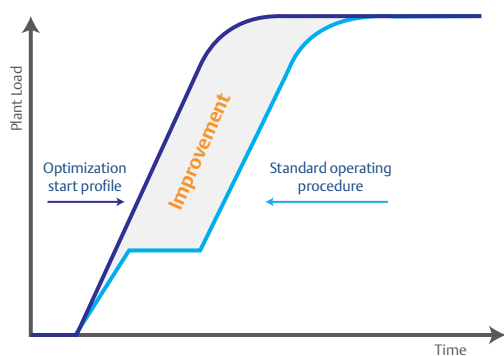


Improve Combined Cycle Plant Reliability and Reduce Costs



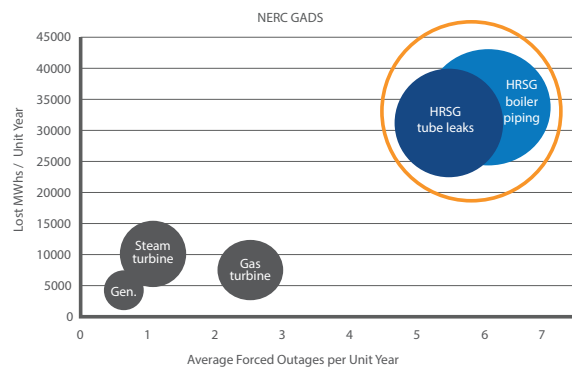
Today's Combined Cycle Operational Challenges

The shifting power industry landscape from conventional steam plant domination to more gas-fired generation is significantly changing the operating modes of existing combined cycle plants. More frequent and cyclic operation is creating a host of challenges that are not only increasing capital spending and routine O&M costs, but decreasing plant reliability and availability.



Can your combined cycle units operate reliably through daily cycling to meet increased load demand?

With low gas prices, older combined cycle plants need to quickly change operating modes when renewables are added into the generation mix. Units designed for baseload operation now require increased operational flexibility and more frequent starts.



Are changes in operating mode increasing your O&M costs and the risk of forced outages?

Today's complex operating profiles require combined cycle units to swing loads quickly while avoiding temperature excursions. This reality comes with reduced performance as well as increased fuel costs and fatigue-related equipment damage.

Combined Cycle Optimization

Emerson's combined cycle optimization solutions can enhance your plant's performance by leveraging advanced control concepts. Our experienced consultants review key plant operational and market factors to produce a prioritized list of potential improvements along with an estimated return on investment. Typical benefits are highlighted below.

HRSG - BOP

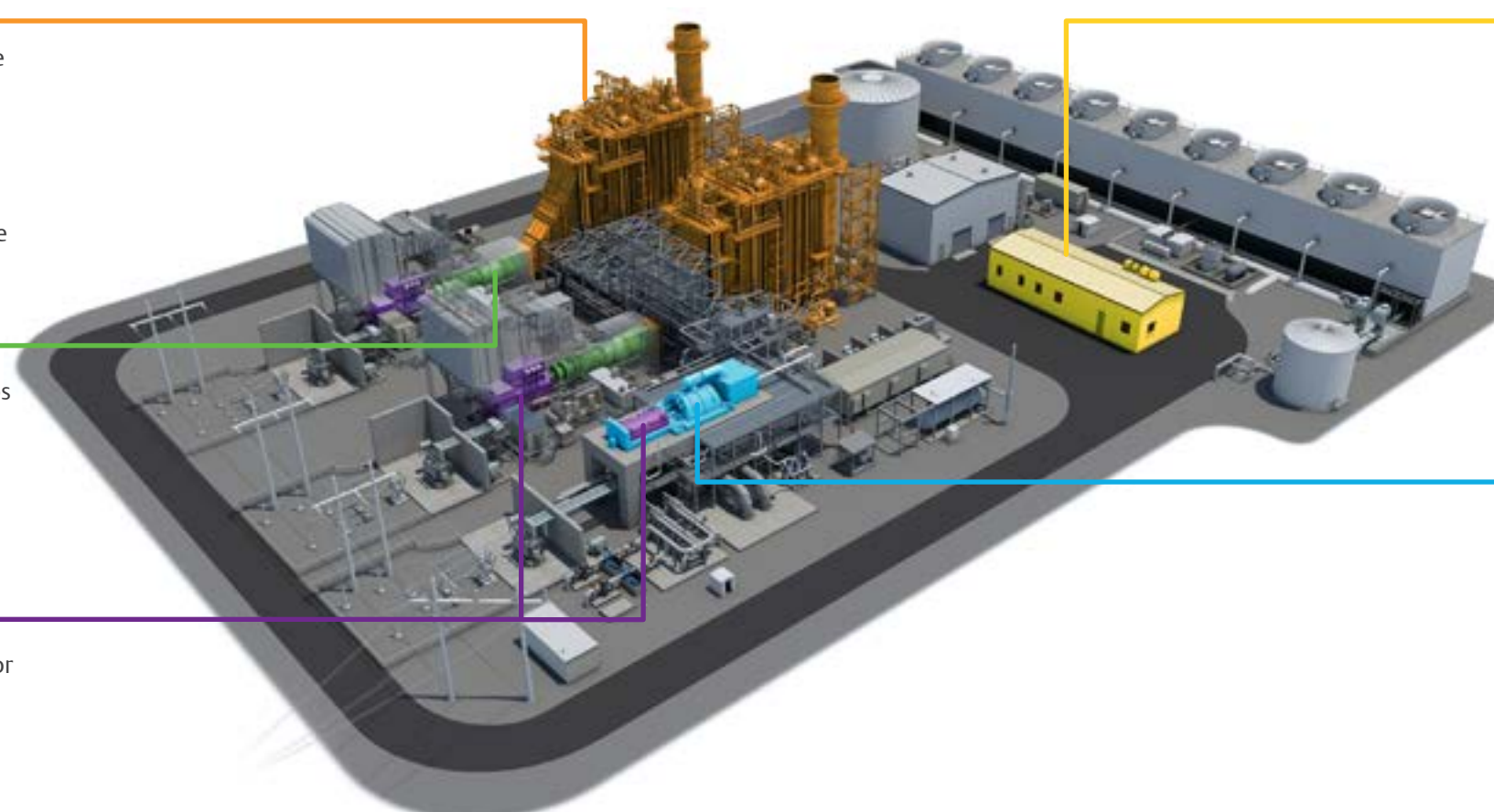
- Enhanced duct burner control improves demand response and increases ancillary service opportunities
- Dynamic drum level control supports daily cycling and reduces trips and runbacks
- Precise model-based steam temperature control reduces HRSG tube stress
- Bypass control revisions reduce startup times and improve heat rate by minimizing waste steam

