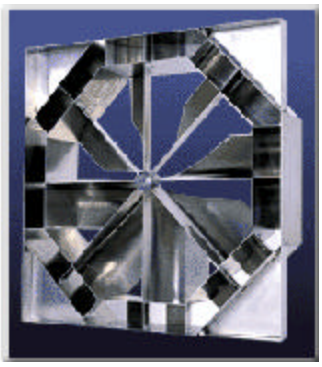
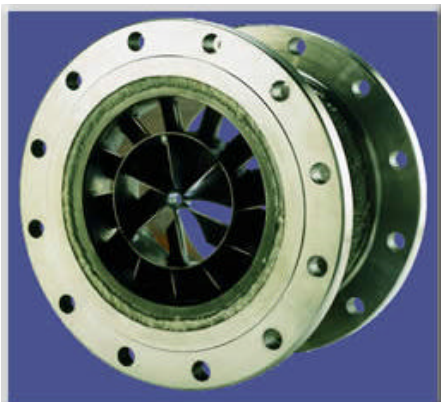
Industrial e-News Bulletin: Thermal Mixing Highlight

The Gas Blender® Mixer



The Gas Blender static mixer is a patented device designed to provide high, repeatable levels of mixing. The turbulence created by the counter rotational blade design provides mixing in minimal distance while maintaining a low pressure drop.

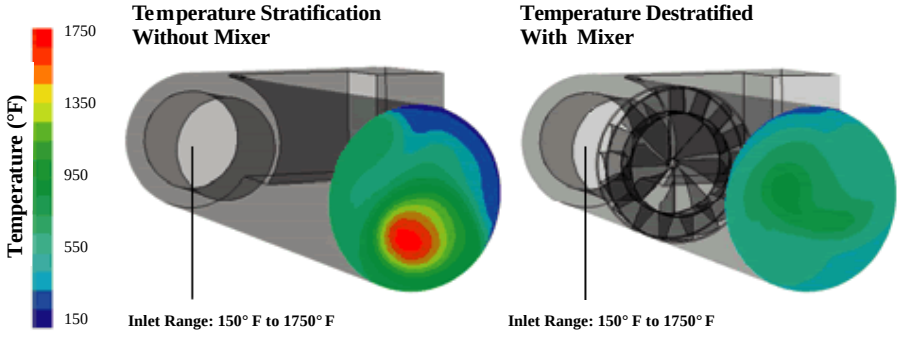
The Gas Blender mixer is tremendously flexible in application. The product is made to accommodate pipe or duct, rectangular or circular applications. Further, the product can be used as a single unit, in series, or in an array depending on system requirements.



Since the Gas Blender mixer uses velocity of the gas stream to mix, it can effectively operate over very broad thermal and flow ranges. The product has been successfully used in applications where temperatures range from 0°F to more than 2,000°F, and flow rates from less than 175 cfm to flows exceeding 850,000 cfm. Because of the broad flow ranges and low pressure drop, the Gas Blender mixer is the ideal solution for many industrial process systems and environmental control applications.

The applications for the Gas Blender fall into three major categories: Thermal Mixing, Concentration Mixing, and Velocity Profiling. This bulletin is focuses on thermal stratification.

The Gas Blender® and Thermal Mixing



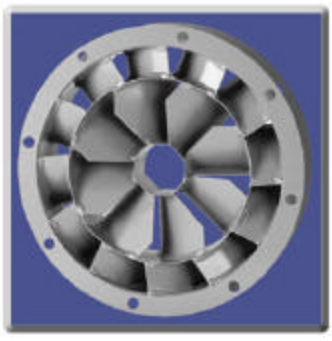
The Gas Blender reduces thermal gradients and insures a highly uniform temperature distribution throughout the flow. Successful installations include, but are not limited to:

- Process Drying of textile and paper.
- Flash Drying of powdered milk and pharmaceutical coatings.
- Mixing hot and cold gases in emission reduction systems such as dry scrubbers, bag house filters, thermal oxidizers and incinerators.
- Thermal and humidity gradient controls for laboratory and painted coating applications.

Thermal Mixing Case Study

Problem

A paper-coating manufacturer combines 1600-degree F air with 500-degree F air that immediately passes across a heat exchanger. The existing aluminized steel plates of the heat exchanger warp under excessive temperature from the hot air stream and render it incapable of adequately performing its intended function.



Before replacing the damaged heat exchanger, the coating manufacturer was advised by their consulting engineers to consider a static mixer that depresses the extreme high temperature experienced by the exchanger, thereby preventing heat damage in the future.

