

Contributing Organizations
to
GTSJ



Gas Turbine Society of Japan

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Sophia Precision Corp.
 Sumiju Precision Forging Co., Ltd.
 SUMITOMO PRECISION PRODUCTS CO.,LTD.
 Suzuki Seiki Kogyosho Co.,Ltd.
 TAIYO OIL CO.,LTD SHIKOKU OPERATIONS
 TEPCO Fuel & Power,Incorporated
 THE CHUGOKU ELECTRIC POWER CO.,INC.
 The Institute of Applied Energy(IAE)
 THE JAPAN STEEL WORKS,LTD.
 THE OKINAWA ELECTRIC POWER CO.,INC.
 TOHO GAS CO.,LTD.
 Tohoku Electric Power Co.,Inc.
 TOKYO ENERGY & SYSTEMS INC.
 TOKYO GAS CO.,LTD.
 Tokyo Gas Engineering Solutions Corporation
 TOMINAGA & CO.,LTD.
 TONENGENERAL SEKIYU K.K.
 TOSHIBA CORPORATION
 Toshiba Plant System Co.,Ltd.
 TOYO CONTROLS CO.,LTD.
 TOYOTA MOTOR CORPORATION
 Toyota Turbine and Systems Inc.
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Corporations

Aikoku Alpha Corporation AP Division



C1

<http://www.aikoku.co.jp/>

We use 5-axis machining center to make structural components for the aerospace industry as well as other complex and sophisticated components. One of the first companies to introduce a 5-axis machining center in 1975, we have been steadily accumulating expertise in this technology since then. We now produce a significant portion of the world's machined impellers while confidently guaranteeing that they are of the finest quality available. We will continue to push our machining technology to new heights as we focus steadfastly on the further developing the potential of simultaneous 5-axis machining.

B&B-AGEMA GmbH



C2

<http://www.bub-agema.de/>

B&B-AGEMA GmbH is an independent service provider for professional power plant engineering and turbomachinery design. Since its foundation in 1995, the company provides its services for the benefit of its national and international clients. B&B-AGEMA provides innovative services on design, calculations and expertise for energy conversion machinery and plants, in particular for gas turbines, steam turbines, expanders, compressors, pumps and combustion systems. A special focus is laid on the progressive design of the major gas turbine components (compressor, combustion chamber, turbine) with respect to highest efficiency, availability and operational reliability. The company gas turbine experts have long-year experience in design for gas turbines varying in size from 3 kW to 300 MW. Another main focus of activities is related to the design and optimization of power plant components by application of modern computational tools, in particular for components as water separators, re-heaters, steam condensers, wet cooling towers, heat exchangers, mixing & control valves and exhaust duct systems. B&B-AGEMA develops on demand user-specific calculation and simulation software. The projects are performed by application of modern and high-quality computational tools for flow simulation, heat transfer calculation, and mechanical strength analyses. The clients benefit not only from the obtained project results but also from the established know-how transfer.

CRE Co.,Ltd



C3

<http://www.cre-nagoya.com/>

★ Product and Service Features

- Focused on gaining customer trust, CRE offers engineering support in the areas of aircraft structural design, structural analysis, electrical and electronic design, software development, device design, productivity-focused process design, and quality assurance.
- CRE prepares and edits a variety of manuals. We also perform contracted projects associated with documentation, such as electronic conversions of documents and translations of technical documents and manuals.

★ Forte

- CRE has been involved in nearly all of major development projects in the Japanese aerospace industry, while building upon the strong relationships with aircraft manufacturers.
- CRE has experience in design and development of almost all major components of aircraft.
- Our skilled engineers, with 30 years of experience in aircraft design and development, are assigned to key roles in projects in order to manage the projects and provide training and guidance to younger engineers.

FE Fuji Electric

Fuji Electric Co., Ltd.

<http://www.fujielectric.com/>

C4

Fuji has engaged in the thermal power plant business through the planning, design, procurement, construction, commissioning and after sales service, ever since we delivered the first steam turbine generator unit in 1959.

Fuji has promised to realize the plant design by Client requirements and high-efficiency and availability for several kind of thermal power plants of coal-fired power plant, combined power plant and co-generation power plant etc..

Fuji is a leading company in the geothermal power generation industry and has supplied geothermal power generating facilities worldwide. Geothermal energy is the renewable energy and its utilization will grow to reduce CO₂ emission.

GE Power



C5

<https://www.gepower.com/>

GE Power is a world leader in power generation with deep domain expertise to help customers deliver electricity from a wide spectrum of fuel sources. We are transforming the electricity industry with the digital power plant, the world's largest and most efficient gas turbine, full balance of plant, upgrade and service solutions as well as our data-leveraging software. Our innovative technologies and digital offerings help make power more affordable, reliable, accessible and sustainable.
Headquartered in Schenectady, N.Y

Hitachi Zosen Corporation

C6

<http://www.hitachizosen.co.jp>

Hitachi Zosen Corporation was founded in 1881 originated from Shipbuilding, now being diversified to Waste to Energy system, Desalination system and other infrastructure related businesses including power plant business, with approx.9,000 employee throughout the world. In the gas-fired power plant business, Hitachi Zosen is able to offer not only turn-key service of construction but operation and maintenance services, supported by its own IPP business for more than 15years. Currently built and operate 2 units of 110MW GE-based GTCC plants in Ibaraki prefecture, Japan. This all inclusive service brings customer promised and stable project earnings in long term basis.

