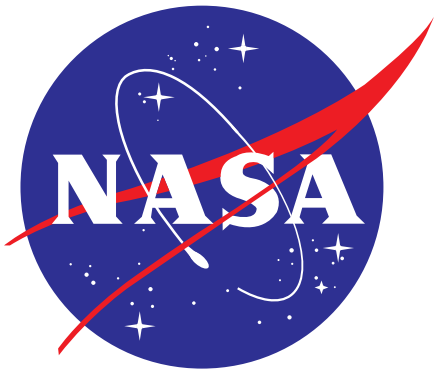
Headshot Booth

$10,000.00 (LIMIT ONE SPONSOR)

Have staff or literature in a highly visited space. Everyone likes a complimentary headshot for social media and business use. Have your materials to read and/or a staff team member there to visit with attendees while waiting in line.

Custom Sponsorships

Contact ASME IGTI today to discuss the sponsorship that works best for you. ASME IGTI will work with you to customize a sponsorship that allows you the best visibility and return on your investment.



Networking Events

Networking during the conference is an effective method of marketing that is used to build new business contacts through connecting with other like-minded individuals. Make sure you attend all of the networking opportunities during the event. Bring your business cards!

Networking Events

Welcome Reception

All Conference registrants are invited to join their colleagues for complimentary light refreshments during the Monday evening event. In a casual atmosphere, greet friends, and meet the thinkers from around the world who are shaping the future of turbomachinery.

Daily Lunches

All Technical Conference delegate badges as well as exhibit booth staff badges include a daily lunch. Additional lunches for guests can be purchased onsite during registration. Take the time during lunch to walk the exhibit floor and visit the many exhibitors from around the world showcasing their products and services.

Expo Hall Receptions

TUESDAY & WEDNESDAY, JUNE 14 & 15
5:00-6:30 P.M.

All registered delegates are invited to the Exhibit Hall for complimentary drinks and networking with industry colleagues, while viewing the exhibits of the industry's leading companies.

Networking Events

Early Career Engineer & Student Mixer

WEDNESDAY, JUNE 15 | 6:45 – 8:00 P.M.
ROTTERDAM AHOY CONVENTION CENTRE

Unwind after a full day of technical sessions and exhibits with fellow engineering students and early career engineers. This popular event allows students to make new friends and build their professional network in a casual evening atmosphere.

Complimentary refreshments will be provided.

