

NEW *PowerPlus* DUCT BURNER MAXIMIZES ELECTRICAL POWER FOR TEXAS IPP

SITUATION

In 1996, Tenaska, an international power development company based in Omaha, Nebraska, placed orders for a Westinghouse 501F gas turbine generator and a Deltak fired HRSG for their Cleburne, Texas site. This was the first "F" class gas turbine in Texas to include power augmentation and supplemental duct firing to boost their power production during high ambient temperatures.

Although the original duct burner performed as designed during normal turbine modes, the stack Carbon Monoxide (CO) emissions were above permitted levels during turbine power-augmentation combined with high duct firing rates. The turbine exhaust gas (TEG) oxygen levels measured 10.9% (by vol) and a moisture content nearing 16.5% (by vol). This represents the most extreme "F" class turbine mode for duct burner firing applications.

Name: Tenaska IV Texas Partners Ltd.
Location: Cleburne, Texas
HRSG: Deltak
Capacity: 375 mmBtu/hr
Duct Burner: Coen's *PowerPlus*
Fuels: Natural Gas
Limits: 25 ppm-CO, 9 ppm-NOx @ 15% O₂

SOLUTION

In response to Tenaska's need to maximize power production and maintain acceptable CO levels during summer peaks, Coen presented a two-step duct burner retrofit program. First, the system was computer modeled using Coen's in-house CFD capabilities. Then, the burner's flow baffles were modified to enhance Fuel/TEG mixing in this "low-oxygen/high-moisture" environment. This approach produced the desired results, while demonstrating that a more aggressive modification would be beneficial. The final answer to this challenging situation was to install Coen's prototype *PowerPlus* elements.



Photo Courtesy of Tenaska, Inc.

This 263-MW facility is powered by a Westinghouse 501F gas turbine generator (with power-augmentation) and a Westinghouse steam turbine. Headquartered in Waco, Texas, this facility is own & operated by Tenaska IV Texas Partners, which supplies power to Brazos Electric Power Cooperative.

