Industrial e-News Bulletin:
Air Pollution Control Systems

The Gas Blender® Mixer Improves Performance of Pollution Abatement and CEM Systems

In pollution abatement and in continuous emissions monitoring (CEM) systems, temperature stratification, concentration non-uniformity and velocity maldistribution are detrimental to performance of these systems. Performance of these systems is enhanced with mixing—with adequate mixing, temperature is destratified, concentrations are more uniform and velocity/flow profiles are more evenly distributed, resulting in decreased levels of pollution and more accurate emissions monitoring measurements. The Gas Blender mixer is specifically designed to condition air flow to achieve each of these ends, thereby significantly improving the operating efficiencies of these air pollution control systems.

Motionless Mixing Performance

Static (motionless) mixing is a very efficient method for blending gases in achieving destratification of temperature, concentration and velocity. The Gas Blender® mixer by Blender Products, Inc. is the most efficient motionless gas mixer, having the highest mixing performance with respect to pressure drop. There are no moving parts and no operation or maintenance procedures required. In flowing across the Gas Blender mixer, turbulence is generated in the gas stream that promotes very rapid downstream mixing. The versatile Gas Blender design, having proven and predictable mixing performance, is used extensively in pollution abatement and continuous emissions monitoring (CEM) systems.

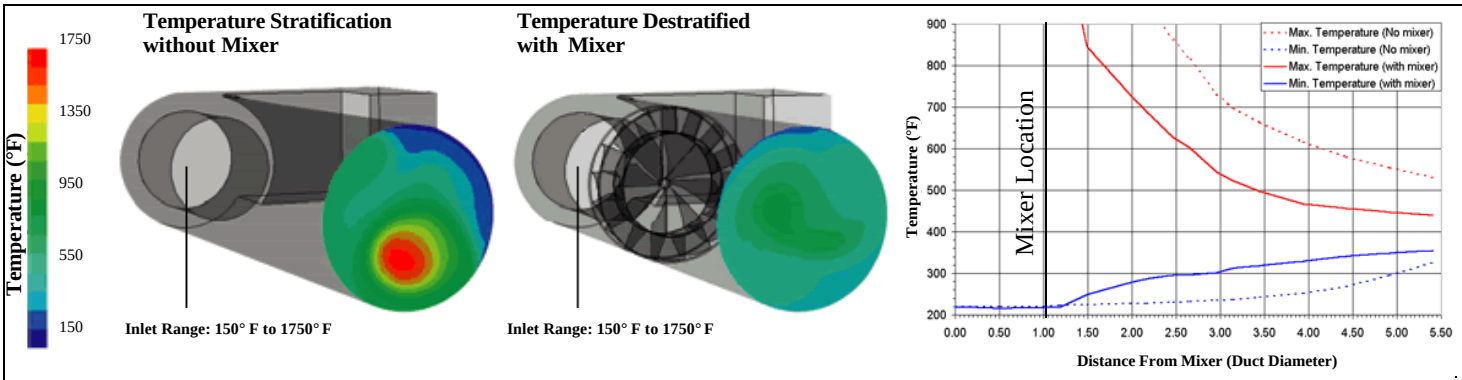


Figure 1: Thermal Mixing - The Gas Blender reduces thermal gradients and insures a highly uniform temperature distribution in pollution abatement systems.

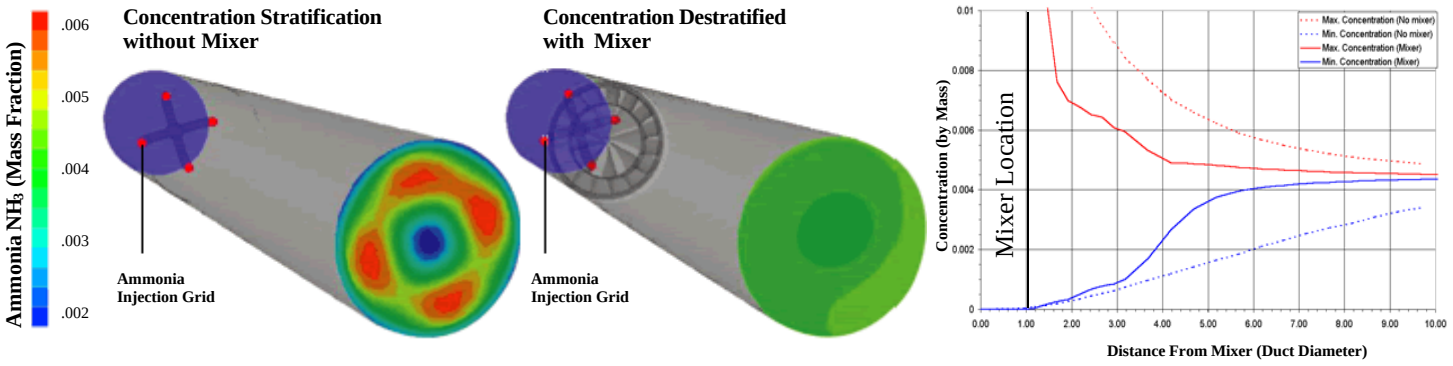


Figure 2: Concentration Mixing - The Gas Blender reduces concentration gradients and insures a highly uniform temperature distribution in SCR systems, stack emission sampling (CEM), and absolute filter testing using DOP aerosols.

