Industrial Gases
A Unique and Profitable Business Model

Chuck McConnell
Vice President

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Global Business/Regional Market Strength

Total Industrial Gases Sales: $48 billion

- Air Products and Chemicals 12%
- Praxair 15%
- Air Liquide 24%
- Linde 12%
- BOC 12%
- Taiyo Nippon Sanso 5%
- Other 20%


*Consolidated as of September 2006

Few global players
Industrial Gases by Market and Product

### End Markets*
- Manufacturing: 21%
- Healthcare: 11%
- Energy: 12%
- Electronics: 7%
- Food & Beverages: 7%
- Metals: 16%
- Other: 12%
- Chemicals: 11%
- Aerospace: 3%

*Praxair 2005 Sales $7,656 MM

### By Product
- Oxygen: 29%
- Nitrogen: 21%
- Helium: 2%
- Hydrogen: 6%
- Acetylene: 8%
- Carbon Dioxide: 9%
- Argon: 12%
- Specialty Gases: 6%
- Other: 7%

*Source: SRI Consulting, Praxair estimates

Atmospheric and process gases are fundamental to industry
Air Separation – Cryogenic Distillation

First commercialized in 1896 → Continuous improvements and enhancements

Air

Air Filtration & Conditioning

Purify

Liquefy by cooling to -320 °F

Separate by distillation

Nitrogen
-320 °F

Argon
-302 °F

Oxygen
-297 °F

78% N₂
21% O₂
1% Other Gases

First commercialized in 1896 → Continuous improvements and enhancements
Air Separation – Non-Cryogenic

First commercialized in 1960

Citigroup Chemicals for the Non-Chemist Conference - NYC 12/04/06
Process Gases – A Chemical Feedstock

- Hydrogen (H2)
- Carbon Monoxide (CO)
- Carbon Dioxide (CO2)

\[
\begin{align*}
\text{Partial Oxidation: } & \quad \text{CH}_4 + \frac{1}{2} \text{O}_2 \rightarrow 2\text{H}_2 + \text{CO} \\
\text{Steam Methane Reforming: } & \quad \text{CH}_4 + \text{H}_2\text{O} \rightarrow 3\text{H}_2 + \text{CO} \\
\text{CO Shift: } & \quad \text{CO} + \text{H}_2\text{O} \rightarrow \text{H}_2 + \text{CO}_2
\end{align*}
\]

Produced “on-purpose” or from purified waste streams.
## Basic Molecules with Many Uses

<table>
<thead>
<tr>
<th>Products</th>
<th>Attributes</th>
<th>Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen $O_2$</td>
<td>Reactive Life Sustaining</td>
<td>Steel, Chemicals, Environmental, Energy Healthcare, Welding</td>
</tr>
<tr>
<td>Nitrogen $N_2$</td>
<td>Inert Cryogenic (cold) Pressurized</td>
<td>Semiconductors, Chemicals, Packaging Food Freezing, Oil &amp; Gas Recovery</td>
</tr>
<tr>
<td>Argon $Ar$</td>
<td>Inert At High Temperatures</td>
<td>Stainless Steel, Welding, Basic Steel Making, Lighting</td>
</tr>
<tr>
<td>Hydrogen $H_2$</td>
<td>Chemical Fuel</td>
<td>Refining, Chemicals, Metals Space Program, Fuel Cells, Alternative Energy</td>
</tr>
<tr>
<td>Helium $He$</td>
<td>Cryogenic (cold) Inert Lifting</td>
<td>MRI, Fiber Optics, Scientific Research Diving Breathing Mixtures, Welding Balloons</td>
</tr>
<tr>
<td>Carbon Dioxide $CO_2$</td>
<td>Solubility Inert Cryogenic (cold) Pressurized</td>
<td>Beverage Carbonation Welding, Steel, Chemicals, Packaging Food Freezing, Dry Ice Oil and Gas Recovery</td>
</tr>
</tbody>
</table>
Applications Technology Drives Growth

Market Drivers

♦ PRODUCTIVITY
♦ ENERGY SAVINGS
♦ ENVIRONMENTAL

Growing at an increasing multiple of IP
Energy and Conservation Technologies

- **Higher energy efficiency**
  - 10-15% fuel savings

- **Higher throughput**
  - 10-20% increase

- **Less emissions**
  - 80-90% NOx reduction

PX commercializes 20+ new application technologies per year

- Steel
  - Blast furnace coal injection

- Glass
  - New oxyfuel burner

- Refining
  - Process heaters

- Aluminum
  - Remelting furnaces

- Utilities
  - Reduced NOX emissions
Helping Customers Reduce their Environmental Footprint