Celebrating Women in Turbomachinery Event

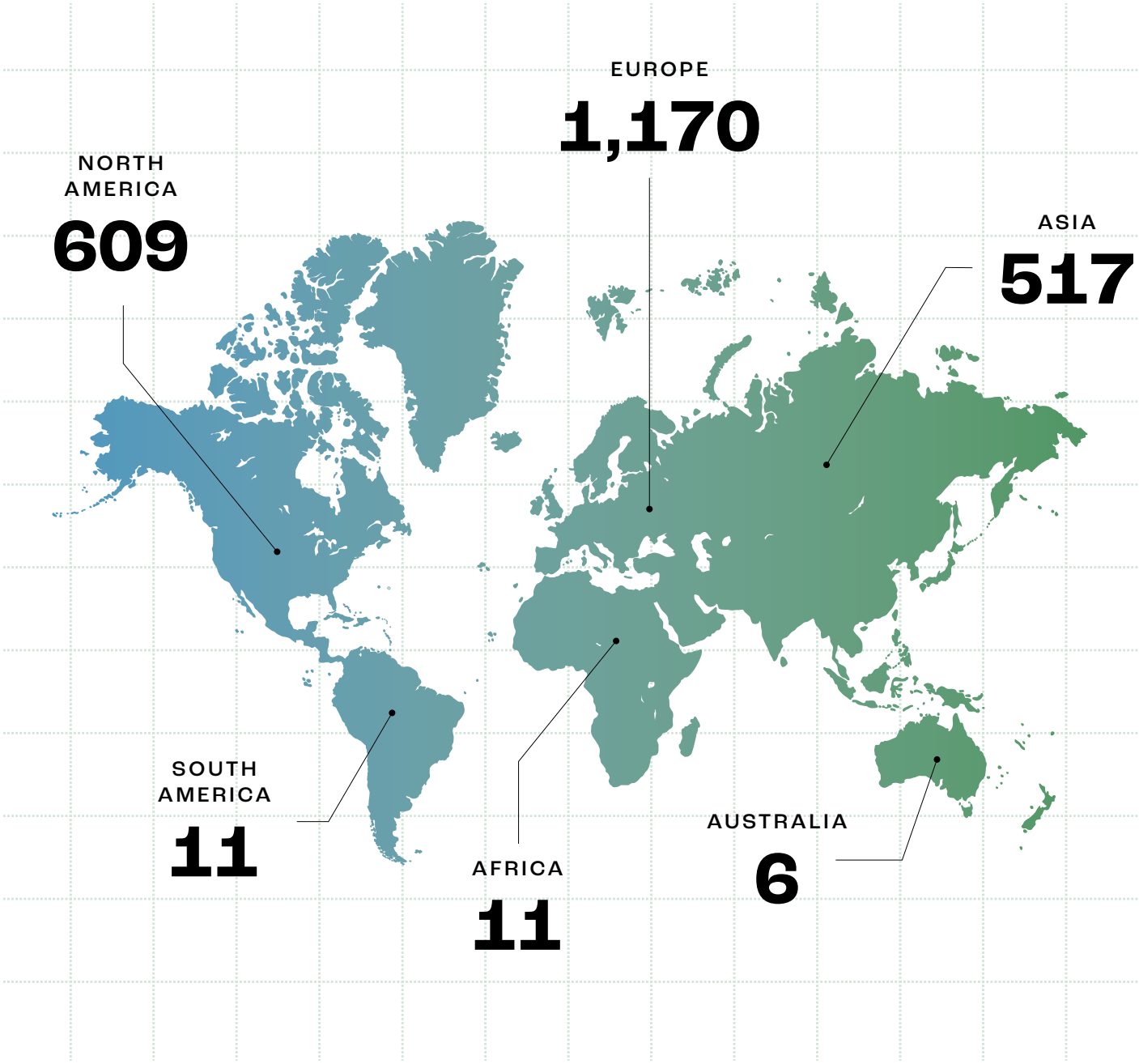
cadence®

TUESDAY, JUNE 14 | 7:45 P.M. – 9:00 P.M.
SPONSORED BY CADENCE DESIGN SYSTEMS

Registrants are invited to join their colleagues for a networking event. Attendees will have the opportunity to network with industry colleagues and learn about their successful career paths. Further details will be available on the Turbo Expo 2022 event website and in the and Final Program.

Thank you to Cadence Design Systems for sponsoring the event!

If you are interested in co-sponsoring this event, please contact igtiexpo@asme.org.



Industry Participants

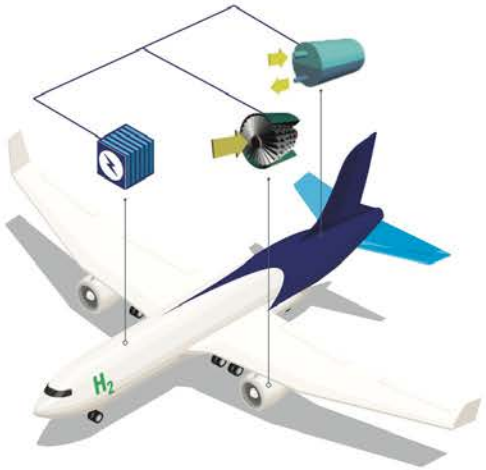
ASME Turbo Expo is proud to have over 2,300 Industry participants from all over the world. These individuals are active within the technical conference and participate as authors, panelists, reviewers, session organizers, session chairs, etc.

FLOWNEX®
SIMULATION ENVIRONMENT

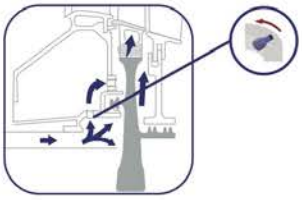
INTEGRATED SYSTEM SIMULATION

Flownex® SE is an industry leader in system modelling tools for the design, analysis and optimisation of various gas turbine systems. Our software provides turbo machinery engineers with an easy to use, off-the-shelf tool for modelling secondary air systems, combustion chambers, lubrication systems and integrated cycle operation.

Through a powerful graphical user interface coupled with a fast and robust solver based on fundamental physics principles, gas turbine systems can be modelled rapidly, leading to significant cost-savings.

