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ECONOMICS AND BENEFITS OF CONVERTING FROM ANHYDROUS AMMONIA TO AMMONIUM HYDROXIDE FOR NOx CONTROL AT THE COMMERCE REFUSE TO ENERGY FACILITY

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ABSTRACT

The Commerce Refuse to Energy Facility, which is operated by the Los Angeles County Sanitation Districts (Districts), first burned refuse in late 1986. This facility was the first U.S. refuse plant to use anhydrous ammonia for NOx control. Although technically effective and economical, the system was converted from anhydrous ammonia (gaseous) to ammonium hydroxide (liquid or aqua ammonia) in May 1995. This change was made to eliminate the potential release of gaseous ammonia if an accidental leak occurred.

This paper will include discussions on: 1) the design layout of the new system, 2) the capital cost of the conversion, 3) the change in operating cost, and 4) NOx emissions before and after the conversion.

DISCUSSION

The Commerce plant is located near Los Angeles, CA which is in an EPA air emission non-attainment area. As a result, the plant was required to have NOx control when it was constructed. Exxon's thermal DeNOx process with ammonia injection as a non-catalytic NOx control was used. This process was considered the "best available control technology" (BACT) by the South Coast Air Quality Management District (AQMD). The AQMD, however, considered ammonia injection an "innovative technology" since it had not been proven with refuse firing. The NOx permit limits at Commerce are:

1) 225 ppm corrected to 3% oxygen for a 15 minute period
2) 190 ppm corrected to 3% oxygen for a 1 hour period
3) 40 lb. for a 1 hour period
4) 825 lb/day

The DeNOx process proved very effective for NOx control averaging 110 ppm corrected to 3% oxygen and 24 lb/hour. The process had 100% availability and thus never caused lost production or down time of the plant for the eight years it was in operation. The process was simply a pressurized tank, a vaporizer, a flow control valve, and solenoid valves to control the elevation in the furnace for the injection.

A 75 hp compressor was originally used to provide carrier air to provide better mixing as the ammonia was injected into the furnace. Initial system performance testing, however, indicated adequate mixing without carrier air so the compressor was not used.

In 1992, a new law through the California Health and Safety Codes required a special Risk Management Prevention Plan (RMPP) study done for acutely hazardous chemical which included anhydrous ammonia. The study identified potential risks to the employees and the public of an accidental leak of ammonia. The study identified some piping changes which were completed and included a dispersion model of the "most credible" gaseous ammonia leak.

Although the model showed that the likelihood and dispersion concentration was acceptable, it required that the a leak be shut off within 6 minutes. This 6 minute response required that Districts' operating staff and not the Fire Department be the "first responder".