

BICARB BULLETIN



Deacidification of Waste Incinerator Gases with Sodium Bicarbonate

HCl Removal with Sodium Bicarbonate Injection at Southland Exchange-Joint Venture, Hampton, SC

The efficacy of sodium bicarbonate in reducing SO₂ and acid pollutants from stack gases was previously established in scrubbing tests conducted by OMNICAL in Ewersbach, West Germany, and by Kontich Refuse Incinerator Plant in Antwerp, Belgium.

This report will discuss the first MSW installation in the Western hemisphere to use dry sodium bicarbonate injection specifically for acid gas removal.

Installation Background

Southland Exchange-Joint Venture (SEJV) is located in Hampton, South Carolina. The plant is designed to handle municipal waste from a three-county area, plus medical waste from hospitals along the Eastern U.S. seaboard. Solid waste capacity is 200 tons per day, of which 30-40% is infectious or pathological waste. The 24-hour facility is the largest incinerator of medical waste in the U.S.

After three years of operation with only particulate removal, SEJV underwent a system retrofit for dry sorbent injection in February of 1989. Retrofit components comprise a reaction chamber, ESP modifications, and a mill-and-hopper to discharge and pulverize the dry sodium bicarbonate. The primary acid gas emitted by the facility is HCl.

Plant Operation

The basic plant layout is shown in Figure 1. Trucked municipal waste is dumped from a tipping truck lift and mechanically separated from other commercial waste. Solid waste from the tipping floor and special waste unloading dock is conveyed to a bank of three waste-fired incinerators where it is loaded by hydraulic ram and incinerated at 2200°F.

Economizers following the two 20,000 pound per hour boilers are used to preheat the boiler feed water to improve overall heat efficiency.

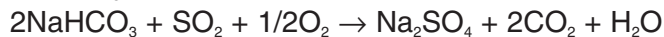
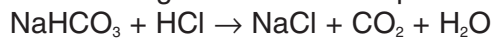
Deacidification of Waste Incinerator Gases with Sodium Bicarbonate

Commercial grade sodium bicarbonate from one-ton semi-bulk bags is automatically discharged into the hopper and milled to a particle size of about 10 microns. From the mill the bicarbonate is conveyed pneumatically by forced air blowers to the exhaust duct where it is continuously added to the acid gas stream at a rate of 500 to 800 pounds per hour.

An acid gas reactor downstream from the injectors allows a three-second reaction time for the sorbent and acid gas. Particulates are removed from the neutralized gases by a three-field electrostatic precipitator (ESP) unit at the reactor end of the exhaust duct prior to release through the stack. A DC potential of 50KV at 150 ma. applied to the ESP grid elements deposits fly ash on the plates which are periodically vibrated to effect particle shake-down.

Stoichiometry

The reactions of sodium bicarbonate with the primary component of combustion are represented in the following stiochiometric equations:



Water vapor and carbon dioxide produced by these reactions are released through the flue and vented to the atmosphere. The solid sodium salts collected with fly ash extracted from the precipitators are mixed with incinerator bottom ash.

Conformance to Environmental Regulations

South Carolina regulatory authorities set maximum particulate concentration at .08 grains per dry standard cubic foot. The permissible limit on HCl is stipulated as 100 ppm or 83% acid removal, depending upon which value provides the lowest residual level.

Gas scrubbing tests performed at SEJV in the spring of 1989 indicate a .04 grain per cubic foot average for particulates.

Acid concentration levels were measured between the two exhaust inlets and common discharge point. Values for the HCl removal are shown for both medical and MSW incineration:

Waste Type	PPM Inlet A	PPM Inlet B	Avg. PPM Inlet	PPM Output	% Removal
Medical	629	968	799	30.7	96
Municipal	422	532	477	3.9	99

An unplanned-for benefit of the dry injection process has been an improvement in stream factor resulting from the reduction of the corrosion damage to the I.D. fan components.

Conclusions

Utilizing sodium bicarbonate dry injection technology, the SEJV MSW incinerator has achieved a 98% reduction in acid gas emissions. Emissions of particulates and critical organics also fall well within the regulatory guidelines.

Deacidification of Waste Incinerator Gases with Sodium Bicarbonate

Summary of Known Parameters at Southland Exchange-Joint Venture

Incinerator Operation:	24-hr/day, MSW & Special Waste
Proportion of Wastes Handled:	60-70% MSW; 30-40% Medical
Total Daily Waste Capacity:	200 tons
Furnace Temperature:	2200°F
Furnace Heat Source:	Waste-fired
Boiler Capacity:	40,000 lbs/hr.
Boiler Heat Source:	Economizer/feedwater loop
Primary Acid Gas:	HCl
Neutralization Medium:	Dry NaHCO ₃
Sorbent Particle Size:	~ 10 micron
Sorbent Injection Temperature:	500-550°F
Sorbent Injection Rate:	500-800 lbs/hr.
Sorbent/Gas Contact Time:	~ 3 seconds
Particulate Removal System:	50KV ESP units (3-field)
Particulate Concentration at Stack:	.04 grain/dry cu. ft.
Average HCl Concentration at Stack:	10.6 PPM
Average Acid Gas Removal Efficiency:	98%

Figure 1. Block diagram of SEJV operation

