Innovative Technology Reduces Power Plant Emissions – Commercialization Success

Presented by

Dr. Clyde Parrish, Senior Chemist
NASA Kennedy Space Center

June 10, 2004
Overview of Emission Control System Development

- Development of new oxidizer scrubber system to eliminate NOx waste and produce fertilizer
- Technology licensed and a 1 to 3 MWatt-scale prototype installed on power plant
- Development of method to oxidize NO to NO₂
- Experience gained from licensing NASA technology
Development of New Scrubber Liquor
Transformation of Waste to Fertilizer

Nitrogen Tetroxide ($N_2O_4$)

Oxidizer Scrubber (pH 14+)

Sodium Hydroxide (NaOH)

Products are a hazardous waste

Sodium Hydroxide
Sodium Nitrate
Sodium Nitrite
Nitric Oxide

Hydrogen Peroxide ($H_2O_2$)

Oxidizer Scrubber (pH 7)

Water ($H_2O$)

Potassium Hydroxide (KOH)

Potassium Nitrate (KNO$_3$)

Control System

Product is high grade fertilizer
New Scrubber Liquor System
Efficiency vs. Scrubber Liquors

![Bar chart showing efficiency percentages for different scrubber liquors.](image-url)
Efficiency vs. pH at Various Peroxide Concentrations
NO Oxidation Testbed
Catalyst Support
Catalyst Holder
Laboratory Conversion NO to NO₂
Efficiency vs. NO₂ Concentration

[Graph showing the relationship between Scrubber Efficiency and Concentration NOx, ppm]
Hydrogen Peroxide Concentration vs. Scrubber Efficiency

![Graph showing the relationship between Hydrogen Peroxide Concentration and Scrubber Efficiency. The graph indicates a constant efficiency across different concentrations.](image)
Efficiency vs. Scrubber Pump Rate

Efficiency

0% 20% 40% 60% 80% 100%

Pump Rate, mL/min

0 100 200 300 400 500 600 700
Initial Installation
View 2<sup>nd</sup> Installation
Top View 2nd Pilot Plant
Initial installation of Pilot Plant
Pilot Plant Results
SOx Scrubbing and NO Oxidation

Time, Minutes

Concentration, ppm

- NO
- NOx
- SOx
Phoenix Systems International, Inc

- Company Information
- Licensing Experience
- NASA Support
- Patent Protection
- Value of NASA Commercialization Efforts
- Teaming with Other Organization