Thomassen Energy
a Hanwha company

TC7 Control System

Supporting our gas turbine power plant customers achieve their business and profitability goals is Thomassen Energy's driving force. This is achieved by delivering performant, cost-effective, scalable and seamlessly integrable Control System solutions that enhance the reliability and operational flexibility of power plant assets for the long-term.

Enhancing Plant Reliability

To remain relevant within today's fast-paced, increasingly competitive power marketplace, plants need to operate at maximum capacity during long periods to meet Customers' needs and remain profitable – a daunting challenge for older systems.
To achieve higher levels of reliable performance at reasonable cost, plant owners can retrofit and affordably upgrade their control system with a state-of-the-art TC7. The TC7 offers the hardware and software flexibility your plant needs to remain relevant, reliable and profitable.

Control Systems Solutions

Thomassen Energy developed a gas turbine control system based on the proven design of Siemens® PCS7 series DCS that brings the latest generation of heavy-duty gas turbine controllers as a result of years of R&D covering every aspects of turbine performance.
Thomassen Energy's TC7 gas turbine controllers are widely accepted turbine controllers within the industry with safety implemented features. It has proven itself to be very reliable and versatile. The modular character of the TC7 results in a proper controls solution for every turbine application.
The TC7 control system takes advantage of an open-architecture design and non-proprietary standard hardware worldwide available, keeping maintenance costs to a minimum while ensuring maximum performance and availability.

Optimized Gas Turbine Performances

Thomassen Energy's TC7 offers a high-performance, cost-effective and scalable heavy-duty gas turbine controller solution. It offers the hardware and software flexibility your plant needs to remain relevant, reliable and profitable. The TC7 is based on the PCS7 platform of Siemens, other platforms are possible, upon customer request.

While optimizing gas turbine performance, it provides re-assurance, confidence and peace of mind.

TC7 enables to keep maintenance costs to a minimum, while ensuring maximum performance, by taking advantage of an open-architecture design and non-proprietary standard hardware that is worldwide available and proven in a variety of industrial applications.
Further plant operation optimization can be realized through digital optimization by integrating Thomassen Energy's FlexSuite building blocks and AutoTune intelligent gas turbine combustion optimization advisory system to the TC7.

Integrated Safety

Safety features for the turbine and its auxiliaries are built in the TC7 according to VDMA-4315. The VDMA is derived from the IEC-61508 and assures safe and reliable operation. It secures your assets and safeguards your personnel working with rotating equipment.

Enhanced Product Life Time Cycle

Thomassen Energy's TC7 is based on the Siemens PCS7 platform. This platform has an impressive product life time cycle and is base for carefree operation of your turbine controller. The PCS7 platform was introduced in 1998 and will be on the market for another 20 years at least.

TC7 Modular, Interchangeable and Open Design

Thomassen Energy's TC7 modular Control System has been developed based on the Siemens® PCS7 series DCS. The system is designed for ease of use and its open architecture will allow for seamless integration in existing or new DCS systems. The hot-backup facility in redundant configuration will allow for a minimum of downtime in case of program changes. Due to extensive design constraints and rigorous testing, the TC7 system and hardware design are infallible. The software-configured I/O modules are designed for easy insertion without requiring a working understanding of hardware configuration.

The TC7 can easily be exchanged with a Mark I / Mark II / Mark IV / Mark V. The dimensions are exactly the same with the predecessor cabinet, so no mechanical support change is needed. Electrical & Instrumentation changes are minimized. Thomassen Energy has performed over 30 control system upgrades across the globe on a variety of GE B, E, F-class gas turbine engines.

The TC7 performs the following functions for a gas turbine application and auxiliary systems:

+ Start / stop sequencing of the gas turbine
+ Speed / Load / Temperature / Acceleration control
+ Protection and limiting with SIL integration in the main controller
+ Control of auxiliary systems

TC7 Highlights

+ Tailor-made to meet any customer needs
+ Easy solution for retrofit projects
+ Alternative to OEM solutions
+ Use existing instrumentation or replace simple switches with analogue transmitters
+ Cost-effective solution
+ SIL safety integrity level certified components
+ Standard off-the-shelf components
+ Fail-safe
+ Simplex or redundant design
+ Online repair capability (hot swappable)
+ Distributed I/O modules
+ Programming according to IEC-61131-3 standard
+ Easy integration into existing or new plant control (DCS)
+ Easy integration with THOMS On-Line Monitoring System
+ Limited training required for GT operators, same look & functionalities as original control system

TC7 Control System Features

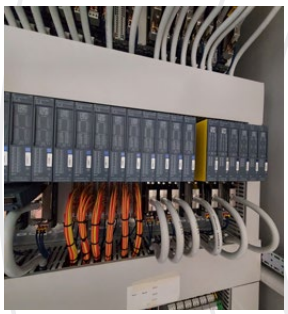
As versatile as it is fully functional, the TC7 is the centerpiece for a variety of applications such as heavy-duty gas turbines, LEC, FlameSheet™ or DLN systems, compressor drives, and generator drives. As the turbine control system is equipped with failsafe I/O, fire detection can easily be integrated in the control system.