Pollution Abatement

In pollution abatement, under highly stratified flue temperatures, catalysts may be fairly ineffective, resulting in relatively large slip of reactants and therefore heightened levels of pollution. Similarly, when combining nitrogenous compounds with flue gases in SCR systems, efficient conversion of NOx and SOx to more benign compounds is highly dependent on having reactant gases adequately mixed—uniform concentration of reactants favors higher conversion rates. Further, in these pollution abatement systems without adequate mixing, catalyst beds may be non-uniformly loaded, which leaves some portions of the catalyst bed under-utilized and other portions over-utilized. A relatively uniform flow/velocity profile achieved through enhanced mixing promotes uniform catalyst loading, resulting in desirably higher conversion rates, and resultantly less pollution.

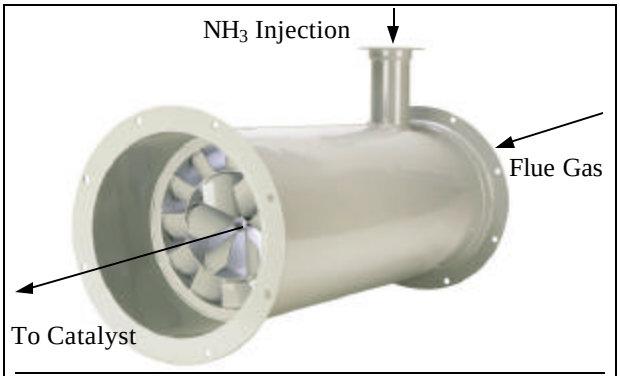


Figure 3: Gas Blender packaged in an engineered gas injection system

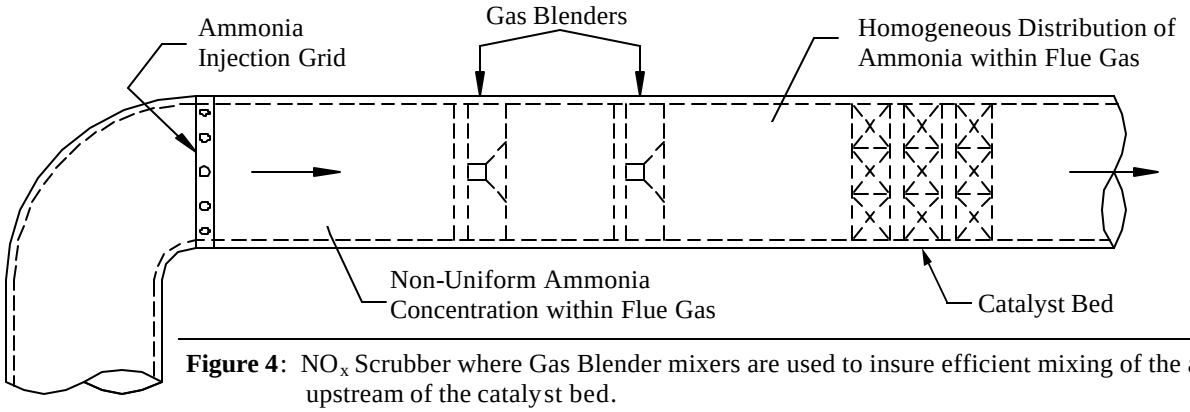
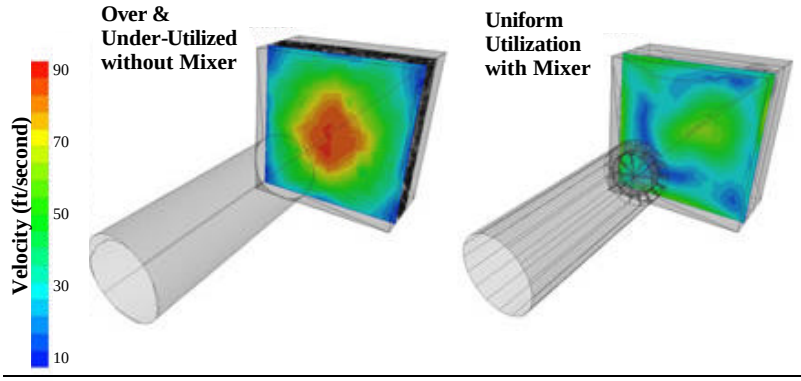


Figure 4: NO_x Scrubber where Gas Blender mixers are used to insure efficient mixing of the ammonia upstream of the catalyst bed.

