



# **TURBINE TECHNOLOGY**

## **SERVICES CORPORATION**

### **TURBINE INSTALLATION AND REAPPLICATION SERVICES**

The relocation of a used gas turbine-generator set is very different from a new unit installation. Relocation projects are typically fast-tracked, requiring immediate equipment availability, and there is little time available for all the engineering and modification work that may be required. Page 9

### **CONVERSION, MODIFICATION AND UPGRADE SERVICES**

Turbine Technology Services Corporation can provide engineering and consulting services to include projects such as frequency conversions, fuel system conversions, emissions abatement systems, auxiliary system modification, and instrumentation and control system modification. Page 7

### **ENGINEERING AND CONSULTING SERVICES**

We offer industry-leading consulting, field and design services to gas turbine owners and operators worldwide as well as a wide range of services to utilities, independent power producers and private sector enterprises. Page 5

### **TURBINE MANAGEMENT SYSTEMS**

Our Turbine Control Systems are built on the most advanced programmable controller platforms available today and these systems are designed using the latest in distributed control philosophy. Page 11

### **GLOBAL FOOTPRINT**

Turbine Technology Services Corporation has served a diverse portfolio of clients in the international power generation marketplace. Page 3



**Gas Turbine Expertise  
You Can Count On**

## ■ OUR MISSION

Turbine Technology Services Corporation's mission is to provide gas turbine technology leadership and engineering consulting services on a global scale, supported by the longevity, experience and knowledge of solutions leading to the successful management of gas turbine installation and modernization projects, and the servicing of control components, combustion and dynamic tuning for clients' power plants anywhere our services are needed to maintain operational excellence.

## ■ OUR VISION

Our vision is to be recognized as the global engineering leader in gas turbine technology consulting services by continuing to achieve performance excellence, outstanding customer satisfaction and project success. As a premier OEM alternative in the gas turbine industry, we will continue to focus on delivering agile, responsive and creative solutions that motivate the results our clients demand and expect from a power plant industry leader.

## ■ OUR PROMISE

Through our knowledge of gas turbines, experience in engineering projects and company longevity, Turbine Technology Services Corporation and its global team of engineering professionals effectively offer the most complete set of skills, reliability, response leadership and international reach to meet the needs of the power plant industry. We accomplish this by providing cost-effective, cutting-edge engineering solutions for private and government clients who need to install a gas turbine or maintain mature equipment to extend its operational lifetime.

# TURBINE TECHNOLOGY SERVICES CORPORATION

## PG1 // Our Mission

## PG3 // Our Company

Serving the power generation industry since 1983.

## PG4 // A History of Innovative Achievement

Celebrating 25 years of engineering excellence and industry leadership.

## PG5 // Engineering and Consulting Services

We offer industry-leading consulting, field and design services to gas turbine owners and operators worldwide as well as a wide range of services to utilities, independent power producers and private sector enterprises.

## PG6 // Recently Completed Projects

Turbine Technology Services Corporation has recently completed projects in Nigeria and Mexico to improve and modernize their turbine system usage.

## PG7 // Conversion, Modification and Upgrade Services

Turbine Technology Services Corporation can provide engineering and consulting services to include projects such as frequency conversions, fuel system conversions, emissions abatement systems, auxiliary system modification, instrumentation and control system modification.

## PG9 // Turbine Installation and Reapplication Services

Turbine Technology Services Corporation is uniquely positioned with the knowledge and expertise required for successful relocation projects.

## PG10 // Turbine Technology Services Launches New Look

Turbine Technology Services Corporation has launched a new website and corporate branding.

## PG11 // Turbine Management Systems

Our Turbine Control Systems are built on the most advanced programmable controller platforms available today.

## PG12 // Modernizing Your System

Turbine Technology Services Corporation provides benefits to improving and modernizing your system.

## PG13 // Our Management Team

You can't be an industry leader without strong internal leadership. Get to know our management team.



# OUR COMPANY

## SERVING THE POWER GENERATION INDUSTRY SINCE 1983

### ■ We Specialize

Gas turbine power plants are Turbine Technology Services Corporation's (TTS) core business, and our team of engineering professionals has the specialized expertise and depth of knowledge to meet the demands of our clients in the power generation industry. From troubleshooting and upgrading gas turbine systems, to relocating entire power plants at a project's site, TTS offers specialized products and services that are tailored to our customers' needs and designed to meet their goals and objectives.