Optional items for the TC7 include generator control systems, generator protection systems, compressor control systems, boiler management systems, and balance of plant control.

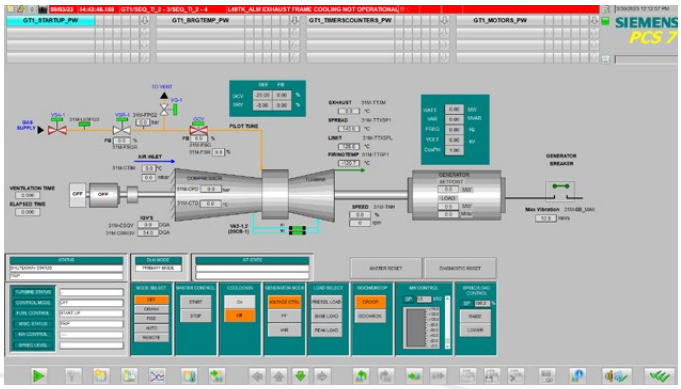
TC7 is suitable for:

+ Turbine Control Systems
+ Compressor and Generator Controls
+ Unit Protection Systems
+ On-Line Monitoring Systems
+ Improving Efficiency & Reliability
+ Reducing Emissions
+ Automation of Control Processes
+ Auxiliary Systems Control
+ Vibration Monitoring
+ Compressor Management including Anti-Surge Control
+ Generator Control & Protection
+ Load-Sharing
+ Steam Turbine Control in CC and Cogeneration Applications
+ Boiler Management
+ Balance-of-Plant Control
+ Low Emission Combustion control
+ On-Line Monitoring
+ Remote Interfacing

Old situation



New situation – I/O TC7 wiring



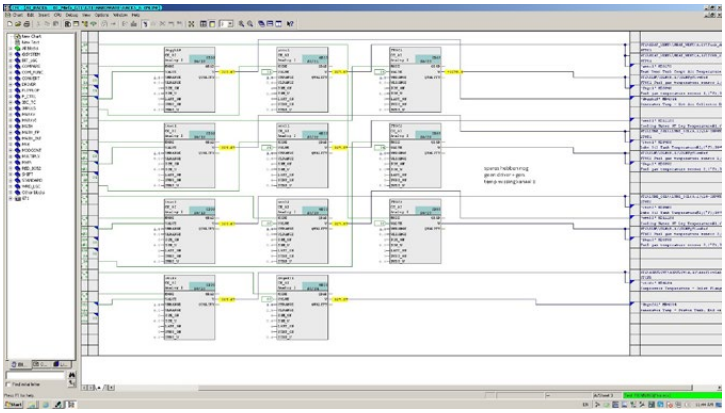
TC7 Control Functions

+ Fuel control loops
+ Turbine pre-ignition purge
+ Load control
+ Inlet guide vane control
+ Ignition & flame detection
+ Exhaust temperature control & monitoring
+ Splitter valve control
+ Acceleration & deceleration limiter
+ Shutdown & cooling sequencing
+ Slow roll or ratchet control
+ Synchronizing
+ DCS interface
+ Starter motor control
+ Speed control and monitoring
+ Generator temperature monitoring

Training & Support

TC7 training for operators and/or maintenance engineers using a real time software simulator can be done in Rheden or at your premises. The TC7 training is especially prepared with your graphical presentations and logics. No prerequisite is needed to follow the training for the participants. The training will discuss hardware, software and the appropriate way to fact find process alarms in the TC7.

Thomassen Energy offers in-situ 24/7 control support as per customer needs.



Additional Services and Products Offered by Thomassen Energy and PSM: Servicing GE, SW, MHI: B, E & F Class Fleets for 50Hz & 60Hz

Field Services & Outage Management includes on-staff bladers and labor supply for gas turbines, steam turbines, and generators worldwide for GE B, E & F-class, SW & MHI F-class.

Reconditioning & Repair all turbine airfoils and combustion system components to include fuel nozzle overhaul using advanced techniques for improved life cycle cost and incorporating new design improvements during repairs.

Combustion System Engine Tuning includes Monitoring & Diagnostics
Support for all rotating equipment (e.g. remote monitoring) of gas turbines worldwide.

Rotor Rebuild & Inspection includes seed rotors, new replacement compressor and turbine disks, disk repairs, full volumetric NDE inspection, and rotor lifetime extension.

R&D, Engineering Assessments, Root Cause Analysis, and system technical support for gas turbines.

Flexible Long-Term Parts and Service Agreements (LTSA) combine PSM's and Thomassen Energy's products and services for a custom solution that meets your needs.

Conversion/Upgrades provide integrated services for all critical power plant components and systems. PSM and Thomassen Energy offer a single point of contact for maximizing your plant's performance potential, increasing operational flexibility, and outage management.

FlexSuite provides plant optimization tailored to your precise needs and offers multiple OEM control systems, from FastStart & FastRamp to Part Load Performance.

Clean Energy and net-zero energy mandate requirements met through improved efficiency and reduced emissionss.

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