Innovative Technology Reduces Power Plant Emissions – Commercialization Success

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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 ($KNO_3$)

Product is high grade fertilizer
New Scrubber Liquor System
**Efficiency vs. pH for 1.0 % Hydrogen Peroxide Laboratory Tests**
Efficiency vs. Scrubber Liquors

- 25% NaOH: 75.9%
- 0.1% H₂O₂: 95.9%
- 0.5% H₂O₂: 96.5%
- 1.0% H₂O₂: 95.2%
Efficiency vs. pH at Various Peroxide Concentrations
NO Oxidation Testbed
Catalyst Support
Efficiency vs. NO\textsubscript{2} Concentration
Hydrogen Peroxide Concentration vs. Scrubber Efficiency
Efficiency vs. Scrubber Pump Rate

Efficiency

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

Pump Rate, mL/min

0 100 200 300 400 500 600 700
Pilot Plant Installation

Flue Gas From Furnace Exhaust

Blower 40 HP

Cooler KO Pot
-8' H
-3' D
-6" Normal Level

Drain

H2O

SOx Scrubber
-15' H
-4' D
-100 gal Normal Level

Drain

Gas

SOx Sump Pump
30 HP
200 gpm

H2O

NOx Oxidation
-6' H
-3' D

H2O2 Oxidation Pump
4.0 gph Max

H2O2

NASA Controller/Analyzer

Need PSV

H2O2 - 3" SST

or 3-way valve here

H2O - 36" SST

Treated Gas to Furnace Exhaust

Duct

H2O2

H2O2 - 318" SST

NOx Scrubber
-30' H
-4' D → -6' D
-250 gal Normal Level

NOx Sump Pump

Drain

Grade

CSO

H2O2
Top View Pilot Plant
Initial installation of Pilot Plant
Pilot Plant Results
SOx Scrubbing and NO Oxidation

![Graph showing concentration over time for NO, NOx, and SOx](image-url)
Phoenix Systems International, Inc

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