TTS knows gas turbines and our company offers OEM alternatives that can keep your project within budget without compromising exceptional results.

### ■ We Customize

TTS can customize any of our engineering solutions to address specific goals, objectives and tasks. As a versatile engineering services provider, TTS can provide complete solutions to your project— from start to finish. Given our longevity and experience, our engineering professionals are equipped to combine unique requirements into every aspect of the project plan.

TTS and our team of engineering professionals have the experience necessary to provide solutions for any customization project.

### ■ We Optimize

TTS can perform a comprehensive evaluation of your entire operation to generate detailed recommendations for increasing output, improving heat rate, improving reliability and availability, reducing operational and maintenance costs, and enhancing the lifespan of parts. Additionally, TTS offers combustion tuning and performance testing, allowing you to utilize one source for testing and tuning services.

## GLOBAL FOOTPRINT

Turbine Technology Services Corporation's engineers have worked for diverse companies in the industry all around the globe and bring this depth of knowledge and experience to our company to secure a strong global footprint in:

- Africa
- Asia
- Australia
- Europe
- North America
- South America

TTS has the versatility and agility to provide gas turbine engineering services anywhere in the world. Our team of professionals can work with local and state governments, as well as other industry partners in developing solutions that can get the job done on time, within budget and with efficiency.

### ■ Western Hemisphere

Turbine Technology Services Corporation's Western Hemisphere division covers North America, Central America, South America and the Caribbean.

The division is spearheaded by Frank Hoegler, who is responsible for the management of all business development and sales efforts in the Americas.

### ■ Eastern Hemisphere

Our Eastern Hemisphere division covers Europe, Africa, Asia and the Middle East. The division is spearheaded by Pat Begley, who manages business development and sales.



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# A HISTORY OF INNOVATIVE ACHIEVEMENT

## 25 YEARS SERVING THE POWER GENERATION COMMUNITY

Turbine Technology Services Corporation is proud to celebrate 25 years of engineering excellence and industry leadership, delivering results in the gas turbine and power generation industries.



### ■ 1983 | The Beginning

Since 1983, Turbine Technology Services (TTS) has been providing the power generation industry with high quality, cost-effective alternatives to the OEM. With more than 20 years in the gas turbine industry, TTS has offered its innovative control solutions and modernization and upgrade services to the mature gas turbine market in addition to offering a complete array of services to the industry, from state-of-the-art control components, combustion and dynamic tuning to performance testing on the latest "F" technology equipment.

### ■ 1987 | Relocation

During the 1980s and 1990s TTS relocated and modernized over 40 gas turbines throughout the world. Many of these projects required 60 - 50 and 50 - 60 cycle conversions along with modernization of gas path and ancillary systems technology. TTS gave new life to neglected simple cycle gas turbines by relocating and reapplying them in combined cycle and cogen roles.

### ■ 1987 | Powerlog Digital Data

First company to apply Powerlog digital data acquisition hardware and software to existing electro-pneumatic-hydraulic turbine controls.

### ■ 1988 | Remote Access and Support

First company to apply remote access systems to support and troubleshoot gas turbine operational failures. Ref. ASME *Extending Expertise through State-of-the-Art Monitoring*.

### ■ 1989 | High Speed Electronic Servo Valves

Pioneered application of high speed electronic servo valves to large gas turbine applications.

### ■ 1994 | Advanced Mechanical Maintenance Methods

In its early history TTS pioneered new maintenance techniques to shave up to 50% off otherwise lengthy procedures.

### ■ 1994 | Online Reference Library

In the 1990s, TTS pioneered the first comprehensive online relational reference library, known as MasterMindT. It linked the sources of all critical alarms and trips on the control screen to all documented detail and live control data related to that root cause.

### ■ 1995 | Wearable Process/Power Plant Control

First company to create wearable Human Machine Interface for wireless Process/Power Plant control.

### ■ 1998 | Dry NOx Control Fuel Systems

In 1998 TTS, together with a leading combustion hardware designer, created the first non-OEM dry low NOx type combustion system.

### ■ 1998 | Remote Worldwide Access

First to provide inexpensive integration of control platforms from diverse OEMs to provide for remote worldwide access.

### ■ 2002 | Bundled Tuning Services

TTS was the first to integrate combustion emissions, dynamics and controls tuning into a comprehensive service. Today, our team of experts tune OEM combustion systems to bring them into compliance. Precise fuel split and dilution hole changes are made in the field, saving days of potential down-time.