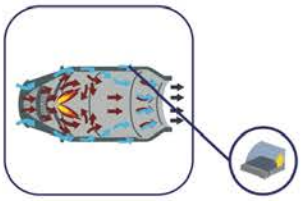


HYDROGEN CONVERSION



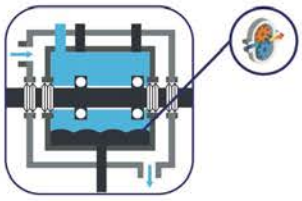
SECONDARY AIR SYSTEMS

- Bleed air consumption
- Wind age power loss, heat transfer
- Flow and pressure distribution
- Coupled flow and structural/FEA simulations



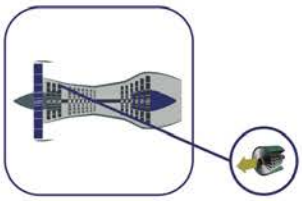
COMBUSTION CHAMBER

- Liner wall ingress air distribution
- Model conjugate heat transfer: combustion, radiation, convection, film convection, conduction, etc.



LUBRICATION SYSTEMS

- Oil and air mixtures
- Scavenge pumps sizing and requirement
- Approximate oil temperatures
- Model oil to fuel and air to oil heat exchangers
- Secondary seal air requirements



INTEGRATED SYSTEM ANALYSIS

- Model different cycle configurations and layouts
- Evaluate recuperative cycles
- Coupling with subsystems for full mission simulations
- Alternative fuels

FLOWNEX.COM

FLOWNEX Ansys

ANSYS COUPLING AND WORKBENCH INTEGRATION

Registration Information

Registration Details

We are back in person and look forward to seeing you all face-to-face! Turbo Expo will be a live in-person event held at the AHOY Convention Centre in Rotterdam, The Netherlands June 13-17, 2022

Please be aware of the spamming non-official vendors contacting you. ASME does NOT sell the conference attendee list.

Technical Conference Registration (In-Person) Includes:

- Access to all conference sessions including technical presentations, keynote sessions, panel discussions, tutorial of basics sessions and award ceremonies.
- Admission to networking sessions including the Grand Opening Turbo Expo Keynote & Awards.
- Program, Welcome Reception, Women in Turbomachinery Networking Event and the Student/Early Career Engineer Receptions.
- Access to on-demand recorded content of technical presentations, keynote sessions, and plenary sessions.
- Admittance into the Turbo Expo exhibition hall and exhibit hall receptions.
- Access to the Student Poster Session.
- Online access to all Turbo Expo 2022 final accepted papers.
- Opportunity to attend facility tours.
- Access to daily lunches.

Registration Category	REGISTER BY May 12, 2022	REGISTER AFTER May 12, 2022
Full Conference (Member) **The following may register at the Member rate(s): ASME Members, Point Contacts, Vanguard Chairs, Session Chairs/Co-Chairs, Authors, Presenters, Speakers, Committee Members, Active Military*	€1,250	€1,355
Full Conference (Non Member)	€1,455	€1,560
Full Conference (Student Member)	€470	€575
Full Conference (Student Non-Member)	€495	€600
Life Member	€470	€575
Member 3-Days	€1,040	€1,145
Non-Member 3-Days	€1,250	€1,355
Group 10+	€1,035	€1,165
Group 20+	€985	€1,115
Exhibiting Company Employee	€1,035	€1,140
Platinum Sponsor Employee	€985	€1,115

All fees include 21% Dutch Value-Added Tax (VAT). *The standard rate of VAT in effect at the time of the event. Please note that your registration may be VAT exempt with a valid Dutch VAT number and that Dutch VAT may be refundable under certain conditions (not guaranteed). For more information, please refer to the FAQ on the Dutch VAT. If you have any questions regarding VAT refunds you may contact bc-a@bc-a.com.*

Registration Details

At this time, ASME will require proof of full COVID-19 vaccination to enter all 2022 in-person conferences, and we will comply with all local safety regulations during the event. Online registration will close June 6 and onsite registration will open June 12, 2022

For Turbo Expo 2022 Technical Publication Guidelines, Author and Presenter Attendance Policies, visit the Author Resources.

VAT Information

The invoice for your participation shall be issued by:
VMC
1 Rond-Point de l'Europe
92250 La Garenne Colombes, France
French VAT Number: FR75523098614
Dutch VAT Number: NL822669481B01

Student Registration Rates

- Student registration rates are only available to undergraduate and graduate students who are enrolled full time and have not yet received their Ph.D. Post-docs may not register as students.
- Persons who register at the Student Member or Student Non-Member rate will be required to submit current valid student identification to ASME. If the identification is not validated, the attendee will need to register at one of the non-student registration categories.

