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## Turner ECS Product --- Total Train Solution™

## Turner ECS - Total Train Solution™

### Mix and match:

Condensation Steam Turbine



Extraction or Admission Steam Turbine



Double Extraction Steam Turbine



Single Shaft Gas Turbine



Dual Shaft Gas Turbine



Triple Shaft Gas Turbine



Motor



Generator



Single Stage Compressor



2-Stage Compressor



3-Stage Compressor



4-Stage Compressor



5-Stage Compressor

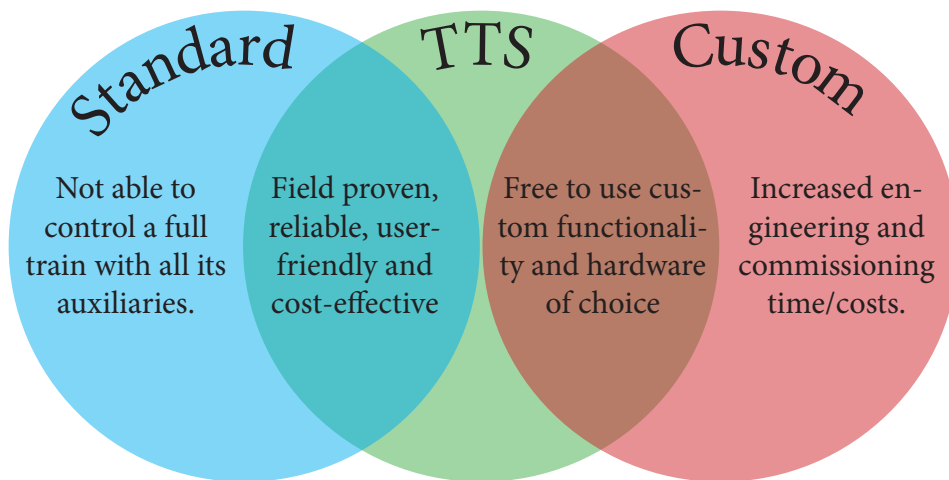


## Turner ECS - Total Train Solution™

### Introduction

The Turner-ECS Total Train Solution™ (TTS) is a controller platform for turbine or motor driven compressor or generator applications developed in Woodward's GAP™ language. TTS is intended for use on multiple Woodward hardware platforms and offers a mix of standard, configurable and programmable functions for control and visualisation.

Using a standard library of field proven code, TTS is the ideal middle ground between standard and custom software and is purposely designed to control complete trains. TTS can be used for direct upgrades of many existing controllers, supporting up to five anti-surge loops, a performance loop, quench valve control and many auxiliary functions.



### Product Description

TTS comprises the following components:

- A Woodward GAP™ based standard software application with an embedded dynamic model intended for off-line configuration and validation;
- A Woodward Toolkit based graphical engineering tool intended for configuration, service and operation, including dynamic compressor and steam maps;
- Standard documentation;
- Engineering services, hardware and HMI visualisation as per project requirements.

### TTS meets the most demanding requirements

- High quality hardware
- Field proven software
- User friendly interface
- Optimized visualization
- Technically expandable
- Detailed manuals
- Extensive services program

### Resulting in

- Minimum installation, commissioning and troubleshooting time

### Product highlights

- Retrofit solution for both non-Woodward and Woodward turbomachinery applications
- Compatible with several leading hardware platforms
- Compatible with Woodward ProTech® overspeed systems
- Compatible with Woodward easYgen genset controllers
- Revision controlled and managed software

## Turner ECS - Total Train Solution™

### Hardware Platforms

TTS is developed for multiple Woodward hardware platforms.

Depending on the site-specific process, customer requirements, I/O count and level of redundancy, any of the following Woodward controls can be selected:

- Flex 200 / 500, simplex or dual redundant operator panel style control system;
- Atlas-II™, compact (stacked) control system;
- MicroNet™ Plus - simplex or dual redundant modular control system;
- MicroNet™ TMR - triple modular redundant control system.



### Application Examples

#### TTS-500 - Flex 500 platform:

- Makes use of the same platform as Woodward's 505 and Vertex products;
- Supports up to 2 anti-surge loops without need for extended I/O.