### ■ 2005 | Future-Proofing for Sustainability

TTS begins applying its unique experience in gas turbine technology to retrofit hundreds of existing gas turbines to burn HFO, RFO and blends of low BTU gas fuel from coal, petroleum coke and other syngases.

### ■ 2008 | Frame 7 Modifications

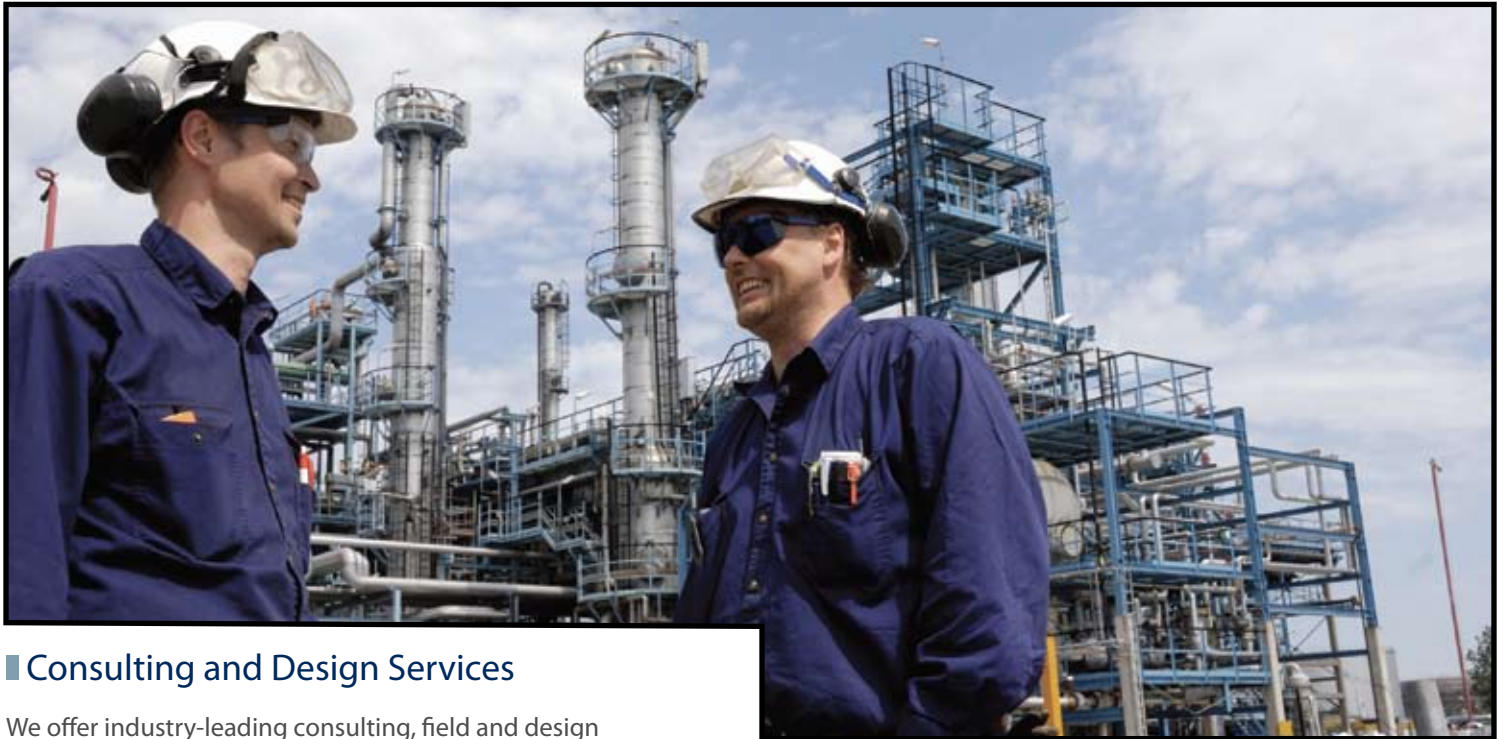
TTS has successfully undertaken the modification of Frame 7 units for 50HZ applications.

### ■ 2010 and Beyond | Industry Leadership Initiatives

We continue to increase our industry leadership through an enhanced set of products and services, along with a brand new corporate image that reflects Turbine Technology Services' outlook for success in the second decade of the millennium and beyond.