AVOID DELAYS!

Confirm your existing ASME membership status now or join/renew your membership to register at the reduced member rate. Contact customercare@asme.org to confirm or renew your ASME membership. Allow approximately one week to process/renew memberships before registering for this year's Turbo Expo.

For Authors Only

Please utilize the same Username and Password for Single Sign On for both the conference webtool and the conference registration site (Note: You should use the same for ALL your ASME interactions).

Group Registration

Group registration is for groups of 10+ or 20+. Please contact igtiprogram@asme.org for assistance with group registration. All group registrations must be paid in full by June 3.

Visitor/Guest 3-Day Registration (€160) Includes

- Admission to the Grand Opening Turbo Expo Keynote & Awards Program and Welcome Reception.
- Admittance into the Turbo Expo exhibition hall and exhibit hall receptions.

Letters of Invitation

You will be able to request your Conference Letter of Invitation during the Registration process which will be sent as a PDF attachment via email. **Once your fee is paid in full, your letter will be sent.** If you require a hard copy invitation letter to be mailed to you, you may request and pay for a hard copy invitation letter during the registration process.

Badge Pick-Up Information

Badges will not be mailed. All badges must be picked-up onsite. Photo identification and proof of Covid-19 vaccination are required for badge pick-up at the on-site registration desk. The COVID-19 regulations are expected to change over time, so please ensure you check the requirements before making travel arrangements, and especially in the weeks before travelling to Turbo Expo, to ensure you are aware of and adhere to all health and safety regulations

Registration Details

Technical Conference Registration (Virtual Attendance)

We understand that as we go back to a face-to-face event, some individuals may not be ready to travel. Therefore, we will be offering technical content and plenary sessions on-demand. Whether you attend in-person or virtually, you will have access to the technical presentations via video on-demand, pre- and post-conference. Please note if you are attending virtually, all content will be on-demand, there will be no live-streamed content.

What is on-demand content? On-demand content is video recorded presentations of the keynote session, plenary sessions, and technical paper sessions. You will also have access to all technical papers pre- and post-conference. Simply register for the event as if you were attending in-person.

Payment Information

- **Wire Transfer (applicable prior to the Conference).** All wire transfers are payable to Sea to Sky Meeting Management Inc., are due in Euros and must be received by Monday, May 16, 2022, otherwise, payment via another method will be required. On the wire transfer, please note Turbo Expo 2022 and the name of the registrant(s) as a reference. Wire transfer information will be included on the invoice sent upon completion of your registration to the email address provided. The full amount is due and any incurring bank fees are paid by the remitter/sender. When requesting a wire transfer to pay your fees, please advise your bank to deduct any fees from your account, and not from the amount to be transferred.
- **Credit Card – American Express, Visa and Master Card.** If paying by credit card, Sea to Sky Meeting Management Ltd. will appear as the vendor on your credit card statement.

Professional Development Hours (PDH)

A PDH Certificate will be emailed to you after the conference indicating the number of PDHs earned during the conference.

Insurance and Liability

Participation in Turbo Expo 2022 is at your own risk. Please make your own health and travel insurance arrangements.

Language

The official language of the Turbo Expo 2020 is English.

Technical Conference Registration (Virtual Attendance) Includes...

- Access to on-demand recorded content of technical presentations, keynote sessions, and plenary sessions.
- Online access to all Turbo Expo 2022 final accepted papers.
- Online exhibition.

Cancellation/Refund Policy

- Cancellations received on or before May 12, 2022, will receive a full refund, less a **€175** administrative fee.
- No refunds will be granted after May 12, 2022. **NO EXCEPTIONS.** No-shows will not be eligible for refunds.
- Registrations may not be transferred or substituted at any time.
- All cancellations must be received in writing by Sea to Sky Meeting Management at turbo@seatoskymeetings.com.

Registration Inquiries

Contact us at turbo@seatoskymeetings.com.
ASME Turbo Expo 2022: Turbomachinery Technical Conference and Exposition
c/o Sea to Sky Meeting and Association Management Inc.
Suite 206, 201 Bewicke Avenue
North Vancouver, BC, Canada V7M 3M7
Phone: +1-604-984-6455
Email: turbo@seatoskymeetings.com
Web: event.asme.org/Turbo-Expo

Registration Details

Childcare Options

We are pleased to offer childcare reimbursement for attendees. For those who need childcare services, ASME will reimburse up to a total of **$250/per registered attendee** for services incurred by a licensed service provider in Rotterdam. This offering will be available from **Monday, June 13 through Friday, June 17, 2022**, during the hours of day in which technical presentations are offered.

