Green Energy Co-generation with LFG at SC Johnson

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SC Johnson
A FAMILY COMPANY

June 2003

SC Johnson


Glade
POTPOURRI
Mango Splash
Sunny Days
Melon Burst


pledge
SMEAR FREE
Natural Beauty Every Time You Dust


pledge


Skintimate
Moisturizing
GEL
ULTRA PROTECTION


Skintimate
Smooth
SHAVE
Creamy Exfoliating
EXTRA MOISTURIZING


NEW
Glade
PLUGINS
SCENTED OIL
Meadow Breeze
60 Days


Raid
ANT KILLER
HOUSE & GARDEN
Raid
Roach


pledge
Orange
pledge
Orange


Antibacterial
Scrubbing Bubbles
Scrubbing Bubbles


NEW!
Windex
OUTDOOR
Windex
Original
Streak-Free Shine


SHOUT
SHOUT


LARGER SIZE
SHOUT
GEL


edge


NEW!
pledge
grab it
Sweeper and Cloth Refills
Electrostatic Cloths Grab Dust, Dirt and Hair!
1 SWEEPER
10 DRY


OFF!


OFF!
SKINTASTIC
KIDS


FASTEST THICKEST EVER!
MAXIMUM STRENGTH
Drano
MAX
CLOG REMOVER


ANTIBACTERIAL
fantastik

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Corporate Environmental Goals

For the top 5 Manufacturing Facilities from 2000 to 2005:

Eco-Efficiency

- Achieve a 15% reduction in overall combined emission as a ratio to production.

Sustainability

- Achieve a 10% decrease in fossil fuel usage
- Reduce greenhouse gases by 5% per year or 22.6% overall

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Climate Leaders Goals

For all US Facilities owned or leased. from 2000 to 2005:

Intensity Goal

- Achieve a 23% reduction in overall combined GHG emissions as a ratio to production.

Absolute Goal

- Reduce greenhouse gases by 8% on an absolute basis

CLIMATE LEADERS

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Develop a GHG Baseline

- do a GHG baseline for worldwide manufacturing facilities
- do a GHG baseline for all US facilities for Climate Leaders

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GHG Protocol Initiative

Standards, Guidelines and Calculation Tools for Corporate GHG Accounting & Reporting

WBCSD/WRI

World Business Council for Sustainable Development

World Resources Institute

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Use GHG baseline to target areas for GHG reductions

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Use GHG baseline to target areas for GHG reductions

- Waxdale's GHG emissions are about 50% of the top 7 worldwide manufacturing facilities baseline

- Waxdale represents over 33% of the US GHG emissions baseline

RESULT

The Waxdale facility is where GHG activities should be targeted.

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Define/Evaluate Green Energy Projects

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Define/Evaluate Green Energy Projects

One 3200kw Turbine - with HRSG - process steam generation

Four 800kw Internal Combustion (IC) engines - with exhaust heat recovery - process steam gen

One 1500kW Wind Turbine - poor wind site 350kW actual vs 1500kW capacity

Fuel Cells - developmental @ 3,200kW

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Define/Evaluate Green Energy Projects

Solar power 3,200kW - poor solar site - variable supply

Geothermal energy 3,200kw - need a large application of heating and cooling

CO2 Recovery from LFG - no Energy savings. Capital is 40% of turbine

Plant trees - CO2 uptake - 210 trees planted - high growth

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Selection of Top two Alternatives

The top two alternatives use LFG to produce green energy:

- one 3,200kW turbine with HRSG = 3,200kW
- four 800kW IC engines with exhaust heat recovery = 3,200kW

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Advantages of top two alternatives

- Both produce a consistent supply of energy
- Neither are affected by weather conditions
- Both can supply 3,200kW routinely with off the shelf equipment
- The technology for both is proven and currently in use

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Advantages of top two alternatives

- Both replace electricity - greatest GHG impact
- Both can replace significant amount of GHGs
- Both have heat recovery as an additional option
- Favorable capital costs for both compared to the other technologies

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Analysis of top two alternatives

Technical Analysis

- Both are adaptable to fluctuations in LFG supply and methane content.
- Both have substantial O & M requirements.
- The IC engines have more operating flexibility - 4 units
- Combustion efficiencies for GHG conversion to electricity are similar.
- Noise control needs are significant for both.