#### TTS-550 - dual Flex 500 platform:

- Makes use of two Flex 500 units in master/slave configuration;
- Can interface with a single Field Termination Module;
- Controller redundancy at an attractive price.

#### TTS-5000 - MicroNet™ Plus platform:

- This SIL certifiable dual redundant platform can be used in many industrial applications;
- Offers maximum I/O flexibility;
- Used as direct replacement of Series 3 or 505CC-2 when redundancy is required.

#### TTS-9000 - MicroNet™ TMR platform:

- This triple modular redundant platform can be used in many critical industrial applications such as nuclear plants;
- Offers maximum reliability and I/O flexibility;
- The TTS-9000 is used as an alternative for the Woodward 5009 family controls when anti-surge loops and auxiliary systems such as oil skids or seal gas systems need to be integrated.

## Turner ECS - Total Train Solution™

### Background

As the Woodward Business Partner for Europe and the Middle-East, Turner ECS developed a solid track record of successfully executed complex compressor control projects.

These last years, Turner ECS engineered and commissioned over 75 compressors control systems for the major Oil & Gas and Petrochemical companies in the world. Various additional services were offered to ensure parts availability and continuation of its local support during the lifecycle of the control system. Based on this solid basis the TTS platform was developed.

### Project Example

For many years, S-Chem in Saudi Arabia suffered from the inability to optimize their control systems configuration affecting three of their most important compressors. Long start-up times, improper redundancy logic and deficient algorithms resulted in a significant loss of production.

By using TTS, Turner was able to replace their existing controllers by a MicroNet™ Plus redundant system which resulted in a 15% production increase and enhanced process control reliability. This configurable control was provided with a sophisticated commissioning and configuration tool and HMI interface with a dynamic steam map and dynamic start-up curve, which resulted in a highly satisfied customer.

Based on the success of this upgrade, this customer decided to upgrade the controls of their other extraction steam turbine controllers as well using the same technology.

### TTS Basic Features

- Steam turbine control
- Motor control
- Gas turbine control
- Compressor control
- Performance control
- Sequencing
- Embedded model for simulation
- Mechanical performance monitoring

### TTS Advanced Features

- Enhanced anti-surge logic complying with major OEM and end-user requirements
- Advanced steam turbine protection including:
  - Steam Dew-Point Protection
  - Delta Pressure Protection
- Advanced motor protection including:
  - Consecutive start protection
  - Winding temperature protection
  - Current monitoring
- Oil skid protection
- Oil skid pre-lube sequencing
- Anti-choke logic
- Compressor load sharing
- Dual and triple redundancy management, including I/O redundancy through Ethernet Global Data (EGD)
- Support for many types of remote I/O
- Configurable Cause & Effects matrix

## Turner Range of Services

**LSTK Projects, Retrofits & Upgrades**  
Turner ECS delivers reliable retrofit solutions for a wide range of prime movers and other applications. This includes lump sum turnkey projects on turbines and compressors.

**Genuine Parts & Service Exchange**  
Turner ECS has the largest stock of parts, service exchange governors and electronics in Europe and can provide a fast turnaround service.

**Product Training**  
Turner ECS can provide official Woodward product training covering both theoretical and practical training on a wide range of Woodward products.

**Electronic Repair & Mechanical Governor Overhaul Service**  
Turner ECS provides a comprehensive overhaul and repair service for electronic, mechanical and hydraulic governors.

**World Wide Field Service**  
Turner ECS field service engineers and technicians provide comprehensive solutions for commissioning and on-site repair.

**Service Contracts**  
Turner ECS provides long term service contracts to support users with Woodward governors and/or control products and electronic control systems.

### ROTATING EQUIPMENT CONTROL SOLUTIONS DELIVERED ACROSS EUROPE & THE MIDDLE EAST

Turner ECS is an official Woodward Channel Partner with offices located in:

- The Netherlands
- England
- Germany
- Italy
- Abu Dhabi
- Qatar
- Saudi Arabia

Turner ECS also operates and manages an extensive network of official agents throughout Europe & the Middle East

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