Gas Turbine

- Integrated logic and interlock displays reduce turbine trips and equipment wear, increasing availability
- Gas turbine signals linked to HRSG model-based controls enhance ramp rate capability
- Prestart check sequencing increases gas turbine start reliability

Generators

- Integrated excitation and plant control enhances operator awareness
- Use of a single platform for excitation and plant control simplifies configuration and reduces lifecycle costs

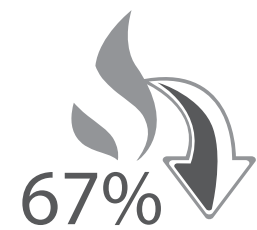


Power Block

- Procedural automation minimizes start times, reduces human error and ensures repeatable operation
- Close coordination of gas turbines, duct burners/HRSGs and steam turbines optimizes plant operation
- Automated prestart actions shorten cycling time
- Automated sequenced startup optimizes header blending, startup time and fuel usage
- Model-based load control allows the power block to accurately meet dispatch commitments

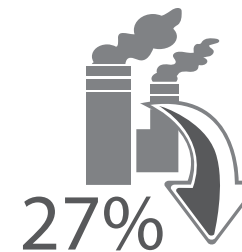
Steam Turbine

- Automated startup with stress monitoring increases reliability and optimizes roll time
- Inlet pressure control improves low load and cycling operation
- Turbine control upgrades enhance response to load demand and grid frequency excursions



Reduced Hot Start Fuel Usage





Emerson applied its expertise in combined cycle plant control and operations with several Ovation™ advanced power applications to help a utility decrease fuel costs during unit startup. The result was a 67 percent reduction in average 2x1 hot start fuel usage. Additionally, average transition fuel usage – the fuel used to bring another combustion turbine/heat recovery steam generator (HRSG) train online and blend it with the running units – was reduced by 31 percent.



Decreased Reagent Cost

Emerson implemented model-based SCR optimization to cost-effectively improve the NOx reduction efficiencies of a combined cycle plant's installed SCR technology. Emerson's solution statistically filtered noisy analyzer signals for precise SCR control. The optimization strategy coordinated SCR processes with the catalyst reaction time to reduce reagent slip. After implementation, the plant experienced a 27% decrease in NOx emissions.

Cost-Effective Automation Solutions for Improved Plant Performance

	APPLICATION	BENEFIT
 REDUCE STARTUP TIME & FUEL USAGE	<ul style="list-style-type: none">• Prestart automation• Procedural automation• Steam header blending automation• Steam turbine rotor dynamic stress evaluation	<ul style="list-style-type: none">• Faster, more consistent starts• Reduced starting fuel usage• Time-accurate release to dispatch• Decreased risk of water induction
 IMPROVE PARTICIPATION IN ANCILLARY SERVICES	<ul style="list-style-type: none">• Model-based steam temperature control• Duct burner AGC• Model-based load demand control	<ul style="list-style-type: none">• Faster ramping• Improved heat rate• Enhanced spinning reserve capability• Lower O&M costs
 INCREASE STARTING & OPERATIONAL RELIABILITY	<ul style="list-style-type: none">• Advanced inlet pressure control• Freeze protection• Advanced gas path trip reduction	<ul style="list-style-type: none">• Improved operational reliability at low loads• Reduced turbine trips due to balance-of-plant events• Decreased failed starts or unit trips due to cold weather conditions
 REDUCE EMISSIONS	<ul style="list-style-type: none">• Model-predictive SCR control	<ul style="list-style-type: none">• Reduced ammonia usage and slip• Protection of downstream HRSG components• Extended catalyst life

One Platform Delivering Infinite Solutions.

Ovation™ goes well beyond the bounds of traditional distributed plant control. In addition to native advanced applications for optimizing plant operations, Ovation now supports integrated machinery health monitoring and generator excitation as well as embedded simulation and enhanced cybersecurity solutions.

OVATION™

For more information:
www.Emerson.com/Ovation


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