How multi-pollutant catalysts enhance value for gas turbines

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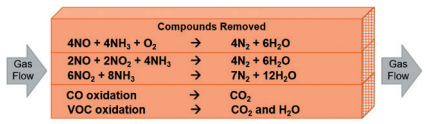


Main emissions reduction reactions for a gas-fired plant (Source: CORMETECH)

The constantly evolving energy market is forcing gas turbine power plants to operate in new and demanding ways. The combined impact of intermittent renewables and tightening emissions requirements is compelling the adoption of optimised combustion systems and advanced emissions control equipment. Global emission standards, for example, are now typically in the range 3-5 mg/Nm^3 for ammonia slip, 10-30 mg/Nm^3 for NO_x, and 5-30 mg/Nm^3 for CO.

To maximise plant dispatchability while economically meeting emissions standards, gas turbine plant owners are increasingly turning to advanced SCR catalysts to increase emissions capture while minimising impacts on turbine efficiency throughout the required load range.

Natural-gas-fired plants, both simple cycle and combined cycle, are facing increasing demands such as wider load flexibility, reduced turbine back pressure and lower maintenance costs while assuring environmental compliance. In many cases, renewables have forced gas turbine plants to run at partial load conditions, driving CO emissions to high levels. While existing plants, with or without an SCR or CO catalyst, may perform well at high load, the demand to run at partial load may require plants to increase their capability to remove CO throughout the load profile, including startups and shutdowns.

Two-in-one

An emerging class of multi-pollutant catalysts is entering the market that combines the catalytic functionalities of SCR NO_x reduction and CO/VOC oxidation into a single catalyst layer. This is a marked contrast to the traditional approach of separating these functionalities into two catalyst layers.

CORMETECH – global supplier of environmental technologies including SCR catalysts – offers a diverse suite of multi-pollutant catalyst solutions to address a wide range of end-uses.

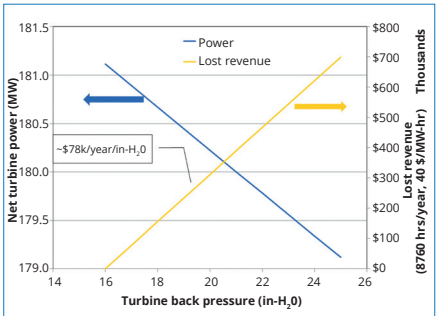
For example, the METEOR™ M1 multi-emissions control technology simultaneously reduces CO, VOCs, NO_x and ammonia to meet multiple compliance requirements in a single catalyst. The technology is particularly suited for retrofit applications thanks to the reduced footprint compared with traditional catalyst configurations and inherent flexibility to accommodate both traditionally injected and directly injected reagent systems.

The METEOR™ M3 technology is specifically for CO and VOC oxidation upstream of the ammonia injection grid, enabling gas turbine operation at low loads, fast compliance with CO emissions during unit startup, and reduced sensitivity to sulphur fouling agents when operating at low temperatures, for both new and existing units.

The METEOR technology was recently applied to a 360 MW natural gas fueled combined cycle power plant (with Westinghouse 501G gas turbine) in Texas. Prior to the retrofit, the CO emissions increased significantly when the plant's gas turbine load was reduced to 60% output. Following the METEOR retrofit, the plant has been able to operate below 35% load without any significant increase in CO emissions. See graph below.

Reducing turbine back pressure can significantly benefit plant operation, allowing increased turbine performance, increased electricity production for the same natural gas consumption, and reduced natural gas consumption at lower loads.

The CORMETECH ELITE™ platform is an ultra-high-surface-area SCR catalyst design offering decreased turbine backpressure with increased catalytic potential. The graph above shows the effect of reduced back pressure: total MW output increases (blue line) and annual revenue losses decline (yellow line).

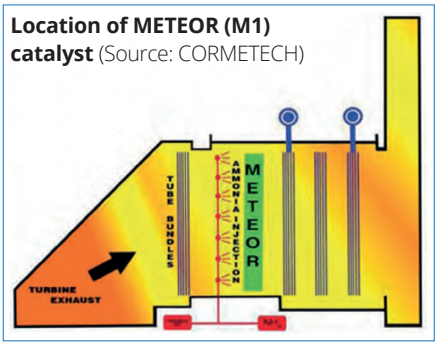


Effect of changes in turbine back pressure (Source: CORMETECH)

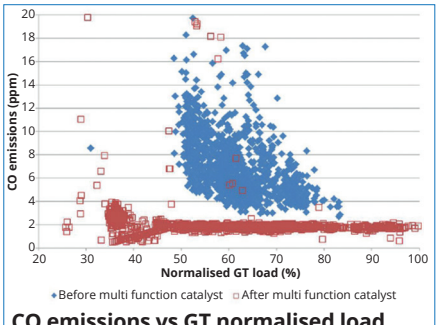
Multi-function = multiple benefits

By simultaneously reducing NO_x, CO, VOCs, and NH_3 slip to compliance levels in one vertical plane, while maintaining a low SO_2 oxidation rate, multi-pollutant catalysts such as METEOR™ and ELITE™ can enable:

- Capital cost reduction through a reduced footprint in the HRSG (for new units).
- Enhanced unit efficiency associated with reduced turbine back pressure (for new and existing units).
- Broader gas turbine load flexibility by keeping CO emissions in compliance at low load, along with reduced sensitivity to sulphur fouling agents when operating at low temperatures (for new and existing units).
- Lower maintenance costs due to reduced cold-end fouling potential (thanks to lower SO_2 oxidation rate in comparison with the traditional two-layer oxidation + SCR system) and the need to only maintain a single catalyst layer (for new and existing units). ●



Location of METEOR (M1) catalyst (Source: CORMETECH)



CO emissions vs GT normalised load (Source: CORMETECH)

ELITE SCR (Source: CORMETECH)

More information can be accessed at www.cormetech.com