<table>
<thead>
<tr>
<th>AIR QUALITY</th>
<th>WATER QUALITY</th>
<th>ENERGY SAVINGS</th>
<th>HEALTHCARE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Nox Combustion</td>
<td>Oxygen/Carbon Dioxide wastewater treatment</td>
<td>CoJet® gas injection system</td>
<td>Respiratory oxygen</td>
</tr>
<tr>
<td>Hydrogen for refining</td>
<td>Nitrogen extrusion cooling</td>
<td>Oxy-fuel combustion</td>
<td></td>
</tr>
<tr>
<td>VOC treatment</td>
<td>Carbon dioxide in grain storage</td>
<td>Helium recycle</td>
<td></td>
</tr>
<tr>
<td>Carbon dioxide recycle</td>
<td>Oxygen in paper production</td>
<td>Cryo-mechanical freezing</td>
<td></td>
</tr>
<tr>
<td>Hydrogen for fuel cells</td>
<td></td>
<td>Metal bonding</td>
<td></td>
</tr>
</tbody>
</table>

“Making Our Planet More Productive”

Over 65% of revenue is from applications that increase energy efficiency or improve environmental performance
Three Distribution Methods – Fully Integrated Business

**On-Site/Pipeline Supply - 26%**
- 15 year take or pay contracts
- Escalation formulas – Electricity/Gas, Inflation, Currency exposure
- Price recovers fixed and capital costs
- High renewal rate

**Merchant Liquid Supply - 30%**
- 5 year requirements contracts
- Sourced as co-product from on-site plants
- Limited distribution range – 200/250 miles

**Packaged/Medical Gases - 33%**
- Cylinder and equipment rental
- 40% gases revenues under contract
- Sourced as co-product from bulk sources

% of 2005 Sales of $7,656MM

Gases are not commodities!
Oxygen Systems – Modes of Supply

Customer demand matched with optimum supply systems
Production and Distribution Density...

Praxair: Strongest North American supply system

On-site and Bulk Gases
- 300 production plants
- 8000 customer locations
- 1500 distribution vehicles
- 11 pipeline enclaves

Packaged and Specialty Gases
- 400 branches
- >300,000 customers
- 280 independent distributors

Illustrative 200 Mile Radius

...drives reliability, growth, and returns
On-site Pipeline Supply

Praxair Gulf Coast System

Current Hydrogen Sources
- Oxygen
- Nitrogen
- Hydrogen

New Hydrogen Plants

Nitrogen Pipeline

Oxygen Pipeline

Hydrogen Pipeline

Pipeline enclaves offer highest returns and customer reliability
Business Environment Is Positive for Industrial Gases

♦ Praxair benefiting from secular growth trends
  - Energy production
  - Energy efficiency
  - Emerging markets – Brazil, China, India

♦ Our backlog is unprecedented

High growth environment for at least 3 to 5 years
Increasing Secular Growth

Praxair Sales Growth

Growth in Asia, Energy & H₂, and alternative energy technologies will fuel large O₂ and H₂ growth

A bigger share of a bigger pie
Energy – Refining Demand for Hydrogen

♦ Low sulfur fuel regulations
♦ Heavy crude upgrading
♦ Planned refinery expansions to process heavy crude
♦ Replacing refineries old reformers

Sulfur Fuel Specifications

<table>
<thead>
<tr>
<th>Year</th>
<th>Gasoline</th>
<th>On-Road Diesel</th>
<th>Off-Road Diesel</th>
<th>Locomotive &amp; Marine</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>120ppm</td>
<td></td>
<td>30ppm</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td>500ppm</td>
</tr>
<tr>
<td>2006</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td>500ppm</td>
</tr>
<tr>
<td>2007</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td></td>
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<tr>
<td>2012</td>
<td>15ppm</td>
<td></td>
<td>15ppm</td>
<td></td>
</tr>
</tbody>
</table>

Source: EIA and PX estimates

US Refinery Input Quality

North American Refining Capacity Forecast

Source: EIA and PX estimates
Energy – Oil and Gas Enhanced Extraction

- Global expansion driving energy demand
- Easily accessible oil and gas resources declining
- Higher prices
- Increased drilling activity
- Allows unconventional resources to be produced
- Enhanced oil recovery and well fracturing opportunities

Expanding our energy reserves

Source: Occidental Petroleum

Oil Production Curve

- Primary Stage
- Secondary Stage
- Typically Water Flooding
- EOR

Recovery % of Original Oil in Place

~10% ~20% ~15-20%

Time

Oil Recovered (bb/ls)
Unlocking Energy with Industrial Gases

Gasification

<table>
<thead>
<tr>
<th>Market</th>
<th>Market Drivers</th>
<th>Praxair Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power (IGCC)*</td>
<td>Clean Coal CO₂ emissions</td>
<td>Large ASU’s CO₂ capture technology</td>
</tr>
<tr>
<td>Refining</td>
<td>Heavy crude processing</td>
<td>H₂ and O₂ supply Pipeline infrastructure</td>
</tr>
<tr>
<td></td>
<td>Environmental - pet coke conversion</td>
<td></td>
</tr>
<tr>
<td>Industrial/Chemical</td>
<td>Alternative to natural gas production of H₂/CO or Fuel</td>
<td>Large plant O₂ and N₂ Hydrogen</td>
</tr>
</tbody>
</table>