To be reimbursed, you must complete an ASME Volunteer Travel Expense Contribution form provided to you from ASME Staff upon request (igtiprogram@asme.org). All requests for reimbursements must be received by ASME, with itemized receipts, no later than two weeks from the last day of the Conference.

If you have questions related to this benefit, please contact Stephanie Heinricks at heinrickss@asme.org.

NOTE: ASME suggests you may also wish to consult with your local hotel concierge for licensed service provider suggestions. Please also do your own due diligence.

The **Holiday Sitters** website includes babysitter bios, sightseeing recommendations, and more. Booking and payment are also done through their website. Visit www.holiday-sitters.com for more information.

Galit Bauer, co-founder, can also be directly contacted by email (galitb@holiday-sitters.com) or by WhatsApp (+31617292579). She is happy to answer any questions concerning your trip to the Netherlands with children.

Facility Tours

We are excited to be offering technical facility tours during the Conference this year. These tours are held during the week of Turbo Expo and are included in your full conference registration fee. Some tours will require registration and pre-screening. This is done at the discretion of the touring company. More information will be available this Spring.

Guest Tours

Guests of Conference attendees will have the opportunity to register for Guest Tours held in the Rotterdam area. Information will be made available for registering for the tours this Spring.

VAT Refund Netherlands FAQ

Why am I paying a VAT on the Conference Registration Fee?

You are paying a Value Added Tax (VAT) on the registration fee because it is required by the laws and regulations of the EU and its Member States. They establish that VAT must be paid on the fees in the country where the meeting is held. For this conference, the Dutch VAT is applicable on the Registration Fee.

Can the VAT be recovered?

Possibly. Only business companies can claim back the Dutch VAT. To recover the VAT you must provide the details of your company - name, address, VAT number or Tax ID - for all expense invoices and submit all original documentation to your company for its processing.

Pay attention that the VAT refund on certain expenses like food and drinks in restaurants, hotels and cafes are not accepted by the Dutch Tax Administration.

What process should companies follow to recover the VAT?

A. EU COMPANIES

EU companies must contact the Tax Administration of their own country for instructions regarding the conditions and process to follow for reclaiming the Dutch VAT. They must submit their claim for a Dutch VAT refund in digital form for the previous year before 1 October of the following year to the tax authorities of the EU country in which they are established. There are also minimum VAT amounts that must be met.

The amount of VAT for which you claim refund must be at least € 50 per calendar year or € 400 per quarter. Please note that these amounts refer to ALL the VAT from the expenses incurred FROM ALL ITS EMPLOYEES in Netherlands for this meeting and any other business-related VAT incurred in Netherlands.

B. NON-EUROPEAN COMPANIES

The Non EU companies can claim refund of the VAT paid in the Netherlands using the form 'Application for VAT refund for entrepreneurs based in non-EU countries'. In order to get to this form, the claimant must register as a foreign entrepreneur.

Thus, for a non-European company, the Dutch tax authorities will only handle the request after its registration as a foreign entrepreneur (registration number is obligatory). The company must send this Application form together with the Enclosing appendices indicated on the first page of the form at: Belastingdienst Buitenland, Afdeling klantenregistratie, Postbus 2865, 6401 DJ Heerlen, Netherlands.

The Non-European companies must send the VAT refund application before 1 July in the year following the year over which they are claiming refund of VAT. Note that the original invoices must be sent with the application. There are also minimum VAT amounts that must be met.

The amount of VAT for which the Non-European companies claim refund must be at least € 50 per calendar year or € 400 per quarter. Please note that these amounts refer to ALL the VAT from the expenses incurred FROM ALL ITS EMPLOYEES in Netherlands for this meeting and any other business-related VAT incurred in Netherlands.