# ENGINEERING AND CONSULTING SERVICES

## INDUSTRY-LEADING CONSULTING



### ■ Consulting and Design Services

We offer industry-leading consulting, field and design services to gas turbine owners and operators worldwide as well as a wide range of services to utilities, independent power producers and private sector enterprises. Our engineering consultants deliver proactive evaluation and solutions for gas turbine owners and operators. TTS field engineers focus on implementing our effective designs, providing thorough evaluations, supervising contractors and suppliers, and coordinating all plant interfaces.

### ■ Project Management

When it comes to project management, we take a “systems approach” to every project. Our engineers can combine gas turbine enhancements into one comprehensive package. Each of our project managers brings a strong combination of experience and specialization to every major project. TTS is a proven alternative for turnkey relocation and installation projects, and our project management teams will cover all of the following aspects of a project:

- **Design Engineering**
- **Field Engineering**
- **Logistic Planning**
- **Performance/NOx Testing/NOx Tuning**
- **Craft Labor/Technicians**
- **Emissions Compliance**
- **Equipment Installations**
- **Material Acquisition**

### ■ Technical Direction

When it comes to overall gas turbine knowledge and experience, TTS is an industry leader in after market gas turbine support.

Our technical directors have an extensive knowledge in mechanical, electrical, controls and support systems for many gas turbine manufacturers and models from the mature fleet to the most advanced models. We provide a complete integrated and tested solution for our customers.

### ■ Troubleshooting and Maintenance

Don't leave troubleshooting and maintenance to the inexperienced. When you have a gas turbine down, there is no time to test the water.

TTS has 25 years of experience in supporting gas turbine users worldwide. Our engineers have decades of experience on many OEM platforms and can begin to support your troubleshooting or maintenance activity immediately.

## ■ Start-Up Commissioning Services

Whether it is a new plant start-up, unit relocation or post maintenance activity, TTS can provide all expertise and equipment needed to commission your gas turbine plant. TTS can provide personnel with the experience needed to start up and commission your high and low voltage systems, generator control and protection, gas turbine control systems as well as all auxiliary systems.

## ■ Combustor Dynamics and Emissions Tuning

DLN combustors involve the complex interaction of multiple fuel systems, changing ambient conditions, stability limits, emissions, and dynamics. High dynamic levels in an improperly tuned system can result in accelerated component wear, or liner and transition piece cracking or failure. TTS' extensive experience tuning GE DLN combustion systems resulted in proven expertise optimizing NOx and CO emissions while minimizing dynamic levels and maximizing the life of components.

## ■ Unit Performance Optimization Program

Gas turbine performance optimization is a process where control systems are improved to minimize fuel consumption while maintaining optimal unit output. TTS can optimize your gas turbine and control systems to become more efficient. Our knowledge of gas turbines uniquely positions TTS to become your optimization partner and help you enhance your power generation system.

## ■ TTS Remote Access Support

TTS' remote support service enables our global network of turbine specialists to remotely monitor and troubleshoot your turbine problems, and/or to make controls modifications from our offices in Orlando, FL, or any other location with ground or satellite Internet access.

This remote "knowledge network" supplements the expertise of our onsite staff to provide enhanced problem review and diagnosis, resulting in faster turnaround times, shorter outages, and time and money savings.

All remote support connections use high level encryption and will follow your corporate protocol ensuring all data is secure and access is controlled.

## Recently Completed Projects

### NIGERIA

TTS has recently installed and successfully commissioned a new TMS-1000 Human Machine Interface system on nine MS6001 gas turbine generators at a power plant in Ebute, Nigeria. The new system provides personnel extensive access to accurate plant information in a user-friendly graphic environment that reflects actual plant installation. The improved access to real-time and historical data will allow more effective control and troubleshooting at the plant for both operations and maintenance personnel.

### MEXICO

TTS has recently installed and successfully commissioned a new TMS-1000 gas turbine control system on two MS5001 gas turbine generators at a steel mill in Monclova, Mexico. With this upgrade the original OEM gas turbine control system was replaced with a new digital PLC based control system. As part of the upgrade, the hydraulic gas fuel control valves were replaced with new high-speed ElectroFlo® Electronic fuel valves thereby eliminating the need for maintenance intensive hydraulic servos resulting in better fuel scheduling to the turbines.

With these upgrades the gas turbine generators will improve the reliability of power production to the mill during peak load demands.