Honda R&D Co., Ltd.
Aircraft Engine R&D Center

C7

http://world.honda.com/RandD/wako_e/

Aircraft Engine R&D Center carries out technology research and product development in order to generate the world's No.1 compact gas turbine engines for the business aviation industry. In 2004, GHAE, a joint venture company with General Electric Co., one of the world's leading jet engine manufacturers was established, and the development of HF120, production engine for business jet commenced. In December 2013, FAA Type Certificate was issued for HF120. Now HF120 is installed in HondaJet playing a key role in its high performance. Honda has continued to pursue research for the future so as to deliver high-performance, high-quality product.



<https://www.idaj.co.jp>

C8

IDAJ was established in 1994, and our major business area is CAE (Computer Aided Engineering) which include CFD (Computational Fluid Dynamics), FAE (Finite Element Method), Optimization, and other simulation methodologies. We also provide engineering consulting services which enable our customers to conduct complex simulations for gas turbines such as fuel spray injection, turbulence, and combustion including exhaust gas emissions. Since 2013, we have formed collaboration relationship with Convergent Science Inc. who develop general purpose CFD code CONVERGE™ with innovative features which including fully automated mesh created at runtime, AMT (Adaptive Mesh Refinement), advanced turbulent modeling, fuel spray modeling, and combustion modeling.

CONVERGE employs SAGE detailed chemistry solver which enable us to predict complex phenomenon such as extinction, ignition, and exhaust gas emissions. LES and RANS solver offers the ability to study transient phenomena easily and efficiently. Combination of AMR, LES/RANS turbulent model, and SAGE detailed chemistry solver allow us to predict ignition, flashback, LBO (Lean Blow Off), and NOx, CO, and soot emissions in gas turbines.



IDAJ CO., LTD.

IHI Castings Co., Ltd.(ICC)

C9

<http://www.ihl.co.jp/icc/>

IHI Castings Co., Ltd.(ICC) manufactures heat-resistant alloy precision castings used for aircraft jet engines, industrial gas turbines, space equipment, turbocharger for vehicles and ships, general industrial equipment and such.

Since its establishment as Ishikawajima Precision Casting Co., Ltd. in 1977, we have been manufacturing and providing precision casting materials. Also, to address the growing demands, we have enhanced the production capacities of Soma and Matsumoto Plants by promoting efficiency of production lines. We will put more effort into new techniques including powder metallurgy and additive manufacturing along with precision casting, and continue to offer excellent products of near-net-shape and net-shape materials.

IHI Compressor and Machinery Co., Ltd. (ICM)

C10

<http://www.ihl.co.jp/icm/index.html/>

IHI Compressor and Machinery Co., Ltd. (ICM), as a member of IHI group, provides comprehensive engineering solutions from manufacturing industrial compressors, marine turbochargers and hydraulic motors for deck cranes to engineering, designing, installing and maintenance of plant facilities.

Our experience and expertise in rotating machinery has been gained through years of manufacturing jet engines and turbochargers. We have been manufacturing compressors since 1970 and as many as 7000 compressors have been delivered to date. Also, ICM compressor lineup covers from 75kW to 1800kW and can meet wide range of customer requests like oil-free option for ecological purpose.

IHI Corporation

C11

<http://www.ihl.co.jp/>

<http://www.ihl.co.jp/powersystems/english/index.html>

1. Energy & Plant Operations

IHI offers a variety of gas turbines with power output per unit from 2 MW to 40 MW, to provide appropriate power generation system to customers with the customization and optimization of the power generation system to meet their needs.

2. Defense System Div.

IHI participates in the development and manufacture of main propulsion and power generators on naval vessel applying aero-derivative gas turbines. In addition, IHI is in charge of the maintenance and repair of these gas turbine engines, contributing to the stable operations of the Japan Maritime Self-Defense Force.

IHI Inspection & Instrumentation Co., Ltd.

C12

<http://www.iic-hq.co.jp/>

IHI Inspection & Instrumentation Co., Ltd. (IIC) is a fully owned subsidiary of IHI. In 1974, the quality management and inspection functions of IHI were spun off to establish IIC. Therefore, from the outset, IIC has been employed many top-level experts in various fields such as sophisticated inspection technology, material and chemical analysis, strain and vibration measurements, stress and fatigue diagnostics and conduct of advanced tests using huge wind tunnels, vibration stands or other facilities. Moreover, we have an organization for developing and manufacturing state-of-the-art inspection instruments and equipment.

IHI Jet Service Co., Ltd.(IJS)

C13

<http://www.ihico.jp/ijs>

IJS provides services and maintenances of Gas Turbines Equipment developed and manufactured by IHI, supports to design and manufacture of Aero-engines and Space Equipment, and maintenances of Industrial Plants.

Based upon high-quality technology which IJS had developed and know-how which IJS had accumulated through their business, IJS also develops and manufactures Mobile Gas Turbine Generator and Aircraft Rinse System.

We continue to make an effort to create customer's delight through our assured technology and our thoughtful service, and contribute to realization of wealthy and happy society.

Japan Aerospace Exploration Agency

C14

<http://www.aero.jaxa.jp/eng/>

Aeronautical Technology Directorate of Japan Aerospace Exploration Agency (JAXA) is pursuing various R&D programs on three key words, "Environment", "Safety", and "Frontier", while continuing to research the aeronautical sciences and basic technologies. One of them is the aFJR (Advanced Fan Jet Research) project. The aFJR puts special emphasis on increasing the environmental compatibility of "fans" and "low-pressure turbines" because Japanese aircraft engine manufacturers have a backed record of developing and supplying these engine components. "Green engine technology" is another R&D initiative for high-pressure systems and core engine technologies. Its aim is to obtain technologies for small and powerful core engines as efficient, clean, and quite as the latest large size jet engines.