*Integrated Gasification Combined Cycle

High energy prices drive alternative technologies
Praxair China – Develop Key Pipeline Complexes

- **Leading position in China**
  - 11 JV’s and 13 subsidiaries

- **Petrochemical Parks**
  - Shanghai, Caojing
  - Daya Bay, Nanhai

- **Metals**
  - Shanghai
  - Guangzhou

- **Electronics**
  - Beijing
  - Shanghai

- **2005 Sales $185MM***
- **2010F Sales $500MM***

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*Combined Sales
Expanding Presence in India

2005 Sales $120MM
2010F Sales $300MM

<table>
<thead>
<tr>
<th>Project</th>
<th>Start-up Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tata Steel II</td>
<td>April 2008</td>
</tr>
<tr>
<td>SAIL Durgapur</td>
<td>April 2008</td>
</tr>
<tr>
<td>Owens Corning</td>
<td>July 2007</td>
</tr>
<tr>
<td>Hospet Steel</td>
<td>Aug 2006</td>
</tr>
<tr>
<td>St Gobain II</td>
<td>Nov 2005</td>
</tr>
<tr>
<td>Tata Steel I</td>
<td>Oct 2005</td>
</tr>
</tbody>
</table>

Unique situation – few global players
Unique and Profitable Business Model

♦ No commodity pricing
♦ Long-term contracts – high renewal rates
♦ Raw material cost pass-through
♦ No speculative capex
♦ High value, low cost product – reliability is key
♦ Production/distribution density drives returns
♦ Applications technologies drive growth above Industrial Production
♦ Strong secular growth trends – energy production and emerging markets

Record project backlog – Unprecedented number of opportunities
Net Present Value of Project Annuity Streams

Example: $100 MM Project Investment

- Pipeline complex with bulk and pkg: NPV $85
- Pipeline complex: NPV $62
- Plant sale: NPV $7
- Stand-alone on-site: NPV $40

15 year NPV @ 8% ($MM)

Project Internal Rate of Return

8% 14% 17% 20%

We prefer the risk/reward of building high density, high return franchises.

Example: $100 MM Project Investment

Plant sale has same completion and performance risk, but low NPV without ongoing annuity stream.

We prefer the risk/reward of building high density, high return franchises.
Increasing Free Cash Flow

- Operating cash flow
  10% CAGR
- Capital spending discipline
- Uses of free cash flow
  - Dividends
  - Selective acquisitions
  - Share repurchases
  - Debt reduction

Praxair Free Cash Flow 1996-2006F ($MM)

1) Non-GAAP measure. Free cash flow equals operating cash flow minus capital expenditures.
2) Excludes Leased Asset Purchase in 2003
Financial Outperformance

1-Year

<table>
<thead>
<tr>
<th></th>
<th>Praxair</th>
<th>5-Year CAGR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Praxair</td>
<td>17%</td>
<td>Praxair</td>
</tr>
<tr>
<td>S&amp;P500</td>
<td>8%</td>
<td>S&amp;P500</td>
</tr>
<tr>
<td><strong>Earnings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Praxair</td>
<td>21%</td>
<td>Praxair</td>
</tr>
<tr>
<td>S&amp;P500</td>
<td>12%</td>
<td>S&amp;P500</td>
</tr>
<tr>
<td><strong>Total Shareholder Return</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Praxair</td>
<td>22%</td>
<td>Praxair</td>
</tr>
<tr>
<td>S&amp;P500</td>
<td>5%</td>
<td>S&amp;P500</td>
</tr>
</tbody>
</table>

Source: Bloomberg – 12/31/00 – 12/31/05 Sales per share, Diluted EPS from Continuing Operations

Praxair continues to outperform the S&P500
Principles of Sustainability

**Governance and Integrity**
Foster a culture of integrity and accountability throughout the company through rigorous compliance with all laws, and by establishing and following effective corporate governance practices.

**Customer Commitment**
Continuously develop new products and applications that help our customers improve their productivity, energy efficiency and environmental performance. Provide the highest levels of service, reliability and quality to our customers.

**Environmental Responsibility**
Continue to improve the efficiency of energy consumption. Reduce the intensity\(^1\) of air emissions, including greenhouse gases.

**Employee Safety and Development**
Maintain a safe work environment with a goal of zero accidents. Provide training and career opportunities that allow employees to develop to their fullest potential. Increase the diversity of our workforce so that it is more representative of the communities in which we operate.

**Community Support**
Help to improve the welfare and future of the communities in which we operate by sharing our knowledge, expertise and resources related to environmental protection, and community health, safety and security.

**Financial Performance**
Continuously improve our financial performance and provide attractive returns to our shareholders. Generate operating cash flow to reinvest in business growth and pay dividends.

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\(^{1}\)Intensity is per-unit-of-production measure