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 (N₂O₄)

Oxidizer Scrubber (pH 14+)

Sodium Hydroxide (NaOH)

Products are a hazardous waste

Sodium Hydroxide
Sodium Nitrate
Sodium Nitrite
Nitric Oxide

Hydrogen Peroxide (H₂O₂)

Nitrogen Tetroxide (N₂O₄)

Oxidizer Scrubber (pH 7)

Water (H₂O)

Potassium Hydroxide (KOH)

Potassium Nitrate (KNO₃)

Control System

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. NO₂ Concentration

Scrubber Efficiency

Concentration NOx, ppm
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

Duct

Blower 40 HP

H2O

Cooler/KO Pot
- 8° H
- 3° D
- 5° Normal Level

Duct

Gas

NOx Scrubber
- 15° H
- 4° D
- 100 gal Normal Level

SOx Sump Pump
30 HP
200 gpm

Duct

NOx Oxidation
- 8° H
- 3° D

H2O2 Oxidation Pump
4.0 gph Max

NASA Controller/Analyzer

H2O2

H2O2, 36° SST

or 3-way valve here

H2O2, 36° SST

Drain

Treated Gas to Furnace Exhaust

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

NOx Sump Pump

Drain

Tote

H2O2

Need PSV

CSO

Grade

H2O2

Need PSV

CSO

Grade

H2O2
Top View Pilot Plant
Initial installation of Pilot Plant
National Aeronautics and Space Administration

John F. Kennedy Space Center

SPACEPORT ENGINEERING AND TECHNOLOGY
Pilot Plant Results
SOx Scrubbing and NO Oxidation

![Graph showing concentration over time for NO, NOx, and SOx]
Phoenix Systems International, Inc

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