Japan Internal Combustion Engine Federation

C15

<http://www.jicef.org/>

Japan Internal Combustion Engine Federation (JICEF) was founded in 1954, which is the Secretariat of Japanese National Member Association (NMA) for CIMAC (International Council on Combustion Engines), and also the Secretariat of JICESC, Japan Internal Combustion Engine Standard Committee for ISO, which consists of national committees for ISO/TC70 (Technical Committee on Internal Combustion Engines in ISO, International Organization for Standardization) and ISO/TC192 (Technical Committee on Gas Turbines in ISO).

JICEF is having very active and important roles for communications, co-ordination of opinions for common interests, promotion of mutual friendship etc. among manufacturers, users and neutral experts on reciprocating internal combustion engines and gas turbines.

Japan Patent Office



JCN 2000012090003

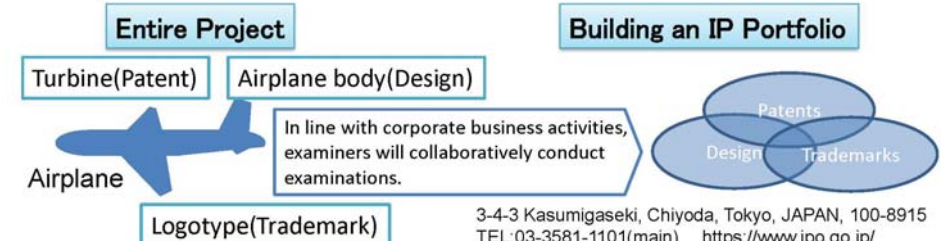
C16

We are dedicated to providing excellent services.

1. Circuit Examination through Interview
-JPO examiners will reach users to conduct interview for patent applications.



2. Collective Examination for IP portfolio supporting Business Strategy
-A team of JPO examiners will conduct cross-sectionally examinations of multiple IP applications (patent, design, trademark), which will be developed into businesses inside and outside Japan.



3-4-3 Kasumigaseki, Chiyoda, Tokyo, JAPAN, 100-8915
TEL: 03-3581-1101(main) <https://www.jpo.go.jp/>

Japanese Aero Engines Corporation

C17

<http://www.jaec.or.jp/>

The Japanese Aero Engines Corporation was established to coordinate and manage the overall progress of multi-national collaboration programs in 1981 under the guidance of the Ministry of International Trade and Industry (presently known as Economy, Trade and Industry) with the IHI Corporation, Kawasaki Heavy Industries, Ltd., and Mitsubishi Heavy Industries, Ltd. It is the Japanese business entity charged with promoting international collaborations for Japanese national projects to develop and produce engines for civil aircraft such as V2500 and PW1100G-JM.

Kawasaki Heavy Industries, Ltd.

C18

<http://global.kawasaki.com>

The origin of Kawasaki's gas turbine business is dating back to 1943, the success of first test flight of type "Ne-0" engine which is developed by Kawasaki. Nowadays, Kawasaki supplies helicopter engines to Japan self-defense force. Also, Kawasaki has been participated several international development programs for commercial airline engines. Furthermore, in order to utilize the technology developed through manufacturing of jet engines, Kawasaki started to manufacture the industrial gas turbine named "Kawasaki Gas Turbine". Kawasaki has wide range of line up from 150kW to 30,000kW and it has been installed all over the world.

Maruwa Electronic Inc.

C19

<http://www.maruwa-denki.co.jp/>

Maruwa Electronic Inc. (MEI) has gone forward surely infinite and unique development for a high speed rotation apparatus and combustion chamber. Our product and service are essential to the design calculation and material integrity for new design, performance and reliability important.

MEI always looks steadily at future and responds surely quickly to the customer's requirement. MEI has grown due to receiving deep trust from our customers. MEI strives for even greater development and contributes a society even increasingly, under the theme of customer satisfaction.

Metal Technology Co. Ltd.

C20

<http://www.kinzoku.co.jp/english/index.html?lid=1>

Metal Technology Co. Ltd. (MTC) was founded in 1960, and now are providing integrated manufacturing systems of metal parts by HIP treatment, Vacuum Heat treatment, Diffusion Bonding, Machining, Brazing, Welding and Additive Manufacturing to meet the rapidly changing needs of various industries including Aerospace and Industrial Gas Turbines as a Specialist Service Provider for customers worldwide from our 7 plants located in Japan and 1 plant in Suzhou in China.

E-mail info@kinzoku.co.jp

Mitsubishi Hitachi Power Systems, Ltd. C21

<https://www.mhps.com/en/>
<http://www.mhpowersystems.com/>
<http://www.pzca.mhps.com>

Mitsubishi Hitachi Power Systems, Ltd. (MHPS) is a company formed in 1st February 2014 integrating the thermal power generation systems business of Mitsubishi Heavy Industries, Ltd. (MHI) and Hitachi, Ltd.

MHPS offers a wide variety of gas turbines to satisfy its global customers. Proven and reliable gas turbines demonstrated in our verification facility in the range from 28 MW to 470 MW provide you value added and attractive solution not only for power business but also for the other industries such as oil and gas. Please visit our website and GTSJ booth for the detailed information.

MITSUI ENGINEERING & SHIPBUILDING CO.,LTD. C22

<http://www.mes.co.jp/>

We, Mitsui Engineering & Shipbuilding Co., Ltd. (MES) started research of developing the industrial gas turbine from 1950, and delivered the first machine in 1954. After that we keep proposing a gas turbine according to the customer's various requests.

SB series (our development gas turbine):
1MW-24MW, can use the byproduct gas from a refinery, etc..

The MSC series (Solar Turbines' gas turbine):
3-14MW class, simple cogeneration system

The MACS series (Solar Turbines' gas turbine): 7-18MW class, the combined cycle

Nakakita Seisakusho Co., Ltd. C23

<http://www.nakakita-s.co.jp/>

Since foundation in 1930, we have been engaged in research and development of fluid control system with a central focus on valves, and aspiring to be a company, which can make best proposals to customers ahead of the needs of the times.

