North American Industrial Gases
Growth and Profitability in the Base Business

November 19, 2003
Forward Looking Statements

The forward-looking statements in this presentation concerning revenue, earnings, return on capital, volume, growth, economic growth rates, stock price performance, and the value of future product and service offerings involve risks and uncertainties, and are subject to change based on various important factors. These include the impact of changes in worldwide and national economies, availability and cost of power and other energy materials and the ability to recover these costs, pricing fluctuations in foreign currencies, changes in interest rates, the continued timely development and acceptance of new products and processes, the impact of technologies, competitive products and pricing, and the impact of tax and other legislation and regulation in the jurisdictions in which the company operates.

The technology discussed is included in U.S. and foreign patents and patent applications.
## Research and Development Tour

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<td>♦ Metals Fabrication/Robotics</td>
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<td>O2, H2, Syngas production</td>
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<td>Merchant liquid production, MRI, Biopharmaceutical, Superconductors</td>
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North American Industrial Gases

Growth and Profitability in the Base Business

November 19, 2003

Jim Fuchs, President, North American Industrial Gases

Scott Sanderude, Vice-President, Marketing and New Business Development
North America

North American Industrial Gases (NAIG)
♦ Merchant and on-site business in North America
♦ Helium and services
♦ 50% of our North American segment sales
♦ Multiple channels to the marketplace

Praxair Technology Center, Buffalo, NY
♦ Research and development
♦ Global supply systems
♦ NAIG operations
Unrivalled North American Network

2002 NAIG
♦ 300 production plants
♦ 4000 customers
♦ 1000 vehicles
♦ 560 railcars
♦ 8000 customer tanks

2002 Praxair Distribution (PDI)
♦ 400 branches
♦ >300,000 customers
♦ 880 vehicles

♦ 280 independent distributors
NAIG/PDI Integrated Supply

♦ Single source for all industrial gas needs
  ♦ United Technologies
  ♦ General Motors

♦ Cross selling of products

♦ 90% of NAIG’s accounts use packaged gas

Leveraging our full line capabilities
Investor Trip: Growth and Profitability in the Base Business

North American Pipeline Enclaves

2002
♦ 660 Miles of pipeline
♦ 11 North American enclaves
♦ 55 plants
♦ 150 customers

Pipeline enclaves provide higher reliability and lower cost to the customer
Investor Trip: Growth and Profitability in the Base Business

2002 NAIG Endmarkets

Our end markets provide diverse growth opportunities
NAIG Growth Strategies

Overall sales grow faster than industrial production from new technologies, new customers and other high growth opportunities.
Refining and Chemicals Services

- Wellhead Oil Injection CO2/N2
- Leak Detection
- Environmental Sampling
- Cathodic Protection
- Pressure Testing
- Cleaning/Purging/Drying
- Pipeline Freezing
- Displacing/Blanketing
- Cooling of Reactor Beds
- Oxygen Enhanced Reforming

Growth from services to the refining and chemical markets
Hydrogen Used Per Barrel of Oil (Standard Cubic Feet)

**2001**
- 480 SCF/BBL
- 200 SCF/BBL
- 280 SCF/BBL

**2006**
- 645 SCF/BBL
- 200 SCF/BBL
- 345 SCF/BBL
- 50 SCF/BBL

**2010**
- 2010 Off-Road Diesel Ultra Low Sulfur Rules
- Could be 700 SCF/BBL

Increasing use of hydrogen in gasoline and diesel production
Environmental Technologies

♦ Low NOx combustion
♦ Volatile organic compound treatment
♦ Ozone wastewater treatment
♦ Helium recovery
♦ Waste gasification

Coal fired utility

Waste Gasification - Plasma bath

Wastewater ISO unit
Pharmaceutical and Food Technologies

- Biotech and Pharmaceutical
  - Low temperature refrigeration
  - Reactor cooling
  - Nitrogen injection - direct cooling

- Food Technologies
  - Chilling and freezing
  - Food safety - fruit and vegetable disinfection

