

LIME KILN

PROVEN TECHNOLOGY REDUCES EMISSIONS AND FUEL COSTS

THE PROBLEM

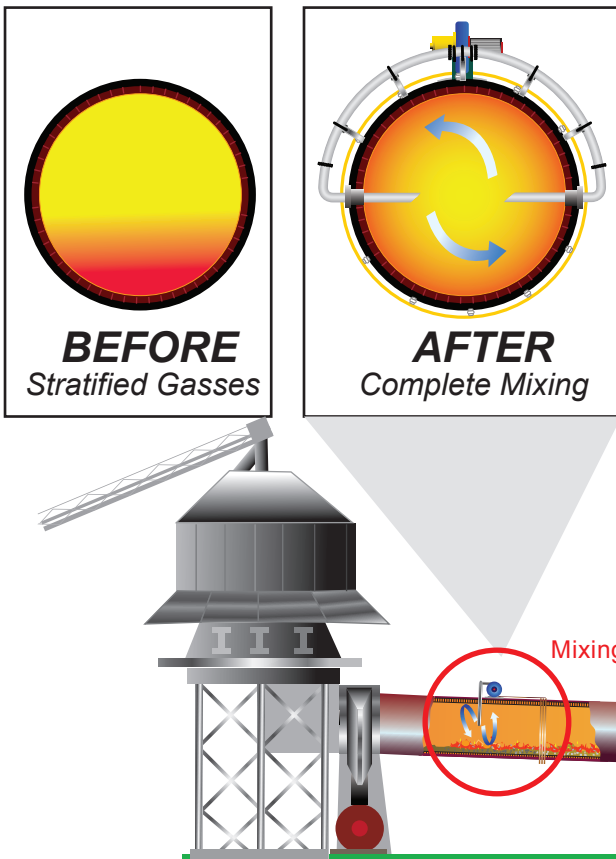
It is well known that lime kilns are operated with a reducing atmosphere to enhance removal of sulfur from the product. This action most always results in loss of fuel value due to incomplete combustion and emissions of carbon monoxide and sulfur dioxide.

THE SOLUTION

The precise injection of high velocity air (about 5% of the total combustion air) into the middle of the kiln where the gas temperatures are 1204°C to 1538°C creates oxidizing conditions for the upper half of the kiln. This dynamic condition enhances sulfur removal without increasing carbon monoxide emissions and most importantly, without the loss of fuel value. Mixing Air Technology will ...

- Cut Fuel Usage 3 - 5%
- Increase Petcoke Use
- Reduce NOx and CO Emissions
- No Product Sulfur Increase

Cadence Mixing Air Technology for Lime Kilns



MIXING AIR IS NOT FALSE AIR ... When ambient air at atmosphere pressure leaks into the pyroprocessing line “false air” results. False Air causes higher heat consumption and loss of production. Cadence Mixing Air injects ambient air at specific momentum levels to mix laminar and high-velocity gasses within the kiln. Top layer gasses are high in temperature, (approximately 1538°C), move at high velocity and are rich in O₂. Lower layer gasses move at a laminar rate, are much cooler (typically 454°C) and are rich in CO₂. By breaking up this gas stratification, heat transfer is significantly improved and heat consumption is reduced.

EMISSIONS REDUCED ... Emissions of carbon monoxide, sulfur dioxide and nitrogen oxides are reduced by staged combustion while enhancing the ability to make low sulfur lime. For kilns not operating in a mode to minimize sulfur, the mixing air allows for slightly reducing conditions in the hot zone to minimize nitrogen oxides while maintaining a well-mixed oxidizing condition in the cooler portion of the kiln to trap the sulfur and destroy any residual carbon monoxide.

HEAT TRANSFER ... When gas stratification is eliminated, heat transfer is significantly enhanced. The calcining limestone is emitting carbon dioxide at the calcining temperature of 904°C. Under normal conditions, the hot combustion gasses at the top of the kiln do not readily mix with the cold and heavy carbon dioxide on the bottom. Thus, the limestone is blanketed with this relatively cool carbon dioxide preventing direct contact of the hot gasses. The Mixing Air system imparts a rotational component to the kiln gas that brings hot gasses in contact with the bed. Without the rotational movement of the kiln gas, the primary mechanism of heat transfer is the heating of the refractory at the top of the kiln and then rotating the refractor under the bed where heat transfer to the limestone occurs. The mixing air is injected with enough energy to create an average rotational momentum of six revolutions per second for the full cross section. Typically, a 60-hp fan is used on a 10 foot kiln to achieve the required amount of rotation using approximately 5% of the total combustion air. One might anticipate that the rotation of gas throughout the kiln might eliminate the need for costly heat transfer inserts like trefoils and lifters.

REDUCED OR ELIMINATED BUILDUP ... The action of the injected air results in cross sectional mixing of the kiln gasses. A common problem in preheated lime kilns is buildups due to this stratification. By achieving cross sectional mixing, the negative effects of the stratification can be eliminated from the operation of the preheater.



NATIONAL SALES OFFICE ... 2219 Sawdust Road, Suite 1505 - The Woodlands, TX 77380
 - Phone: (936) 242-1008 - Fax: (936) 242-1267 - Email: ttreese@cadencerecycling.com