We're producing valves for gas turbine as an overall manufacturer. Products line-up you can use at the wide process, including high/low-temperature and high-pressure line. We can supply high quality control valves (pneumatic/hydraulic/servo/electric-motor operated), butterfly, self-operated and safety valves, which has been verified by our high-accuracy inspection facilities including precise Cv measurement and are applicable to customer's various requests.

Turbomachinery Group, Research Institute for Energy Conservation, Department of Energy and Environment, National Institute of Advanced Industrial Science and Technology C24

<https://unit.aist.go.jp/energy/tmrg/>

As the primary technologies supporting the distributed energy network system, following subjects are studied: (1) Novel turbomachinery systems, (2) Various device technologies and control technologies and (3) Material processing technologies. Coping with those technologies, optimum ways to suppress fossil fuel dependency and adopting clean energy are explored. Recent topics are the followings; Ammonia fueled gas turbine, Flow controlling by DBD plasma actuator, Suspension plasma spray using twin cathode plasma spray gun.

Key words: Gas Turbine, Heat Resistant Material, Active Flow Control Device, Cycle Analysis, Cogeneration, Thermal spray, CMC, A-IGCC, A-IGFC

Niigata Power Systems Co., Ltd.

C25

<http://www.niigata-power.com>

Niigata Power Systems Co., Ltd. (NPS) is a Japanese diesel engine manufacturing company. Since 1895 Niigata Engineering Co., Ltd of predecessor was founded, NPS have contributed to the industrial development in the world, for example the development of the Japan's first marine diesel. NPS mainly produces diesel and gas engine, gas turbine, and Z-Peller (Z drive azimuth thruster) which are utilized for electric generator, seagoing vessel, and locomotive train. NPS also builds generator packages by using its productions or other companies' (e.g. Solar Turbines, IHI) engines.

NIPPON KAIJI KYOKAI (Class NK)

C26

<http://www.classnk.com>

ClassNK is a ship classification society dedicated to ensuring the safety of life and property at sea and protecting the marine environment. With more than 230 million gross tons, or some 20% of the world's merchant fleet on register, ClassNK is one of the world's largest classification societies on a gross tonnage basis.

Based in Japan, ClassNK is a global organization committed to providing the highest quality services, supporting clients 24/7 through a service network of 130 exclusive survey offices worldwide.

Nippon Muki Co., Ltd.

C27

<http://www.nipponmuki.co.jp>

We make new clean value and help to control the clean environment as leading company of air filter.

Air filter protects air compressor from dust and prevents for drop of the generation efficiency.

We started the sales to Gas Turbine (GT) customer from 1993. Now many GT customer in Japan are using and satisfying our products.

Air filter for GT are requested as high efficiency and long life. Because we have a lot of filter lineup, technical knowledge, and experiences, we can propose the best filter based on the customer's environment and request. Please feel free to contact us.

Osaka Yakin Kogyo Co.,Ltd.

C28

<http://www.osakayakin.co.jp>

Based on technology cultivated for over 70 years, we offer vacuum heat treating, vacuum brazing and surface modification for heat-resisting alloys used of gas turbine. We also produce complex shaped parts by metal injection molding.

Heat treatment

Treated products exhibit their performance sufficiently, and meet the specifications with a sufficient margin because of controlling technique of narrow temperature range and cooling rate. We achieve prompt and precise response by maintenance of equipment by ourselves.

Metal Injection Molding

We supply complex shaped parts with high quality by using know-how and series of techniques including powder production, molding, debinding, sintering and inspection.

 **PENTAIR**
PENTAIR TECHNICAL SOLUTIONS JAPAN CO.,LTD.

C29

CapaciSense

www.capacisense.com/

CapaciSense systems combine blade tip clearance and vibration monitoring using high bandwidth electronics to provide two sets of data from one state-of-the-art turbine sensor. With sensors (probes) that are able to withstand temperatures of 1400 deg-C/2550 deg-F, CapaciSense systems enable you to monitor at turbine temperatures in continuous operation.

We provide 5series FM system and new SOLO system to measure a tip clearance and tip timing. Then we provide AM system to measure a continuous surface such as a shaft or shrouded blades.

CapaciSense systems are used in gas turbines within the power generation and aerospace industries, although they are also suitable for other applications where a conventional proximity probe would not survive the environment.



contact us:

PENTAIR TECHNICAL SOLUTIONS JAPAN CO.,LTD.

3F YS Shin-Yokohama Building, 2-15-10, Shin-Yokohama, Kohoku-ku Yokohama, Kanagawa, 222-0033, Japan
tel. +81-45-471-7630 fax. +81-45-471-7631

 **SHINWA CORPORATION**

C30

Shinwa Corporation

<http://www.shinwatec.co.jp/en/index.html>



We and main factory as Japan Air Filter corporation are engineering / trading company specializing in air filtration products and related equipment so we are taking the part of traction of this industry.

We are supporting our customer to improvement GT performance such as GT out put, Heat Rate Value by good performance of our Air filter products.

Please let us know your concern issue.

1-32-2 Honcho Nakano-ku, Tokyo,Japan
info@shinwatec.co.jp

Sophia Precision Corp.

C31

<http://www.sophiajet.com>

Sophia Precision Corp. develops and produces Jet Engines in the 10kW micro gas turbine and 85N thrust turbo Jet Engine specially for educational markets worldwide. Sophia Precision can supply numerous variations, like liquid fuel or gas fuel, electric generator or eddy current dynamometer, and can monitoring many inspection points. All systems are controlled with Labview® and its data acquisition allows you to study how the jet engine works.

