

Emerson Combustion Turbine Purge Credit Solution

Benefits

- Tightly integrated, NFPA-85 compliant control and mechanical solution
- Improves system response resulting in:
 - Increased revenue potential
 - Faster startup time
 - Faster ramp rates
- Increases reliability by minimizing thermal stress
- Reduces the potential of forced outages, extended downtime and major repairs
- Lowers electricity, fuel and water consumption
- Helps to avoid failed start penalties



Purging Challenges

A normal startup safety procedure for open or combined cycle power plants is to purge residual natural gas or liquid fuel from the combustion system with fresh, ambient air prior to firing the combustion turbine. This process removes excess combustible gases or liquids from the combustion turbine, combustion turbine exhaust or heat recovery steam generator, which decreases the potential of a fire or an explosion. However, a prestart purge can add five to 20 minutes to the plant's startup due to the actual time it takes to purge the gas and to drain the extra condensate created by ambient air. Additionally, the purge process decreases the overall HRSG system temperature and pressure and increases the time required to startup the steam turbine. Even though the prestart purge protects the plant from catastrophic hazards, this process can place additional thermal stress and fatigue on the plant's equipment, thus triggering performance, maintenance and reliability issues.

Emerson's Solution

The National Fire Protection Association (NFPA) 85: Boiler and Combustion Systems Hazards Code establishes standards for safe equipment operation, including requirements for a fresh air purge. In 2011, the code was changed to incorporate a combustion turbine purge credit that allows operators to take credit for purging during a normal shutdown using additional gas-flow valves and monitoring systems.

For cycling plants and hot start conditions, attaining a purge credit can significantly decrease the normal start-to-load time. Implementing Emerson's purge credit solution can reduce startup times by up to 30%, improve system response, increase reliability, reduce forced outages, avoid failed starts and provide a host of auxiliary benefits such as reduced electricity, fuel and water consumption.

Emerson begins evaluating each purge credit opportunity with a site walk down. Physical site conditions, existing pipe routing, instrument air availability and P&IDs are carefully reviewed by Emerson's control and mechanical experts who then use that data to develop a recommended scope of work.

Mechanical Scope

Emerson's purge credit mechanical scope typically includes new pressure and differential transmitters on the main and pilot fuel lines, fuel block valves and vent valves. Cutting-edge PCMM 3D scanning technology is used to survey the existing fuel train and create a 3D model for accurately designing and manufacturing the custom "drop-in place" equipment skid. A new pressurized air system can also be provided to meet NFPA requirements.

Control Scope

Control upgrades included with the solution consist of adding I/O and logic associated with the new purge credit hardware to the existing control system platform. Additionally, Emerson control engineers modify the following:

- Duct burner management logic to produce a duct burner purge credit active signal
- Combustion turbine logic to produce a turbine purge credit active signal
- Combustion turbine start logic to provide a choice of starting up the turbine with or without a purge
- Applicable operator graphics and alarms

Installation & Commissioning Scope

When the equipment is on-site, Emerson installs and tests the new fuel block valves, vent valves and air equipment skid. The fuel trains are tapped to accommodate the new instrumentation and air skid. New cables

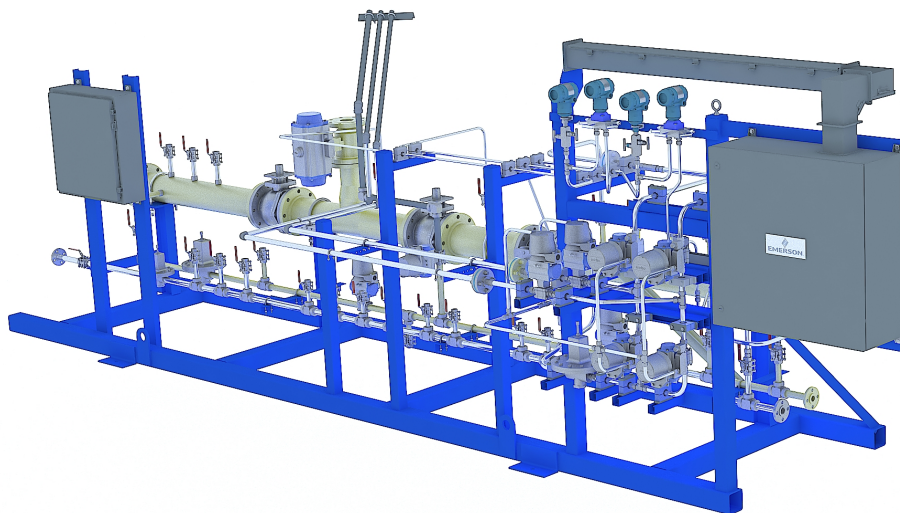


Illustration of Emerson equipment skid for purge credit solution

are installed, connecting the field devices to the applicable gas turbine and duct burner management control cabinets. Loop checks, functional testing and a site acceptance test are performed to complete the project.

Optional Integrated Plant Control

Emerson's purge credit solution works with any operating plant control system, regardless of vendor. As an option, Ovation™ automation technology can be provided to replace disparate balance-of-plant, HRSG, duct burner management, combustion turbine or steam turbine control systems implemented on multiple different platforms.

Operating with a single Ovation platform for simple or combined cycle plant operations provides numerous benefits such as removing extra hardware; reducing maintenance and service costs; eliminating potentially troublesome data link communications; improving time synchronization; and harmonizing configuration, trending and alarms. The Ovation automation platform continues to evolve well beyond the bounds of traditional distributed control and data acquisition systems. In addition to native, advanced applications for optimizing power generation operations, Ovation supports integrated vibration monitoring, generator excitation control, safety instrumented systems, scalable footprints for small or distributed applications, virtualization and embedded simulation — all backed by Emerson's comprehensive support programs.

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