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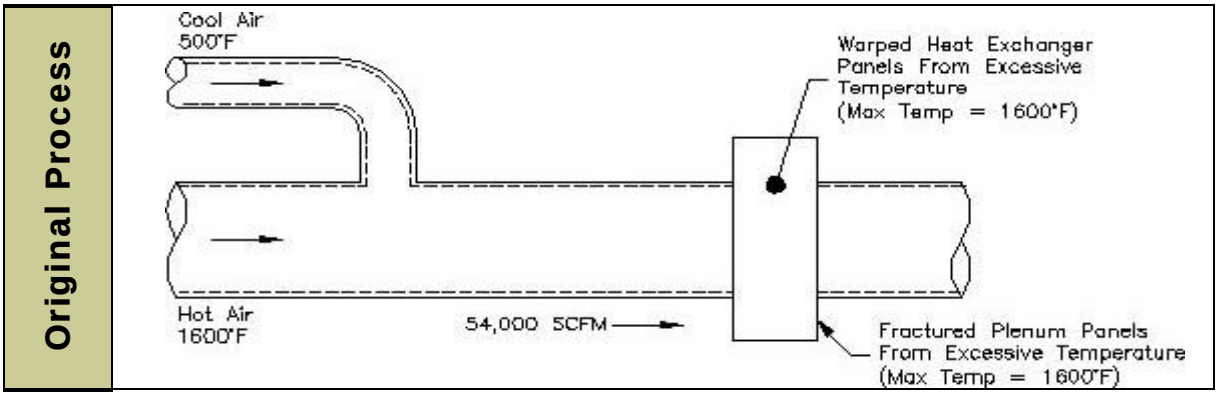
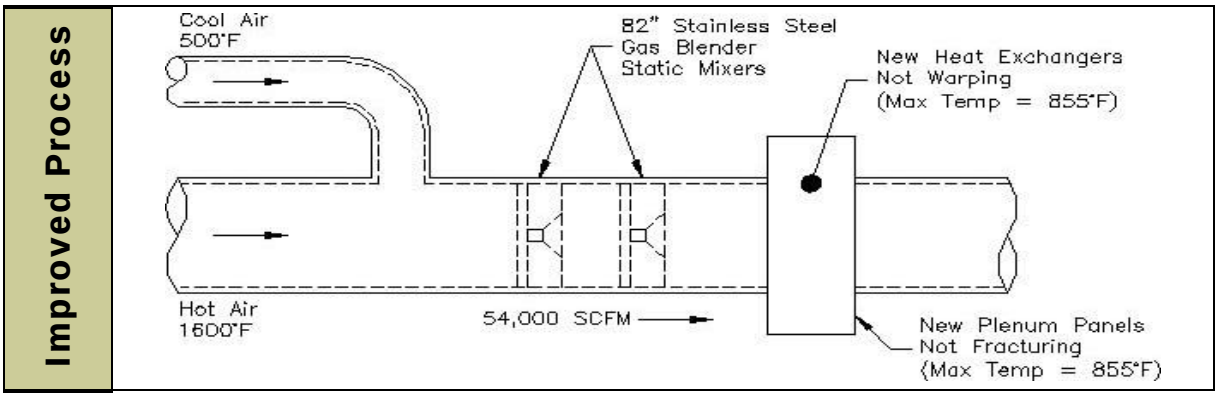


The hot and cold streams combine for a total flow rate of 54,000 SCFM. The hot air stream is typically maintained at 1600 degrees F, yet may rise as high as 1750 degrees F, while the cold air stream varies between 150 degrees F and 500 degrees F. In a very short plenum, the two streams combine with minimal mixing, leaving the combined air stream highly stratified with respect to temperature, so that some plates of the heat exchanger experience temperatures in excess of 1600 degrees F. Additionally, the existing stainless steel plenum panels were fractured from hot spots from the stratified air stream—by destratifying temperature, both the heat exchanger plates and the stainless steel plenum panels will not experience extreme temperatures and not be susceptible to heat damage. The owner established tight performance criteria of a maximum 100-degree F temperature spread about the average temperature.

Solution

To solve this problem, Blender Products, Inc. provided two 82" diameter 309 stainless steel mixers in series to adequately mix the hot and cold air streams. The combined pressure drop across both mixers was less than 0.8" w.g. Over the 2-month validation period, the temperature range did not exceed the 100-degree F range limit set by the owner. Before installation of the mixers, the temperature chart recorder had such disparate readings that the output was essentially unreadable—after installation of the mixers, the temperature charts were finally legible.



Even at the worst case mixing condition with a 50/50 mass mixture of hot and cold air, the largest temperature spread recording was 82 degrees F. The highest temperature recorded is 855 degrees F, which is well below the new heat exchanger temperature rating of 900 degrees F. With the Gas Blender® mixers installed, the temperature controllers are now operating optimally, which reduces operating costs.

> *"Because of the good results from the blenders, our temperature indicating controllers are now operating as designed……..we anticipate lower operating costs. Now the excessive wear and tear from stratified air has been brought under control and we are very satisfied with the results." --Joseph Guzek, FCPI*

Closure

The Gas Blender® rapidly mixes gas streams to homogenize temperature and humidity, destratify velocity and reduce concentration gradients. The Gas Blender® is made for ducts and pipes and fits either circular or rectangular profiles. Applications include paint booth humidity control, tissue paper drying, SCR pollution abatement, CEM pollution monitoring systems and natural gas pipeline mixing. Blender Products, Inc. has over 500 applications worldwide providing engineering consultation, design and fabrication services in industrial gas mixing.