 **TOKYO GAS
ENGINEERING SOLUTIONS**

C32

<http://www.tokyogas-es.co.jp/en/>

Energy Advance Co., Ltd. and Tokyo Gas Engineering Co., Ltd. merged on April 1, 2015 and started a new chapter in their history as Tokyo Gas Engineering Solutions Corporation.

We are a provider of comprehensive energy solutions to make your facilities more energy efficient using renewable energy. Our approach include smart energy networks with concept of “local production local consumption of heat and electricity” based on cogeneration system. We also help customers meet engineering requirements of LNG receiving terminals and city gas distribution network.

Our mission is to contribute to sustainable, safe and stable society through engineering solutions.



<http://www.ethosenergygroup.com>



TOMINAGA & Co.,Ltd. was founded in 1939, and our Gas Turbine business has more than 30 years of history.

EthosEnergy, whom Tominaga has served as distributor, is a joint venture between Wood Group GTS and TurboCare of Siemens group. EthosEnergy is a leading independent service provider of rotating equipment services and solutions to the power, oil & gas and industrial markets.

Globally, these services include power plant engineering, procurement and construction; facility operations & maintenance; design, manufacture and application of engineered components, upgrades and re-rates; repair, overhaul and optimization of gas and steam turbines, generators, pumps, compressors and other high-speed rotating equipment.

Their products and service will provide the maximum cost merit for customers. It is not only brought by low initial cost but also their high-standard technologies which make turbines operation optimized truly. "Delivering 15% life cycle value improvement on your power generation and mechanical drive assets", they state loudly.

Tominaga Co.,Ltd (<http://www.english.tomco.co.jp>)
Tel: +81-3-3639-5315 Fax: +81-3-3639-5360

C33

富永物産株式会社

Toshiba Corporation

C34

<http://www.toshiba.co.jp/index.htm>

Toshiba Eco Technologies Give Energy to the Future

Supplying the world's expanding energy needs.

Meeting the world's growing environmental needs.

Toshiba power generation technology for geothermal, hydroelectric, wind and other renewable sources is smart for the future: stable supply of sustainable energy.

Our goal is No. 1 environmental performance in every product we manufacture.

For a growing world and a sustainable society, Toshiba is at the forefront of environmental technology.

Toshiba Plant Systems & Services Corporation

C35

<http://www.toshiba-tpsc.co.jp/>

Toshiba Plant Systems & Services is a comprehensive engineering constructor that globally carries out integrated operations ranging from planning and engineering to procurement, construction and field services. Using our solid technological capabilities as a foundation, we aim to offer technologies and quality that accurately respond to the voices of our customers. By doing so, we seek to achieve further growth and development as a company that is widely trusted and chosen by people in Japan and overseas.

Toyota Motor Corporation

C36

TOYOTA

<http://www.toyota-global.com/>

Toyota started development of the automotive gas turbine in 1964. The idea of "the gas turbine hybridization" was succeeded to the PRIUS. The technologies developed since have been utilized for the automotive turbocharges and other products of Toyota Turbine and Systems Inc. We continue to pursue R&D for various applications of the gas turbine, including potential for use in future mobility. I would appreciate any advice members and supporting members of the Gas Turbine Society of Japan may provide.

C37

TURBO SYSTEMS UNITED

An ABB and IHI joint venture

Turbo Systems United Co., Ltd. (TSU) is a joint venture between ABB and IHI established on October 1st, 1998.

TSU's mission is to provide highest quality products and service, based on the knowledge and experience gained over several decades.

TSU is headquartered in Tokyo and service stations are located in Tokyo, Kobe, Onomichi and Fukuoka, also service point in Hakodate. Each Service Station provide maintenance, overhaul, and repair works for ABB and IHI turbo chargers.

C38

Woodward Japan Ltd.

<http://www.woodward.com/Application-IndustrialTurbine.aspx>

Since 1870, Woodward Inc. has been developing Aero and Industrial Control Systems for the Gas Turbine market. Woodward supplies reliable products and services to customers world-wide. Woodward's market-leading portfolio contains controllers, metering valves, geometric actuators, and fuel nozzles for application in heavy frame turbines, aero-derivative engines, as well as Small and Micro gas turbines. Visit our website to find the optimum solution for your gas turbine.

Woodward Japan Ltd.
WBG Marive West 19F, 2-6-1 Nakase,
Mihama-ku, Chiba-shi, Chiba 261-71119 Japan



Universities

Hosei University
Fluid Engineering Laboratory
Department of mechanical engineering
Professor Hoshio Tsujita

U1

<http://mech.ws.hosei.ac.jp/004.html>

The research subjects in the fluid engineering laboratory at Hosei University are emphasized on the internal flow and the performance characteristics of turbomachine. The recent research programs concerning the axial turbine are the investigation of the internal flow behavior in the highly loaded turbine cascades with high turning angle by the experimental and the numerical methods and the numerical study for the transpiration cooling. Those for the centrifugal compressor are devoted to the control of the rotating stall and the surge, and the numerical analysis for the effects of the tip leakage flow on the loss generation.

Kansai University
Thermal Engineering Laboratory,
Department of Mechanical Engineering

U2

http://www.kansai-u.ac.jp//English/academics/fac_eng.html

Fundamental researches on film cooling, impingement jet cooling, endwall heat transfer, and ribbed and pin-fin channels, are being performed by Large Eddy Simulations (LES) validated by wind tunnel test. We are developing an in-house LES program with a SGS model developed in Japan, which can simulate our low-speed wind tunnel tests of complex turbulent flows and heat transfer in gas turbines. Our goals are (1) to clarify the basic mechanism of complex heat transfer in gas turbines, (2) to control flow and heat transfer to minimize entropy generation, and (3) to develop advanced cooling technologies for coolant flow reduction.