# CONVERSION, MODIFICATION AND UPGRADE SERVICES

## REDUCING COST THROUGH MODERNIZATION

Turbine Technology Services Corporation (TTS) can provide engineering and consulting services to include projects such as frequency conversions, fuel system conversions, emissions abatement systems, auxiliary system modification, and instrumentation and control system modification. Modernizing or upgrading a gas turbine can lead to the improvement of component durability and its benefits can result in reducing the need to replace or recondition parts and components. The result of the upgrade or modernization efforts can also lead to a reduction in the cost of maintaining the power plant.



### ■ Frequency Conversions

Frequency conversions are required when a unit is relocated from a 50Hz system to a 60Hz system or vice versa. TTS has undertaken numerous frequency conversions on a variety of units and in both directions, the most complex of which was a recent reapplication project of 4 Frame 7EA units to a 50Hz location in the Middle East.

When undertaking a frequency conversion project, TTS considers and reviews a range of items, including:

- **All AC Motors and associated driven equipment**
- **Load Gear modification or installation requirement**
- **Generator design limitations**
- **Generator excitation and protection requirements**
- **Control system requirements**
- **BOP requirements**

TTS has the technical resources and expertise to manage all of these areas and make certain that each is addressed correctly to ensure optimum operation of the unit in its new location.

### ■ Fuel System Conversions

In today's demanding power generation markets, fuel cost and availability have become critical items for most gas turbine users. As such, the ability to switch fuels has become an important competitive advantage.

TTS has extensive experience in the provision of complete fuel conversions for gas turbine units, which allows customers to consider a variety of options, including:

- **Liquid to gas or gas to fuel**
- **Single liquid or gas fuel to dual fuel on gas and liquid**
- **Dual liquid or dual gas**
- **Conversion to DLN or Dry Low NOx**
- **Conversion to HFO or Residual Fuel**
- **Conversion to Naphtha**
- **Conversion to non-standard or low-BTU gas**

TTS can undertake an entire fuel conversion project in all of these scenarios, including using our gas turbine expertise in making diverse hardware and software system modifications required on the existing control systems.





TTS also has the capability to deal with non-standard fuels including Naphta and low-BTU gases and to address the combustion system design issues associated with these fuels to ensure the proper operation of your gas turbine and extend its operational lifetime.

## ■ Emissions Abatement System

As the international community transitions into a Green Economy driven by sustainable engineering practices, concern for environmental optimization is prompting governments throughout the world to require gas turbine users to reduce NOx emissions from their units.

Such environmental requirements vary from country to country and site to site, and the most cost-effective systems can vary from country to country according to factors such as the availability of resources and the wide diversity of governmental policies.

TTS has extensive experience in the provision of complete emission abatement systems for gas turbine users including both "wet" and "dry" systems. TTS can work with each customer to analyze their required NOx levels and the cost of each potential NOx reduction approach to identify the most cost-effective system for each individual case. In addition, we can also provide NOx emission calculations for each of the possible cases to ensure the compliance of the system before its installation.

Once the optimum solution has been identified, TTS can undertake the entire conversion including all required hardware and the software system modifications required on the existing control systems or the provision of new systems as necessary.

## ■ Auxiliary System Modification

On older gas turbines, many of the original auxiliary systems have become obsolete and difficult to maintain. In addition, better versions of these systems have been developed and new systems, which further benefit the unit, have been designed.

TTS can provide and install a range of auxiliary system modifications, which are fully engineered for your unit. These include:

- **Pneumatic or Hydraulic Fuel Valve Replacement**
- **Ratchet Upgrades**
- **Quick Restart Systems**
- **Pneumatic System Modifications (PS&G Panels)**
- **Inlet Misting**
- **Inlet Cooling**
- **Starting Means Modifications**
- **Atomizing Air Modifications**
- **Flow Divider Modifications**
- **Compartment Cooling Modifications**

If you currently have problems with existing auxiliary systems or wish to add an additional system, contact us to request a review of your unit and we will provide the optimum solution for your requirement.

## ■ Instrumentation and Control System Modifications

In addition to providing complete control system upgrades with the Turbine Management System (TMS) range of products, TTS can provide support and replacement components on a number of existing control systems and sub-systems. These include:

- **GE Speedtronic System DOS replacement**
- **GE Speedtronic System DOS upgrades to Cimplicity HMI equivalent**
- **GE Speedtronic System Cimplicity HMI replacement GE**
- **Speedtronic Mark I, Mark II, Mark IV, Mark V, and Mark VI engineering and modifications including parts as required**
- **WDPF engineering and modifications including parts as required**
- **On base transmitter and device upgrades**
- **TTS HMI upgrades**

# TURBINE INSTALLATION AND REAPPLICATION SERVICES

## OUR SPECIALIZED SKILLS PROVIDE A COMPLETE SOLUTION

The relocation of a used gas turbine-generator set is very different from a new unit installation. Relocation projects are typically fast-tracked, requiring immediate equipment availability, and there is little time available for all the engineering and modification work that may be required.