Leadership Team

Turbo Expo Organizing Committee 2022

Conference Chair
Jaroslaw Szwedowicz
Siemens Energy AG

Executive Conference Chair
Christer Björkqvis
ETN Global

Technical Program Chair
Keun Ryu
Hanyang University

Review Chair
Natalie Smith
Southwest Research Institute

Vice Review Chair
Alberto Traverso
University of Genova

Vice Review Chair
Virginie Chenaux
German Aerospace Center (DLR)

Vice Review Chair
Tom Verstraete
von Karman Institute, Ghent University

Tutorial Chair
Harald Schoenenborn
MTU Aero Engines AG

EC representative (TE21 CC)
Karen Thole
Penn State University

Local Liaison Chair
Piero Colonna
Delft University of Technology

ASME Gas Turbine Technology Group

Chair
Zoltan Spakovszky
MIT

Vice-Chair
Sean Bradshaw
Pratt & Whitney

Member
Caroline Marchmont
Ansaldo Energia

Member
Richard Sandberg
University of Melbourne

Member
Daniela Gentile
Ansaldo Energia

Member
Tim Stone
GE

Member
Charles Soothill
Sulzer

Member
Nateri Madavan
NASA

Member
Susan Scofield
Siemens Energy

IGTI Structure

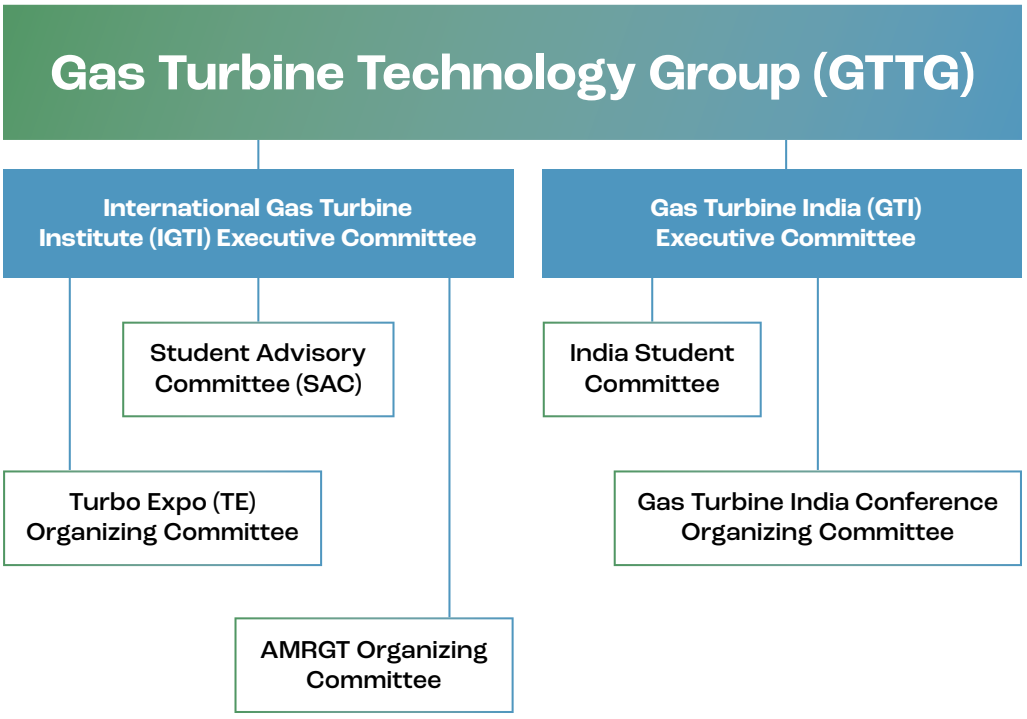
IGTI MISSION

Dedicated to supporting the international exchange and development of information to improve the design, application, manufacture, operation and maintenance, and environmental impact of all types of gas turbines, turbomachinery, and related equipment.

WHAT IS THE ASME STRUCTURE FOR IGTI DIVISION?

IGTI Council of Chairs

1. Aircraft Engine
2. Ceramics
3. Coal Biomass & Alternative Fuels
4. Combustion, Fuels & Emissions
5. Controls, Diagnostics & Instrumentation
6. Cycle Innovations: Energy Storage
7. Education
8. Electric Power
9. Fans and Blowers
10. Heat Transfer
11. Industrial & Cogeneration
12. Manufacturing Materials & Metallurgy
13. Marine
14. Microturbines, Turbochargers and Small Turbomachinery
15. Oil & Gas Applications
16. Steam Turbine
17. Structures & Dynamics
18. Supercritical CO_2
19. Turbomachinery
20. Wind Energy



Watch social media announcements for more information on how IGTI is structured within ASME and how the **IGTI Division** and the **Gas Turbine Technology Group** work together.