Kyoto University
Environmental Fluids and Thermal
Engineering Lab., Dept. of Mechanical
Engineering and Science
Associate Prof. Ryoichi KUROSE

U3

<http://www.fluid.me.kyoto-.ac.jp/members/kurose/hpci.html>

The principal objective of our Lab is to physically understand turbulence and transport phenomena appearing in industrial and environmental flows. Particular emphasis is placed on the chemical reaction and combustion seen in many engineering applications such as engines and energy conversion devices. Gaseous/spray/pulverized-coal combustion including pollutant emissions are targeted. Recently, large-eddy simulations (DNS) and direct numerical simulations (DNS) of such turbulent gaseous, spray and pulverized coal combustion fields in several combustors and furnaces have been carried out by massively-parallel computing using K computer. For further details, see <http://www.fluid.me.kyoto-.ac.jp/members/kurose/hpci.html>

Kyoto University
Thermal Engineering Laboratory
Department of Aeronautics and
Astronautics
Kyoto 615-8540, Japan

U4



<http://te.kuaero.kyoto-u.ac.jp/>

Prof. Hideo YOSHIDA Assoc. Prof. Hiroshi IWAI
Assist. Prof. Motohiro SAITO Assist. Prof. Masashi KISHIMOTO

We are currently studying transport phenomena in solid oxide fuel cells (SOFCs) and catalytic combustors. In particular, to improve the performance and durability of SOFCs, microstructure of porous anode/cathode are investigated by using a focused ion beam and scanning electron microscope (FIB-SEM). Numerical simulations are also conducted for the thermofluid and electrochemical fields. In view of energy carrier, studies on ammonia are ongoing with special emphasis on decomposition/reforming reactions. Previously, we also made performance analyses for hybrid systems consisting of GT and SOFC, and experiment on a novel bearing aiming at an application to micro GT.

Aerospace Propulsion Laboratory,
Department of Aeronautics and Astronautics,
Kyushu University

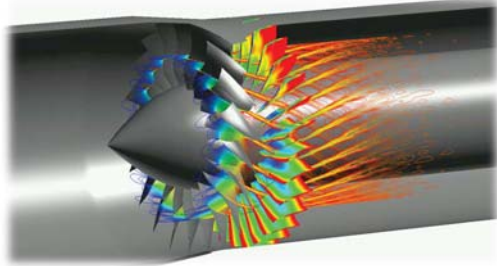
<http://www.aero.kyushu-u.ac.jp/apl/>



In Aerospace Propulsion Laboratory, many studies related the fluid dynamics and thermal engineering of airbreathing engines are executed. One of the main research topic is the fan noise prediction and active control. In the fan noise prediction, the hybrid method of CFD and the modal decomposition is used, and good agreement with experiment is obtained. In the active control of fan noise research, the optimal anti-sound of the target sound modes is successfully generated to reduce the fan noise. Other research topics are the linear unsteady CAA in the frequency domain for the sound propagation and radiation, the CFD of the flutter of turbomachinery, the aerodynamics of the small centrifugal compressors for automobile turbochargers, etc.



Experimental Fan Test Rig for
Active Fan-Noise Control



Total Pressure Distribution due to Rotor/Stator
Interaction for Sound Pressure Evaluation using CFD

Kyushu University
Department of Mechanical
Engineering, Faculty of Engineering,
Reactive Gas Dynamics Laboratory

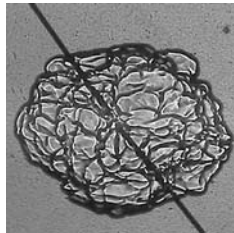


U7

Prof. Toshiaki Kitagawa
Asoc. Prof. Hiroaki Watanabe
Assist. Prof. Yukihide Nagano

toshi@mech.kyushu-u.ac.jp
whiroaki@mech.kyushu-u.ac.jp
y_naga@mech.kyushu-u.ac.jp

Combustion Phenomena are studied in Reactive Gas Dynamics Laboratory. Our interests include not only conventional fuels but also alternative and next-generation fuels such as carbon neutral biomass, coal gasification syngas and hydrogen. We investigate the fundamental and practical aspects of combustion properties and techniques by experiments and numerical simulations. Our studies contribute to developments of automobile and gas turbine engines, combustors and boilers in industries.



Premixed flame propagation
in a pressure vessel

Visit <http://www.mech.kyushu-u.ac.jp/~rgd/index-e.html>

Kyushu University
Department of Mechanical Engineering,
Fluid Science Laboratory

U6

<http://fe.mech.kyushu-u.ac.jp/index-j.html>

The research topics in the Laboratory include: unsteady flow phenomena in turbomachines such as the rotating stall and the surge in axial and centrifugal compressors, aerodynamic noise in fans, design of wind-lens turbine, aerodynamic optimization of turbomachines, advanced turbomachinery design with an innovative approach, development of optical measurement (PSP: pressure sensitive paint) technique for low speed flow. Much of the research has been conducted as collaborative projects with industries and consortium research.

Nagaoka University of Technology
Professor OKAZAKI Masakazu

U8

<http://mcweb.nagaokaut.ac.jp/~okazaki/iamutHP/>

Research activities

- * Structural and/or functional reliability of superalloys,
 - * Thermo-Mechanical, Low- and High- cycle Fatigue of Thermal Barrier and Protective Coatings,
 - * Evolution and Non-Contact Evaluation of CMAS Damage,
 - * Friction Stir Welding of Heat Resisting Materials.
- and,
- * Utilization Technology of Bio-Mass Resources for Energy Systems.