### ■ New Unit Installation and Commissions

TTS is uniquely positioned with the knowledge and expertise required for successful relocation projects, and our engineering team has the specialized skill set to provide a complete solution.

Since 1988, we have been involved in the relocation of more than 80 gas turbines in diverse locations throughout the world and have a depth of knowledge about the demands and requirements of such projects, including:

- **Original plant disassembly**
- **Transportation and logistics**
- **New plant layout engineering**
- **Fuel conversions**
- **Frequency conversions**
- **Electrical one-line and protection engineering**
- **Emissions control and compliance**
- **Equipment upgrades and modifications**

## TTS KEY GLOBAL PROJECTS

### ■ 9 Frame 6 Power Barges

TTS was the EPC contractor for the relocation of these units from the Philippines to Nigeria. In addition to the basic relocation and commissioning work, the project also required 60/50Hz frequency conversions, fuel system conversions, emissions controls equipment, demin water plants and new control systems. The project was completed ahead of schedule.

### ■ 8 Frame 7B Turbine-Generators

TTS provided extensive technical direction and project management for the relocation of these units from South Korea to sites in the USA. In addition to project supervision, TTS was also the overhaul and upgrade contractors for much of the work required to convert them from 7B/liquid fuel configuration, to 7E/gas fuel/low NOx combustor design. The first of these projects was completed in eight months – from South Korea disassembly to USA operation.

### ■ 4 Frame 7EA Turbine Generator Sets

In 2009, TTS made history by being the first company to engineer and install Frame 7EA turbine-generators in a 50hz country (Kuwait). The commissioning of the units required a long and complex engineering process, much of which had to be performed at the site in Kuwait. The



frequency conversion required the addition of gearbox and auxiliaries, generator modifications, plant layout engineering, generator design and protection, plant electrical design, diesel starting systems, modifications to all on-base auxiliaries, controls engineering, etc.

## Turbine Technology Services Launches New Look

TTS has launched a new website and brand identity, which will showcase the company's knowledge and experience serving clients who employ gas turbines for power generation.

A new and more streamlined company logo leads the way in a series of branding improvements aimed at enhancing TTS' marketing and business development efforts, which include video introductions by key members of the company's executive staff and a Global Footprint section that outlines the types of projects they have completed.

"We wanted a corporate image that can exemplify Turbine Tech's longevity, experience and knowledge of solutions," says Tony Thornton, Chief Executive Officer at Turbine Technology Services. "The new corporate brand will strengthen our image in the power generation industry and gas turbine market as we look to continued growth in the future."



"The gas turbine market is well aware of our knowledge of control components, combustion and dynamic tuning, which keeps us in strong demand," said Frank Hoegler, Vice President of Sales for the Americas at Turbine Technology Services. "The new image reinforces our message and will pave the way for new opportunities for us to serve gas turbine users."

# TURBINE MANAGEMENT SYSTEMS

## THE MOST ADVANCED PLATFORMS AVAILABLE

Our Turbine Control Systems are built on the most advanced programmable controller platforms available today and these systems are designed using the latest in distributed control philosophy.

Turbine Technology Services Corporation (TTS) supplies a complete package of engineering, hardware and technical support to complete the control system upgrade, which includes overall system design; all controller and operator interface hardware, software, and installation drawings; instruction manuals; and technical direction for system commissioning.



### ■ TMS-1000 Turbine Control Systems

The TMS-1000 Series of turbine controllers are built on the most advanced programmable controller platforms available today; these systems are designed using the latest in distributed control philosophy. With our hardware independent approach, one can use technology and parts already common to their plant. The following benefits result from the implementation of a fully integrated TMS® system:

- **Improving existing control system performance and reliability**
- **Optimizing unit output and efficiency**
- **Eliminating dependence on the OEM for spare parts and/or repair**
- **Reducing the cost of spare parts and/or repair**
- **Improving the amount and quality of information the system provides to operators and engineers**
- **Providing additional features to enhance unit operation and maintenance**

We supply a complete package of engineering, hardware and technical support to complete the control system upgrade, which includes overall system design; all controller and operator interface hardware, software, and installation drawings; instruction manuals; and technical direction for system commissioning.