Leadership Team

ASME IGTI Executive Committee

Kenneth Suder
Chair
Senior Technologist, Airbreathing Propulsion Propulsion Division, Research and Engineering Directorate NASA Glenn Research Center

Douglas Hofer, PhD
Vice-Chair
Engineering Fellow Heliogen

Professor Ricardo Martinez-Botas, FREng
Past Chair
Professor of Turbomachinery Mechanical Engineering Imperial College London

Akin Keskin
Member
Chief of Integrated Design Systems Rolls-Royce

Karen Thole, PhD
Member
Distinguished Professor, The Pennsylvania State University

Let's Get Social!

Post that you are planning to attend the Conference, that you are authoring a technical paper, exhibiting, sponsoring.....contact IGTI if you would like to use the Conference logo.

facebook.com/asmeigti

twitter.com/IGTI

instagram.com/asmeigti

linkedin.com/groups/4058160

linkedin.com/company/asme-international-gas-turbine-institute

Student News

Student News

The Student Advisory Committee (SAC) is a group of students who work to foster student engagement in the IGTI community and improve the Turbo Expo conference every year. Towards this goal, the SAC organizes various sessions and events during the conference, provides opportunities for students to work behind the scenes with leaders in their technical area, and awards travel funds to eligible degree seeking individuals.

SAC Committee Members

CHAIR
Mavroudis Kavvalos
Malardalen University, Sweden

VICE CHAIR
Dimitra Eirini Diamontidou
Malardalen University, Sweden

SECRETARY
Vamsi Krishna Undavalli
The University of Alabama, Tuscaloosa

PAST-CHAIR
Deepanshu Singh
University of Oxford, United Kingdom

SAC Sessions at Turbo Expo

The sessions organized by the SAC during the technical conference are focused on professional development and are open to all conference attendees. In previous years, the SAC has curated panel sessions led by community leaders on Turbomachinery Careers and Networking, as well as tutorial sessions titled “Effective Technical Presentations”, and “The Art of the Peer Review Process”.

Poster Session

The Student Advisory Committee is once again sponsoring a student poster session at ASME Turbo Expo. Student posters will be on display on the main exposition floor on Tuesday, June 14th from 12:30 – 1:30 p.m. Be sure to stop by the poster session to see the results of their work and encourage them to become active in the ASME IGTI community.

Cash Prizes for Poster Session Winners

1st Place	*2nd Place*	*People’s Choice*
€430	€215	€85

Early Career Engineer & Student Mixer

WEDNESDAY, JUNE 15 | 6:45 – 8:00 P.M.
ROTTERDAM AHOY CONVENTION CENTRE

Unwind after a full day of technical sessions and exhibits with fellow engineering students and early career engineers. This popular event allows students to make new friends and build their professional network in a casual evening atmosphere.

Complimentary refreshments will be provided.

Student News

Technical Committee Student Liaison Application

Applications are now being accepted to join the student liaison subcommittee designed to encourage interaction between the Student Advisory Committee (SAC) and the ASME IGTI technical committees. The student will be expected to serve as a link between the SAC and the leadership of the technical committee to which they are assigned. The potential outcomes of this relationship include, but are not limited to, collaboration for future tutorial sessions at IGTI Turbo Expo, communication of ideas and announcements between the SAC and the technical committee, and opportunities for professional development.

Applicants for these positions must be students who are or plan to be members of the SAC. The liaison will be expected to communicate directly with the leadership of the technical committee to which they are assigned. Further, the liaison should be in attendance at the ASME Turbo Expo 2022 Conference in Rotterdam, The Netherlands. Because attendance at Turbo Expo may not be guaranteed, applicants should apply with the intention to attend Turbo Expo 2022. Communication with the SAC leadership team may be requested prior to, during, and following Turbo Expo. The service period will extend from April 1, 2022 to March 31, 2023. Additional expectations may be outlined by the SAC leadership team, but not without input from the liaison.

To apply for a position as a liaison to the IGTI technical committees on behalf of SAC, please submit a resume or CV with the application to the SAC via email at sac.igti@gmail. com by January 14th, 2022. If several applicants desire to represent the same technical committee, the SAC leadership team will choose representatives based on the contents of this application. You will be notified of the status of your application by January 31, 2022.

Consider joining the team in 2023!