Osaka Institute of Technology
Mechanical Engineering Department
Turbomachinery Laboratory
(Kawata Laboratory)

U9

<http://www.oit.ac.jp/med/~kawata/index.html>

Research topics of the turbomachinery laboratory concerning the gas turbine are as follows:

- (1) Turbine aerodynamics for the reduction of the secondary flow loss. 3D fence is developed to reduce the secondary flow loss
- (2) Internal convection cooling of the turbine blade with improved rib turbulator. Combined system of internal and external cooling by enhanced vortex
- (3) Efficiency enhancement of radial compressor and the method to reduce surge area and simulation of surge phenomena
- (4) 3D blade design of axial fan and propeller fan to improve performance and to reduce noise. Especially innovative design concepts to improve performance of the gas turbine is pursued as research object

Teikyo University
Joint Program Center
Applied Fluid Dynamics & Energy
Machinery Systems

U10

<https://www.e-campus.gr.jp/staffinfo/public/staff/detail/1503/160>

The objective of research and development activities in Joint Program Center of Teikyo University is to create valuable products, components and technology for global society and industry through objective oriented cooperative programs with manufacturing companies, universities and research institutes.

Our scopes of research and development are

1. Energy Machinery Systems: Collaborative programs are underway to increase steam turbine efficiency with the development of high-performance blade and exhaust diffuser design methodology using large-scale aerodynamic and structural interaction analysis.
2. Applied Fluid Dynamics: CFD and structural analysis of arteries with cerebral aneurysms and nasal passages.

Jet Propulsion Laboratory
The University of Tokyo



U11

<http://webpark1362.sakura.ne.jp/?lang=en>

Jet Propulsion Laboratory in the University of Tokyo (UTJPL) executes fundamental researches in the area of thermo-fluid dynamics in jet engine and rocket systems through experimental, computational, and theoretical approaches. The recent research programs include flow-induced vibration of transonic fan, detailed unsteady behavior of compressor flow, humid air flow in compressor, broadband fan noise, two-phase flow phenomena in liquid rocket system, sloshing, liquid atomization, bio-fluid mechanics, and so on. The laboratory is widely opened to the global collaboration with institutes and industries.

Professor: Toshinori Watanabe, Associate Professor: Takehiro Himeno
Project Associate Professor: Chihiro Inoue, Assistant Professor: Yasunori Sakuma
Research Engineer: Seiji Uzawa

The University of Tokyo
Dept. of Aeronautics & Astronautics,
Teramoto-Okamoto Lab.

U12

<http://www.thermo.t.u-tokyo.ac.jp>

Our research interest is to understand basic flow physics of variety of flowfields related to aerospace propulsion and turbomachinery.

Current research topic includes high-resolution large-eddy simulation of tip clearance flow, acoustics from supersonic impinging jet, turbulence of cryogenic supercritical flows, shock wave / turbulent boundary layer interaction, cycle analysis and design study of new concept rotating machines such as wave rotor Tesla pumps.

Faculty members: Associate Professor Susumu Teramoto, Associate Professor Koji Okamoto, Assistant Professor Kazuo Yamaguchi

Advanced Aeropropulsion Laboratory The University of Tokyo

U13



<http://www.aeroeng-lab.t.u-tokyo.ac.jp/english/>

Members: Project Professor: Toshinori Watanabe, Project Researcher: Atsushi Tateishi

Advanced Aeropropulsion Laboratory (AAL) is a social collaboration laboratory based on a collaborative study between IHI Corporation and the University of Tokyo, located in the University of Tokyo.

Present project is intended to create an advanced and fundamental technology and to foster human resources for developing a safe, highly environmentally compatible and innovative aeropropulsion system which is inevitable for the future air transport to be broadly-accepted and to accomplish sustainable growth. The research topics are as follows:

- Environmental compatibility
- Energy management
- Manufacturing technology

Along with these research activities, AAL is working on education and promotion of cooperation among government, industry and academia.

Tohoku University Prof. Satoru Yamamoto Laboratory of Mathematical Modeling and Computation, Department of Computer and Mathematical Sciences

U14

<http://www.caero.mech.tohoku.ac.jp/>

Our laboratory studies numerical methods and develops the computational codes on multi-physics CFD (MPCFD). MPCFD is a research field where flows with additional complex physics are resolved by numerical simulation. Two typical in-house codes are now being developed. Numerical Turbine: code for simulating unsteady 3-D flows of moist-air and wet-steam through multi-stage stator-rotor blade rows considering nonequilibrium condensation. This code can apply to not only steam turbines but also gas turbines with humidity. Supercritical-fluids Simulator (SFS): code for simulating supercritical-fluid flows. Several substances such as water and carbon dioxide in gas, liquid and supercritical states with critical point can be taken into account.

Tokushima Bunri University (TBU) Takeishi Laboratory, Department of Systems Control Engineering, Graduate School of Engineering

U15

<https://www.bunri-u.ac.jp/en>

Takeishi Laboratory was relocated major laboratory equipment from Osaka University in 2014, and started research on gas turbine heat transfer etc. in TBU. The following experimental and numerical research items are investigated.

- *Higher efficient film cooling configurations and the mechanism of its high efficiency
- *Heat transfer and film cooling on the endwall of high loaded vanes and blades
- *Improvement of heat transfer coefficient of an impingement cooling, turbulent ribs and pin fin etc.
- *Heat transfer on the rotating flow passage.
- *New experimental methods to investigate gas turbine heat transfer, such as X ray CT, MRI, LIF, PIV etc.

