

Gas Turbine Fuel Controller  
FuelPAC®

# CONTROL SOLUTIONS DESIGNED TO FIT RIGHT IN

Maximizing your  
plant's efficiency  
with control systems  
built to fit your needs –  
*exactly.*

**Energy Control**   
**Technologies**

**E**nergy Control Technologies (ECT) provides the latest in advanced fuel control for gas turbines. ECT engineers high value control solutions for gas turbines (*historically available only in proprietary hardware*) and delivers them in an open platform using Rockwell Automation hardware and software.

ECT provides solutions for single or multi-shaft gas turbines that include speed or power control while protecting against excessive temperature, pressure and over speed conditions.



*ECT's FuelPAC Turbine Control System Using Standard Rockwell Automation Hardware and Software*

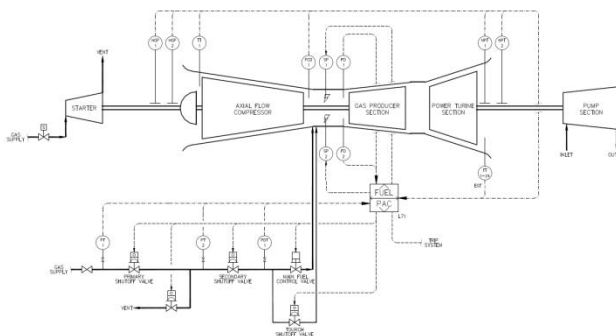
## KEY BENEFITS

Gas Turbines are critical machines that require precise control to maintain speed. ECT has a long history of advanced speed measurement and control applications that provide robust, reliable and accurate control of rotating equipment.

- Three speed inputs for each shaft
- Local or remote speed setpoint control
- Startup/shutdown sequencing
- Four critical speed avoidance bands
- Integrated Overspeed Protection
- Vibration monitoring
- Temperature monitoring

- Limiting control of Compressor Discharge Pressure (CDP)
- Acceleration and deceleration limits
- Modbus communications to other equipment
- Timers for automatic cooling during coastdown
- Independent alarming and trip functions including 'first out' indication
- Multiple EGT temperature probes with configurable geometries

*ECT's Gas Turbine Fuel Control on a Pump Drive*



## STARTUP CONTROL

The start-up control application is an open loop sequence which increases the fuel stroke reference as the turbine start-up sequence progresses to the different configured levels. FuelPAC includes flame detection, warm up ramping functions with temperature limiting and acceleration control with automatic transition to speed control.

## TEMPERATURE LIMITING CONTROL

Temperature control is used to limit the turbine firing temperature by limiting

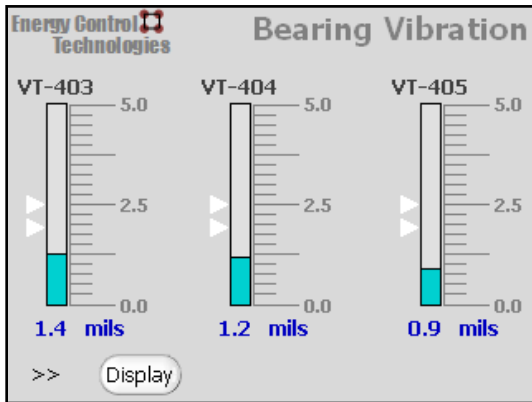
the fuel flow. Advanced algorithms adjust for ambient air temperature and CDP changes.

### FAULT TOLERANT STRATEGIES

ECT control systems all have advanced strategies to adjust the control action in the event of sensor failures. The control actions can be tailored to the specific signal and process being measured. These include speed, temperature and pressure signal failures.

### VIBRATION AND TEMPERATURE MONITORING

ECT uses standard Rockwell Automation hardware for vibration and temperature monitoring.



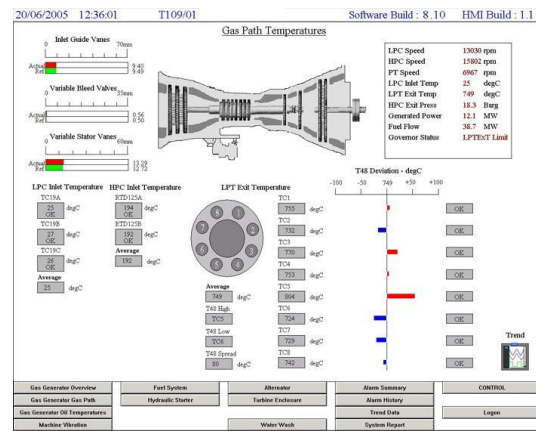
ECT's Vibration and Temperature Monitoring Displays

### TURBO PACVIEW®

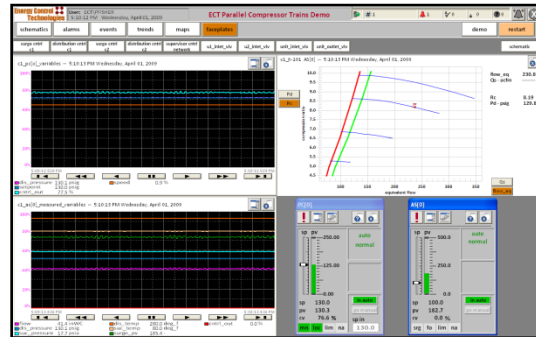
ECT's Turbo PACView® is your window into your turbomachinery plant enhancing operation, maintenance, and monitoring functions. With high resolution data recording capability,

Turbo PACView® can capture critical data that you can replay for troubleshooting purposes. Our engineers customize your Turbo PACView® with the following features:

- Turbomachinery diagram
- Controller faceplates
- High speed trending
- Event-driven fast archiving
- Alarms and events



ECT's FuelPAC Operation Summary



ECT's trend screen

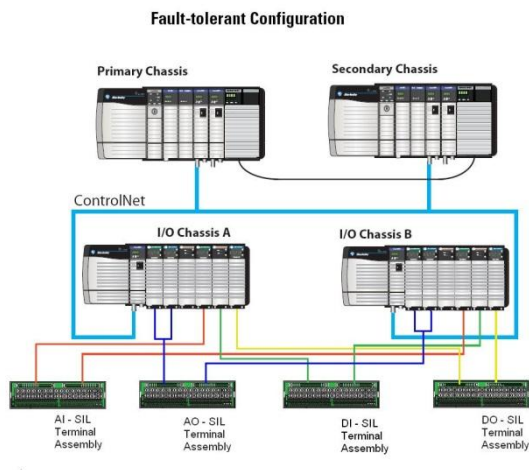
### ENVIRONMENT

FuelPAC is certified for:

- Class 1 Division 2 installations
- SIL 2 applications

## FAULT TOLERANCE

ECT can provide a fully redundant control system that is SIL 2 compliant. In addition, ECT's Fault Tolerant Control Action keeps your system running even with failures of non redundant transmitter inputs.



## FIELD SERVICE

ECT provides full field service support from system checkout to commissioning including onsite surge testing and tuning of your system. ECT also has the capability to provide remote field support using the latest technology.



## PUT ECT TO WORK FOR YOU

Whether it's a site survey to calculate an ROI for a retrofit or to help you with important decisions on piping layout and vessel locations on a new project, ECT is ready to support you on your next turbomachinery control system project.

Contact ECT today at:

Energy Control Technologies, Inc.  
2751 99<sup>th</sup> Street  
Urbandale, IA 50322  
515 223-1635

[contactus@energycontroltechnologies.com](mailto:contactus@energycontroltechnologies.com)

Or visit us on the web at:

[www.energycontroltechnologies.com](http://www.energycontroltechnologies.com)

**Energy Control Technologies**