Schedule at a Glance

SUNDAY June 12	MONDAY June 13	TUESDAY June 14	WEDNESDAY June 15 (Hydrogen & Energy Storage Day)	THURSDAY June 16	FRIDAY June 17
	Registration 7:00 am - 5:30 pm	**Registration** 7:00 am - 6:30 pm	**Registration** 7:00 am - 6:30 pm	**Registration** 7:00 am - 5:30 pm	**Registration** 7:00 am - 3:00 pm
	Speaker Ready Room 7:00 am - 5:30 pm	**Speaker Ready Room** 7:00 am - 5:30 pm	**Speaker Ready Room** 7:00 am - 5:30 pm	**Speaker Ready Room** 7:00 am - 5:30 pm	**Speaker Ready Room** 7:00 am - 3:30 pm
	Session Participant Networking Coffee 7:00 am - 7:45 am Room 120-D	**Session Participant Networking Coffee** 7:00 am - 7:45 am Room 120-D	**Session Participant Networking Coffee** 7:00 am - 7:45 am Room 120-D	**Session Participant Networking Coffee** 7:00 am - 7:45 am Room 120-D	**Session Participant Networking Coffee** 7:00 am - 7:45 am Room 120-D
	Conference Sessions 8:00 am - 10:00 am	**Conference Sessions** 8:00 am - 10:00 am	**Conference Sessions** 8:00 am - 10:00 am	**Conference Sessions** 8:00 am - 10:00 am	**Conference Sessions** 8:00 am - 10:00 am
	Coffee/Tea Break 10:00 am - 10:30 am	**Coffee/Tea Break** 10:00 am - 10:30 am	**Coffee/Tea Break** 10:00 am - 10:30 am	**Coffee/Tea Break** 10:00 am - 10:30 am	**Coffee/Tea Break** 10:00 am - 10:30 am
	Keynote & Awards Program 10:30 am - 12:00 pm	**Plenary Session** 10:30 am – 12:00 pm	**Plenary Session** 10:30 am – 12:00 pm	**Conference Sessions** 10:30 am - 12:00 pm	**Conference Sessions** 10:30 am – 12:00 pm
Registration 12:00 pm - 6:00 pm	**Opening Lunch** 12:00 pm – 1:30 pm	**Exhibit Open** 12:30 pm – 6:30 pm **Conference Lunch** 12:30 pm – 1:30 pm **Poster Session** 12:30 pm – 1:30 pm (Exhibit Hall)	**Exhibit Open** 12:30 pm – 6:30 pm **Conference Lunch** 12:30 pm – 1:30 pm	**Exhibit Open** 11:30 am – 2:30 pm **Conference Lunch** 12:00 pm – 1:30 pm **Closing Ceremony** 1:00 pm	**Closing Lunch** 12:00 pm – 1:30 pm **IGTI Executive Committee Meeting** 1:00 pm – 5:30 pm
Speaker Ready Room 12:00 pm - 6:00 pm	**Conference Sessions** 1:30 pm – 3:30 pm	**Conference Sessions** 1:30 pm – 3:30 pm	**Conference Sessions** 1:30 pm – 3:30 pm	**Conference Sessions** 1:30 pm – 3:30 pm	**Conference Sessions** 1:30 pm – 3:30 pm
	Coffee/Tea Break 3:30 pm - 4:00 pm	**Coffee/Tea Break** 3:30 pm - 4:00 pm (Exhibit Hall)	**Coffee/Tea Break** 3:30 pm - 4:00 pm (Exhibit Hall)	**Coffee/Tea Break** 3:30 pm - 4:00 pm	**Coffee/Tea Break** 3:30 pm - 4:00 pm
	Conference Sessions 4:00 pm – 5:30 pm	**Conference Sessions** 4:00 pm – 5:30 pm	**Conference Sessions** 4:00 pm – 5:30 pm	**Conference Sessions** 4:00 pm – 5:30 pm	**Conference Sessions** 4:00 pm – 5:30 pm
		Exhibit Hall Reception 5:00 pm - 6:30 pm	**Exhibit Hall Reception** 5:00 pm - 6:30 pm		
		Technical Committee Meetings 6:00 pm - 7:30 pm	**Technical Committee Meetings** 6:00 pm - 7:30 pm	**Technical Committee Meetings** 6:00 pm - 7:30 pm	
Council of Chairs Meeting 6:00 pm - 7:30 pm	**Welcome Reception** 6:00 pm - 7:30 pm	**Celebrating Women in Engineering Event** 7:45 pm - 10:00 pm	**Early Career Engineer/Student Mixer** 6:45 pm – 8:00 pm		

SCHEDULE SUBJECT TO CHANGE. UPDATED DECEMBER 30, 2021.