### ■ ElectroFlo Electronic Control Valve

Fast and accurate flow control for combustion turbine applications is more accessible with the ElectroFlo® Electronic Control Valve. Developed by TTS, the ElectroFlo® Valve surpasses the response and accuracy of most pneumatic and high pressure hydraulic systems, while eliminating many of the complications associated with each. With the ElectroFlo® Valve and other suggested modifications; TTS can completely eliminate all hydraulic and pneumatic accessories found on typical gas turbines. The ElectroFlo® Valve has over 10 million installed hours in applications controlling fluids from natural gas and diesel fuel to steam and water for NOx abatement.

### ■ Balance of Plant Control Systems Solutions

Traditionally the Gas Turbine Control System was autonomous and connected to the rest of the plant via a communications link. With the advances in communications options, I/O types and the capabilities of programmable controllers, the Gas Turbine Control System can be a fully integrated component in an overall Balance of Plant Control System.

The Balance of Plant Control System uses the same controller and I/O platforms and



communications on a common bus, sharing all plant parameters. Typical systems include, but are not limited to:

- **Liquid Fuel Treatment/Forwarding/Storage**
- **Gas Fuel Compression**
- **De-mineralized Water Treatment**
- **Plant Instrument Air**
- **Plant Cooling Water Systems**
- **Switchgear Interface**

## ■ Operator Interface System

TTS offers the following HMI services:

- **New HMIs for our own systems**
- **Upgrade to existing HMIs for our own systems**
- **Upgrades to other OEM systems - GE**

## ■ Motor Control Center(s)

Often overlooked during system upgrades, the Gas Turbine Motor Control Center (MCC) is often a point of failure.

TTS can provide a system fully integrated into the new TMS-1000 Turbine Control System using a combination of "point I/O" and Allen Bradley's Intellicenter technology. Some of the benefits include:

- **Reduced control cabling**
- **Increased motor running data available to operator and maintenance**
- **Reduced cost versus upgrading existing MCC with component replacement**

## ■ Generator Protection and Control

As part of our integrated approach to Gas Turbine Generator upgrades, TTS offers the following:

- **Excitation System Upgrades**
- **Generator Protection System Upgrades**
- **Generator Synchronizing System Upgrades**
- **Generator Control Upgrades**

## ■ Customer Service and Support

We supply a complete package of engineering, hardware and technical support to complete the control system upgrade, which includes overall system design; all controller and operator interface hardware, software, and installation drawings; instruction manuals; and technical direction for system commissioning.

## Modernizing Your System

With the current demands for gas turbine system modernization, TTS has expanded its services to include certain hardware and accessories; advanced software associated with a variety of new control systems or upgrades; along with conversion, modernization and engineering services, which include plant design and turnkey operations.

TTS has the knowledge needed to extend the life of a gas turbine, its systems and components. Contact us today to learn more about our modernization and reapplication services.



# OUR MANAGEMENT TEAM

## OVER 125 YEARS OF EXPERIENCE AT YOUR SERVICE

### ■ Tony Thornton | President

Tony Thornton is directly responsible for all aspects of the company's growth and operations in the international power generation and energy markets.

Born in Scotland, Tony began his career with Weir Pumps of Glasgow, serving an engineering apprenticeship. From there he took a position with General Electric, where he traveled internationally providing power-plant project management and consulting services.

In 1988, he moved to the USA and became Vice-President and co-owner of Turbine Technology Services, an international energy services firm that was acquired by the NYSE-listed Teleflex Corporation in 2000. After the acquisition, Tony remained with Teleflex as a Senior Vice-President, his primary role being to develop their international power generation services portfolio.

Following the management buyback of Turbine Technology Services in 2004, Tony has been using his 28 years of gas turbine and business experience to oversee the successful renewal of TTS' global power generation businesses.

Tony holds an HNC in Mechanical Engineering from the Glasgow College of Technology (now the Glasgow Caledonian University) and an MBA from the University of Central Florida.

He is an active member of the American Society of Mechanical Engineers (ASME) and a member of the ASME's International Gas Turbine Institute's Electric Power Committee.

### ■ Frank Hoegler | VP of Sales for the Americas

Frank is responsible for the management of all business development and sales efforts in the Western Hemisphere.