Tokyo Institute of Technology

U16

Assistant Professor Yu Ito, Dept. of Mechanical Engineering



<http://www2.es.titech.ac.jp/ito/index.html>

Aviation engines are strongly desired to reduce CO₂, carbon dioxide, emission in the worldwide trend of CO₂ reduction. Gas turbine engines are bound to remain as aviation engines by 2040 at least because of its high power density and no alternative engine. Then, the aviation gas turbines definitely have to enhance their efficiency and to reduce fuel consumption. One of the likely solutions is an ICR, intercooled and recuperated, jet engine. Some researchers have confirmed that the SFC, specific fuel consumption per thrust, certainly decreased by employing an intercooler and a recuperator; however, the fuel burnt, fuel consumption per flight, rose because of weight increase. Therefore, to decrease an ICR engine weight, Ito proposed a new concept of an ICR jet engine using existing airfoils, such as compressor stators and guide vanes, as heat exchangers. Their outer shapes are airfoils for working air in a gas turbine, and their inner shapes are circular for HTM, heat transport medium. Some airfoil heat exchangers are installed in a hot section (a compressor or a core nozzle), and the other heat exchangers are installed in a cold section (a bypass duct or a combustor inlet). The HTM transports heat between a pair of the heat exchangers. In this concept, the intercooler and recuperator require no additional space except connecting tubes for the HTM between the heat exchangers. Furthermore, an airflow path can remain at almost the same position as that in a baseline engine. To evaluate feasibility of this concept, our group has experimentally investigated heat transfer performance of the airfoil heat exchangers. In the previous studies, our group revealed heat transfer rates on air-contact surfaces, heat transfer rates on HTM-contact surfaces, and thermal resistance of the airfoil heat exchanger. Currently, using this information, a new ICR jet engine is designed, and its performance, weight, and feasibility are theoretically evaluated.

Tokyo Metropolitan University Combustion and Propulsion Laboratory

U17

<http://www.comp.sd.tmu.ac.jp/comb/index.htm>

Our research mainly focuses on the development of hybrid propulsion and micro gas turbine applications. Fundamental combustion topics related to these applications are also studied. The laboratory has a rocket engine test cell enabling up to 1.5 kN thrust and a combustion experiment room.

Research topics:

- Swirl-flow Hybrid Rocket Engines
- Combustor development for Micro Gas Turbines
- Propulsion applications of detonations and high-speed flames
- Fundamental combustion: meso-scale combustion, Lean-premixed pre-vaporized combustion of kerosene using porous media

Member: Takashi SAKURAI (PI, Assoc.Prof.), Graduate students (Master: 7), Bachelor students: 4

Tokyo University of Agriculture and Technology Thermal Fluids Engineering Lab. (Prof. Akira Murata) Department of Mechanical Systems Engineering

U18

<http://www.mmlab.mech.tuat.ac.jp/>

We carry out the researches on various heat/thermal problems as follows:

- 1) Effective cooling of gas turbine elements for higher thermal efficiency and CO₂ reduction (film cooling of airfoil trailing edge, internal cooling enhancement of turbine blades by using dimpled surface, and effusion cooling of combustor liner wall)
- 2) Development of high performance heat exchanger for environment-friendly energy conservation (heat transfer enhancement by using vortex generators and dimples)
- 3) High performance heat transport device utilizing phase change applicable to heat spreader for electronic/electric device cooling (parallel tube heat transport device with spontaneously induced internal flow)

Tokyo University of Science Department of Mechanical Engineering Yamamoto CFD Labo.

U19

<http://www.rs.kagu.tus.ac.jp/yamamoto/index.html>

Multi-physics CFD (Computational Fluid Dynamics) simulation will be one of key technologies in research and development of various machines in near future. We are challenging to construct multi-physics CFD codes to reproduce a lot of multi-physics phenomena such as icing, sand erosion, particle deposition and so on, which can often be observed in a jet engine. The developed codes have successfully be applied to fans, compressors and turbines. The numerical results provided us useful knowledge that it is too difficult to obtain by experiments.

Waseda University

U20

Aerospace Transportation Systems Lab. (Prof. Tetsuya Sato)
Department of Applied Mechanics and Aerospace Engineering



http://www.sci.waseda.ac.jp/eng/research_profiles/fundamental/f3/2013/04/2503/

Our laboratory mainly conducts R&D of the hypersonic precooled turbojet engine to apply for hypersonic cruisers and spaceplanes in cooperation with JAXA. We are currently involved in preliminary studies such as an engine system unsteady simulation, study of supersonic inlet buzz, study of the cryogenic two phase flow, study of the frost formation on the precooler and CFD analysis of the mixed-flow compressor under the windmill condition or with temperature distorted inflow. Recently, we have proposed a Mach 5 flight experiment of a small scale ramjet vehicle using a sounding rocket called HIMICO: High Mach Integrated Control Experiment.



Precooled Turbojet Engine (Courtesy of JAXA)



High Mach Integrated Control Experiment Vehicle (HIMICO)

Waseda University

Fluid Mechanics and Turbomachinery Lab.

Department of Applied Mechanics and Aerospace Engineering

Professor Yutaka Ohta

Professor Emeritus Eisuke Oota

Unsteady flow-induced vibration and noise generated in turbomachinery systems such as rotating stall, surge, rotating instability, inlet distortion, off-designed operation and aeroacoustic noise are main targets of our research. In order to achieve high-efficient fluid machinery systems, we are conducting large-scale experiments with detailed measurements of flow field and high-precision numerical analyses of unsteady turbulent flows. Our research covers various types of rotating machinery, such as axial-flow compressors and turbines for aircraft engines, centrifugal and radial-flow compressors for turbochargers and also cross-flow and propeller type fans for ventilating systems. Further research interests include unsteady vortical structure experiments in cascade flows and unsteady data reduction systems using correlation analyses and/or wavelet transformation.