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Continued - Analysis of top two alternatives

Technical Analysis - continued

- **The turbine has a higher parasitic load**
- **The turbine has an efficiency dependent on ambient air temperatures**
- **Turbine - virtually all waste heat is available for SC Johnson high pressure steam production.**
- **IC engines - only approximately 25% of the waste heat is available for SC Johnson high pressure steam production**

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Continued - Analysis of top two alternatives

Energy/environment analysis

- **Turbine - saves the maximum energy and GHGs (32,000T/yr.) due to the largest usable waste heat recovery**
- **IC engines - saves less energy and GHGs (24,500T/yr.) because of reduced recovery of waste heat.**
- **For both - 3 air pollutant of concern are NOx, CO, & nmoc**
- For Turbine - classification as simple system vs a combined system

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Continued - Analysis of top two alternatives

Energy/environment analysis - continued

Turbine - must meet 25ppm Nox limit

- operate with low BTU LFG (380-420 BTU/scf LHV) - temporary
- Rule change for alternate fuels - applicable Nox is 35ppm

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Continued - Analysis of top two alternatives

Financial analysis:

IC engines without waste heat recovery
energy savings $1,200,000/yr. ROI 4%

IC engines with exhaust heat recovery
energy savings $1,500,000/yr. ROI 9%

Turbine with HRSG
energy savings $2.66 million/yr. ROI 20%

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Co-Generation - Financial Results

Item	I C System	Turbine System
Capital Investment	$4,500,000	$4,950,000
Reduced Cost of Natural Gas Purchased	630.000	1,540,344
Reduced Cost of Electricity Gas Purchased	1,121,000	1,121,000
Return On Investment	9.1%	19.6%

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Make Renewable/Green Energy

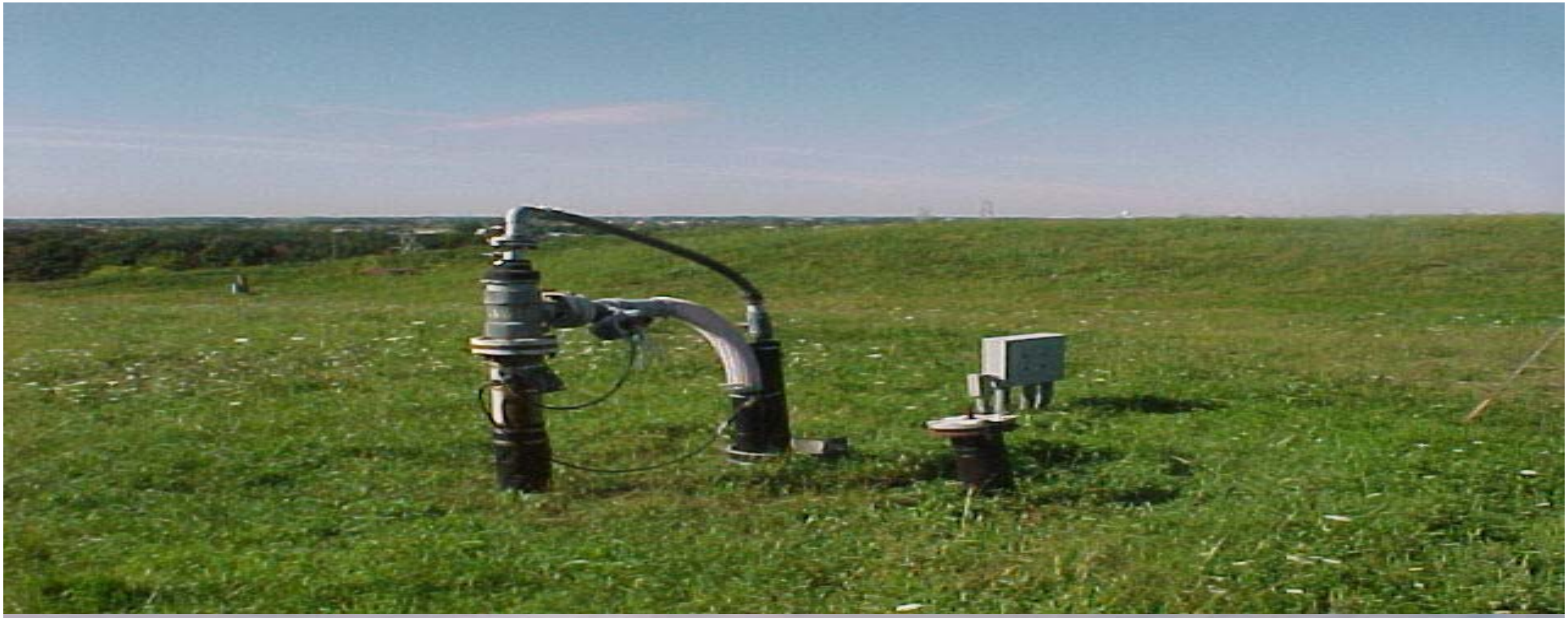
Use landfill gas to make electricity and steam at Waxdale

