I/A Series System
Combustion Turbine Cogeneration System

INTRODUCTION
The Foxboro® Combustion Turbine Cogeneration System integrates the cogeneration cycle into a total power plant system, and provides regulatory and supervisory control functions to manage and optimize overall power generation. Based on Invensys Foxboro’s extensive process knowledge and experience in the power industry, this application solution includes the technology and engineering services necessary to maximize plant operating efficiency, safety, and availability.

FUNCTION
The operating flexibility of most cogeneration plants — especially combined-cycle plants that can be operated in several different modes — poses new challenges for operations personnel whose prior experience has been limited to traditional steam generating facilities. Furthermore, combustion and steam turbines are generally implemented with control subsystems provided by the turbine manufacturers themselves, while the Distributed Control System (DCS) supplier furnishes other power plant controls.
The Combustion Turbine Cogeneration System (CTCS) integrates all of the control subsystems in a centralized control center, ensuring reliable and seamless operation. The CTCS control center combines the most suitable control strategy for the unit, cycle, and plant levels with a common, intuitive operator interface.

Plant optimization functions are provided to allow the most cost-efficient operations of gas and steam turbines, producing an optimum combination of cogeneration, condensing, and/or purchased electricity.

Furthermore, the CTCS provides real-time plant information management tools that may be used to maximize the plant’s efficiency, security, unit availability, and maintainability, resulting in increased productivity and profitability.

**BENEFITS**
- Secure and reliable power plant operation
- Common operator interface to all control subsystems
- Maximized cogeneration output
- Maximized operating efficiency
- Minimized energy costs
- Improved documentation to meet internal and regulatory requirements
- Reduced record-keeping costs

**STANDARD FEATURES**

**UNIT LEVEL CONTROLS**
Individual power generation units such as steam turbine generators, combustion turbine generators, heat recovery steam generators (HRSGs), and auxiliary equipment are supported by unit controls. These include the necessary regulatory instruments and controls, together with sequencing and protective logic functions for that equipment.
Typically, unit level controls include:

- Steam turbine controls (normally supplied with new turbine generators by the manufacturer, but commonly provided by the DCS supplier on retrofit units)
- Combustion turbine controls (normally supplied with new turbine generators by the manufacturer, but commonly provided by the DS supplier on retrofit units)
- Steam generator controls (normally provided by the DCS supplier)
- Auxiliary equipment controls (normally provided by the DCS supplier)

**COMBINED AND/OR SIMPLE CYCLE LEVEL CONTROLS**
Cycle level controls link and coordinate various unit controls to provide centralized control of the entire cycle. The system requirements depend upon the cycle configuration and the degree of control coordination desired. This coordinated control system Foxboro's Load Management Control Center (LMCC), is designed to fully integrate the combustion turbine, steam generator, and steam turbine controls. The system provides the centralized regulation of megawatts and process steam by coordinating individual unit operations.

**PLANT LEVEL CONTROLS**
Plant level controls integrate the cogeneration cycle into a total power plant system, and provide the supervisory control and management functions to optimize overall generation and distribution.

**PLANT OPTIMIZATION FUNCTIONS**
Factors that are manipulated to optimize the mix of cogeneration, condensing and/or purchased electricity include:

- Cogeneration (maximize cogeneration power through turbine dispatch and steam header optimization)
- Tie-line control (minimize purchased electric power through in-house condensing power generation and load shedding)

**PLANT INFORMATION SYSTEM**
Power plant real-time information management is as critical to plant operation as are effective controls:

**Operational Analysis and Monitoring**
- Logs and reports
- Group displays
- Process graphics
- Alarm summaries
- Real-time trends
- X-Y plots
- Data historian
- Historical trends
- Post trip review
- Sequence of events

**Performance Analysis**
- Steam turbine performance calculations
- Combustion turbine performance calculations
- HRSG efficiency
- Cycle heat rate (Btu/kWh) calculations