Emissions Monitoring

In monitoring emissions from flues and stacks, measuring instrumentation and devices are placed in an attempt to capture average conditions. Under perfect mixing, average conditions are spatially independent and therefore placement location of probes is not critical. Systems in which measuring equipment is installed are designed to conform to discharge limits—the design often is based on average or near-average conditions. Invariably though, flue and stack gases are not adequately mixed, and therefore recorded measurements do not reflect average conditions—rather, off-average or even extreme measurements may be recorded that reflect exceedance of discharge limits. Static mixing in flues and stacks drives extreme values of temperature, concentration and velocity toward theoretical averages over an appreciably shorter flow distance, so that flue property measurement are less indicative of extremes and more indicative of theoretical average conditions.



To the left is a CFD model detailing an application where the Gas Blender mixer is used for insuring velocity uniformity. In this application, airflow passes from a circular duct across a rectangular catalyst bed. The expansion ratio is 9 to 1. The catalyst bed is less than 2 diameters downstream of the circular duct discharge.

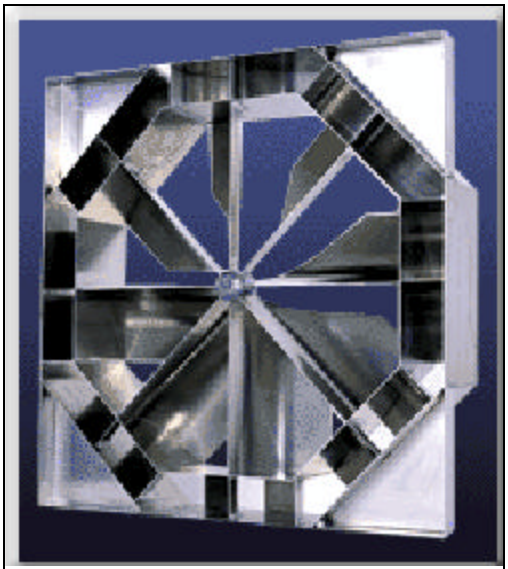
The Gas Blender mixer minimizes velocity maldistribution, thereby preventing equipment damage caused by high velocity jets and improving efficiencies in applications such as:

- Stack emissions testing
- Chemical removal processes
- Gas/Particulate Filtration

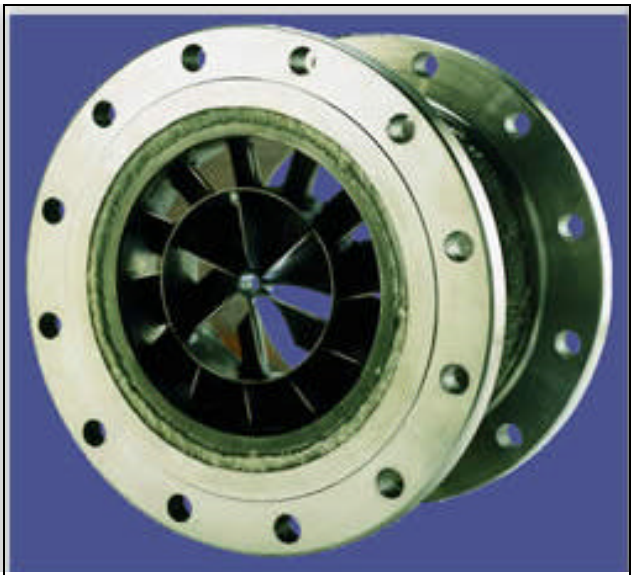
Figure 5: Velocity Profiling

Summary

The Gas Blender® static mixer is available in a wide variety of materials, configurations and architectural arrangements. Standard materials include carbon steel and stainless steel—other materials are available for high temperature and corrosive applications. The Gas Blender unit comes in round, square or rectangular and may be either sleeve-mounted in your duct/pipe or flange-mounted. In pollution abatement systems, Blender Products offers an engineered package with injection/diffuser equipment integrated with the Gas Blender unit.



Rectangular Sleeve Mount Gas Blender®



Pipe Series (Flange Mount) Gas Blender®

Gas Blender® air and gas static mixing equipment is sold through qualified Product Representatives—please contact your local Representative for application assistance and pricing. A current list of Product Representatives and their contact information may be found on the Blender Products website at **www.airblender.com**. In seeking the most efficient air and gas static mixing, insist on the Gas Blender® by Blender Products, Inc.