- **Install turbine to make 3,200 kW of electricity**
- **Recover waste heat from exhaust to make 17,000 lb/hr of plant steam at 150 psi**

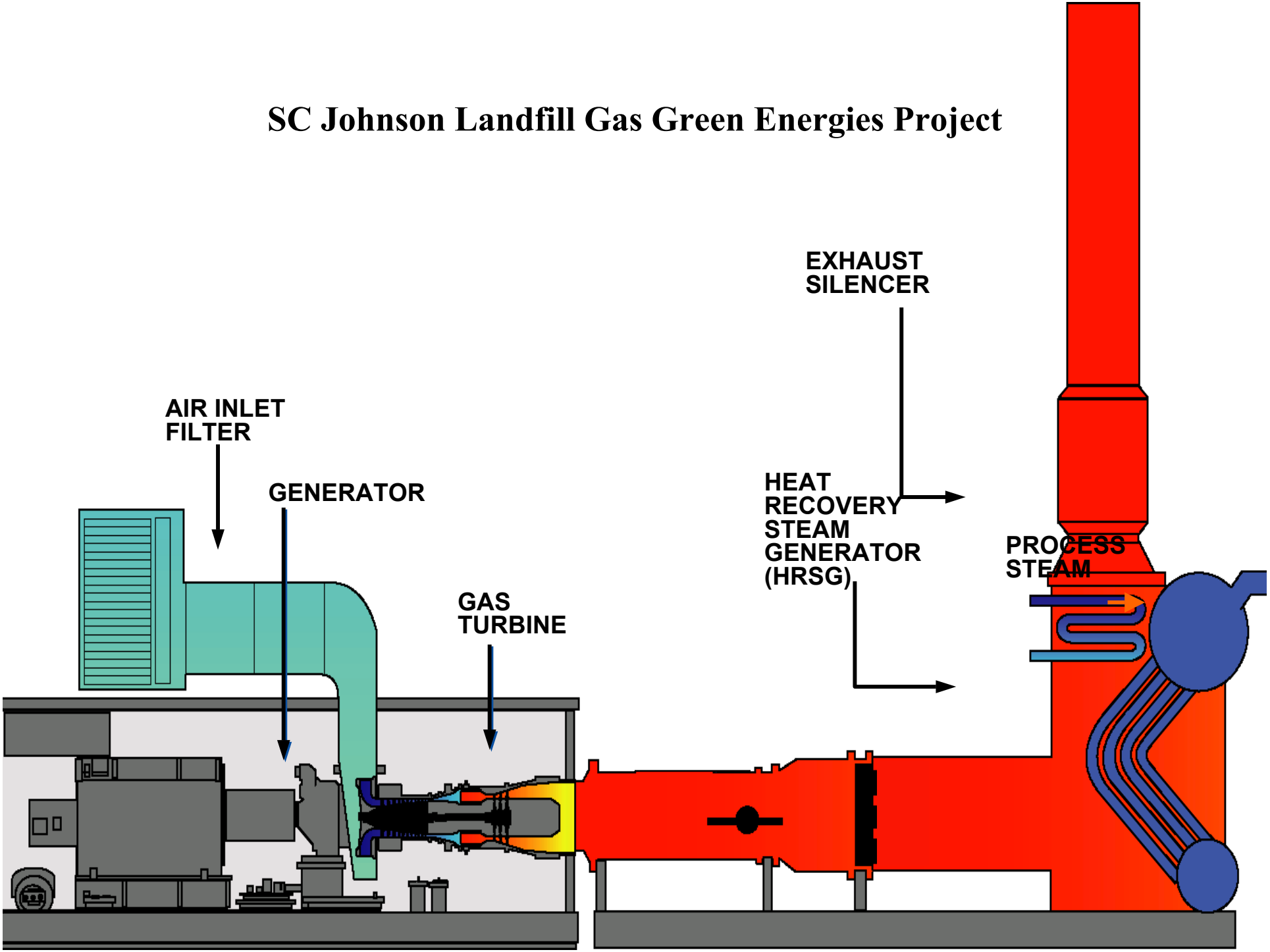
Reduce Waxdale's fossil fuel use by 50%

Reduce Waxdale's GHG emissions by 47%

Reduce SC Johnson - USA GHG emissions by 23%



SC Johnson Landfill Gas Green Energies Project



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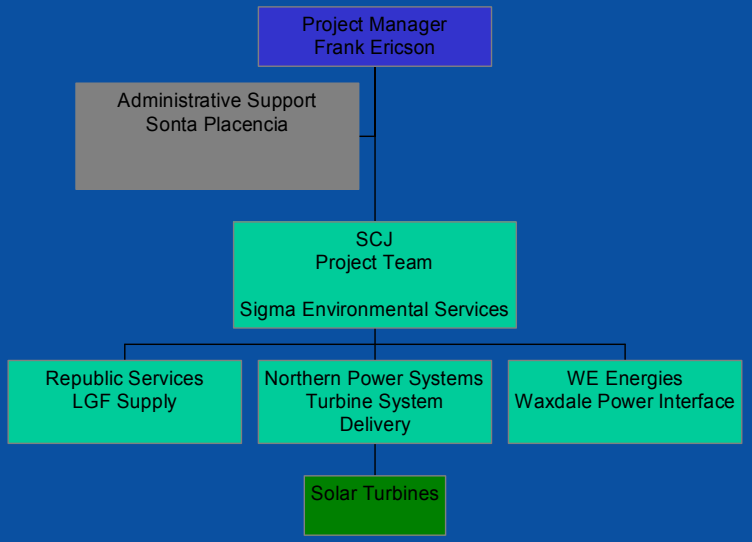
Project Team
LFG/Turbine Co-Generation Project



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LFG/Turbine Co-Generation Project Schedule

TURBINE CO-GENERATION SYSTEM

ENVIRONMENTAL PERMITS - **Oct 15 – March 1**

PRELIMINARY DESIGN - **Nov 1 – Feb 1**
Place order for Turbine — Dec 16

FINAL DESIGN & PLANNING - **Feb 1 – April 25**

GROUNDBREAKING CEREMONY - **April 25**
Company officials, employees and Government dignitaries

PROJECT IMPLEMENTATION - **April 26 – Dec 1**

Building Construction and Infrastructure Installation	April
Turbine delivery	June-July
System on line @ 3.2 MW	**Dec 1, 2003**

ENERGY SUPPLY AND SALE

REPUBLIC LFG SUPPLY **Sept 02–Sept 03**

Reestablish LFG Supply	Jan 15
Confirm final supply system needs for turbine	April 15


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