Frank brings over 23 years of gas turbine experience to Turbine Technology Services. Prior to joining TTS he was employed by Sermatech Power Solutions serving as Vice President of Sales and Marketing and previously as Director of the Gas Turbine Parts Program. Frank was also employed by Power Systems Manufacturing LLC as the General Manager of Sales and by the General Electric Company where he held various positions ranging from Field Engineer to Sales Manager to Combustion and Fuel Nozzle Repair Business Leader. He is also a U.S. Navy Veteran where he worked on gas turbine shipboard propulsion and electrical systems.

Frank was born in Ohio. He earned his baccalaureate degree in Technical Management from the State University of New York

and a Masters in Business Administration from the University of Central Florida. Frank also holds a U.S. Patent for Gas Turbine Repair Techniques and is a specialist in Industrial Gas Turbine Technology.

### ■ Pat Begley | VP of Sales for Africa, the Middle East and Asia

Pat Begley is responsible for Business Development and Customer Support in Asia, the Middle East and Africa.

Pat brings over 27 years of gas turbine experience to Turbine Technology Services. Prior to taking up his current role, Pat was employed by Sermatech Power Solutions serving as Executive Manager of Corporate Sales. In the 90s Pat worked for TTS as Vice President of Corporate Sales and prior to that with HSDE Inc. as Manager of Industrial and Marine Business Development.

In his early career with GE, Chromalloy, Unitech and HSDE, Pat developed his extensive knowledge of heavy rotating equipment by performing engineering roles including Mechanical Field Service Engineer (GE & Chromalloy), Speedtronic Control System Service/Startup Engineer (GE & Chromalloy), PLC Control System Development Engineer (Unitech) and Controls Group Engineering Manager (HSDE).

Pat was born in Ireland. He earned his baccalaureate degree in Mechanical Engineering from the University of Dublin and Masters degree in business administration from the University of Houston.

### ■ George Gramatikas | Strategic Development Officer

George co-founded Turbine Technology Services with Dan Davis in the early 1980s. Serving as President and CEO throughout the 1990s, George led TTS to prominence as an independent product, service and construction provider.

Teleflex Corporation acquired the company in the year 2000 and George continued as President of the Turbine Technology Services group, as it assumed a new identity as part of Sermatech Power Solutions, a Teleflex company. Then in 2004, he played an integral role in a management team buy-back of TTS and the return of its legacy to the private sector.

From 2004 to 2007, George served as Strategic Development Officer, directing the company's strategic relations and technology management. His contributions in the executive team included market analysis, advertising, corporate social

## OUR TEAM

network development, corporate brand development, technology innovation initiatives, and providing technical and general support.

Today George serves as an active board member and advisor to TTS. In addition to his prominent role in the company, George has been serving as an international arbitrator for the American Arbitration Association (AAA) and the International Centre for Dispute Resolution® (ICDR) since 2003.

In his early career with General Electric, George developed his extensive knowledge of power generating equipment in engineering roles ranging from Mechanical Field Services to Electrical and Startup Engineer and Project Manager.

George earned a Bachelor of Science degree in Mechanical Engineering from the Wentworth Institute of Technology, in Boston, where he was honored with the prestigious Beatty Award. In 2004, George earned a Masters degree in Business Administration (MBA) from the University of Central Florida, where he is an active advocate of the UCF Executive Development Program. He is originally from the state of New Hampshire.

### ■ Ricky Morgan | VP of Engineering

Ricky is responsible for all technical aspects of TTS' products and services.

Ricky brings over 23 years of electrical and controls engineering experience to TTS.

Prior to joining TTS, Ricky was employed by Sermatech Power Solutions, serving as the International Executive manager for the Middle East and previously as Vice President of Turbine Systems Engineering.

Ricky also worked for John Brown Engineering as a Senior Field Engineer on numerous gas turbine control systems. Ricky originally joined John Brown as an electrical design engineer for generator protection and control equipment associated with gas turbine generator drives.

Ricky was born in Scotland, where he earned his baccalaureate degree in Electrical and Electronic Engineering from Strathclyde University, Glasgow. More recently, he graduated from the University of Central Florida with a Masters in Business Administration.



■ Tony Thornton



■ Frank Hoegler



■ Pat Begley



■ George Gramatikis



■ Ricky Morgan

A world map is centered in the background, overlaid with a grid of turbine blades that appear to be rotating or converging towards the center. The entire image has a dark blue color scheme.

## **TURBINE TECHNOLOGY SERVICES CORPORATION**

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