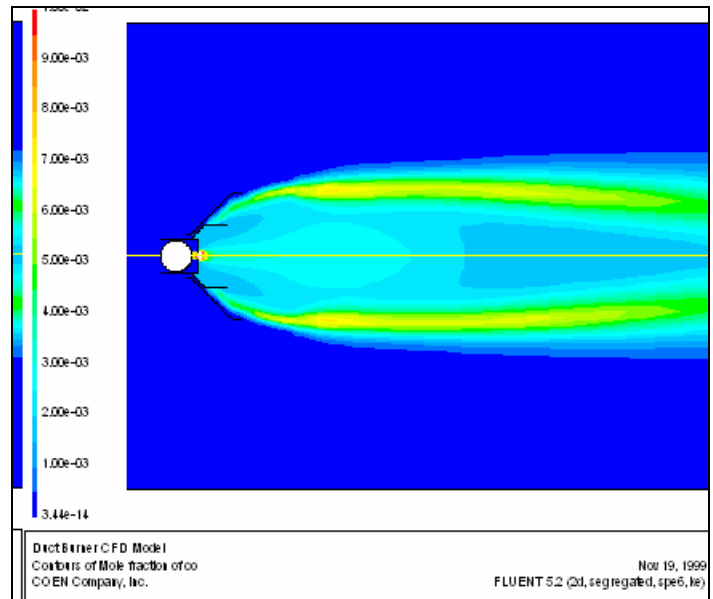
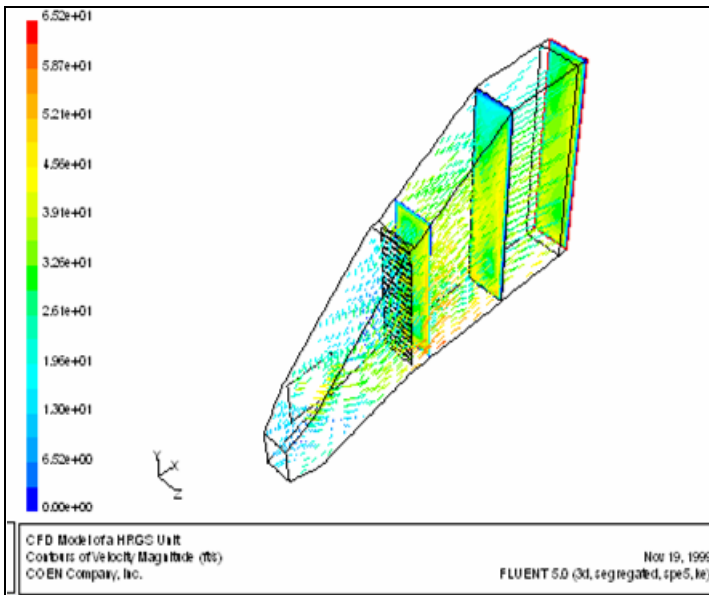
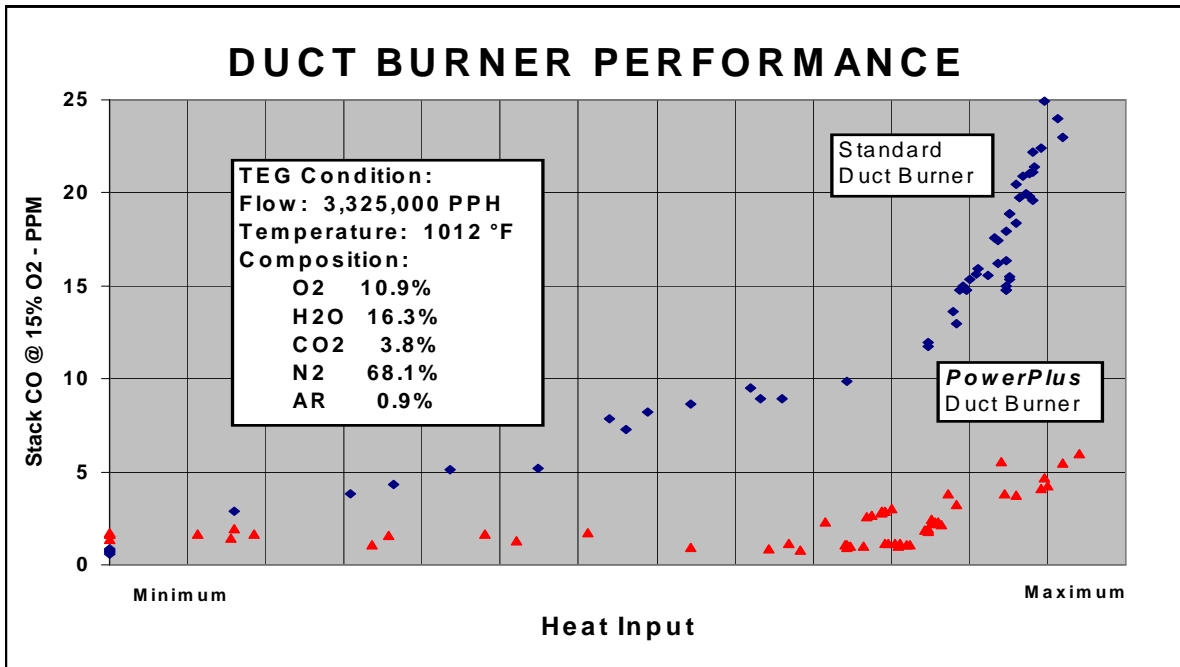
This unique burner, in service since 1998, has been successfully tested under all turbine conditions, including full power-augmentation during last summer's heat wave.

RESULTS

The stack Continuous Emission Monitoring (CEM) system indicated **the new *PowerPlus* duct burner reduced the stack CO by over 50%**, bringing the plant well into compliance in all operating modes.

In addition, *PowerPlus* provided:

- ✓ **LOW CO** - CO emissions reduced below 10 ppm throughout the duct burner's firing range.
- ✓ **LOW NOx** – NOx emission remained below 9 ppm
- ✓ **Met all permit levels without Augmenting Air**



CFD STUDIES

Strict federal air pollution regulations trickling down to the district level are creating great economic challenges to remain competitive in a fierce domestic power environment. It is no longer an option, but a necessity for industry to pursue and implement the latest technology that provides economic and environmental benefits.

Coen Company, the world leader in duct burner technology for 30 years, understands this trend. We are committed to providing the latest in combustion and emission control technology to meet the needs of Independent Power Producers and the cogeneration industry.

Maximum Power When Temperatures Peak