Pharmaceutical and Food Technologies all offer significant growth opportunities
North American Industrial Gases: Achieving cost reduction results

November 19, 2003

Ricardo Malfitano, Senior Vice President
Ted Dougher, Vice President, Engineering & Supply Systems
Mark Harmata, Director, Energy Management
Murray Covello, Vice President, Operations and Services

www.praxair.com
Strong Productivity Gains

Cumulative Productivity Contribution 1999-2003E ($MM)

- 1999: $104
- 2000: $197
- 2001: $298
- 2002: $424
- 2003E: $543

Business Operations
Procurement
Global Production Excellence

Targeting $100MM in savings per year
Cost Reduction

♦ Global Production Excellence
  ♦ Focus on plant efficiency and reliability
  ♦ Expanding in 2004 to packaged operations and merchant liquid distribution

♦ Procurement
  ♦ Focus on business/local supply chain
  ♦ Expanding to low cost country strategy in 2004

Still expanding cost reduction efforts
Six Sigma

♦ PST - 1998
♦ NAIG and South America - 2000
♦ All Praxair businesses 2004
♦ 2003 savings forecast $50MM

Still expanding cost reduction efforts
Optimizing cryogenic plant design has resulted in a 15%-20% reduction in the unit cost of production.
Target Sustained Productivity Gains

♦ Control system automation
  ♦ Enclave optimization
  ♦ Model predictive control

♦ Equipment upgrades

♦ Maintenance

♦ Energy conservation
Best in Class Reliability

- Reliability centers
  - Centralized key expert
  - Maintenance resources
- Predictive programs
  - Vibration
  - Oil analysis
  - Infra-Red thermography
- Outage planning
  18 month planning in concert with operations, sales, & customers

A 1% improvement in reliability saves $10 - $20MM per year
North American Energy Procurement

2002 Energy Spend

Electric Power
- $300 MM
- 70 Plants / 34 Suppliers

Natural Gas
- $150 MM
- HYCO = 88% of Volume

USA Power Supply by Fuel

<table>
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<tr>
<th>Fuel</th>
<th>Praxair</th>
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<tr>
<td>Coal</td>
<td>60%</td>
</tr>
<tr>
<td>Oil &amp; NG</td>
<td>25%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>10%</td>
</tr>
<tr>
<td>Hydro, etc.</td>
<td>5%</td>
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Energy Cost Management

**Purchasing Strategy**
- High load (MW of demand)
- High load factor
- Time of day flexibility of use
- Regional production flexibility
- Self generation options

**Customer Pass Through**
- **Hydrogen**
  - Onsite - pass through
  - Liquid - pass through
- **Atmospheric Gases**
  - Onsite - pass through - 30/60 day lag
- Liquid
  - Formula escalation
  - Open - price increases
  - Fixed - price increases at renewal
  - Energy charges/surcharges on all three

**Result:** Lowest Cost Energy
NAIG Distribution - A World Class Operation

- State of the art planning & logistics center for merchant liquid distribution

- Systematic process for optimization of power and distribution costs using proprietary programs and systems

- Goal of continuous improvement in cost and service level KPIs

- 65,000,000 miles; 400,000 deliveries, and 10,000 delivery points every year.
KPI’s for Production and Distribution

- $/CCF
  - Unit power improvements of 1-2% per year
  - Capital investment - new facilities and upgrades
  - Six Sigma and focused cost reduction engineering

- Volume per trip

- Volume per mile - from 1999 to 2002 we achieved a 10% improvement in this measure

- Customer Service
  - World class call center performance
  - 5 sigma delivery performance

Production and distribution efficiency improvements of 2-4% per year
The Tour...

♦ North American Logistics Center (NALS)
  ♦ Optimizes production and distribution costs to meet customer demand
  ♦ Proprietary program - visual tools for customer demand, asset utilization and trip design
  ♦ Linkage between plant, driver and planning personnel
  ♦ Activity matched to product/regional “boards”

♦ International Monitoring and Production Assistance Center (IMPAC)
  ♦ Identical control interface - reduces staffing
  ♦ Over 450 units monitored
  ♦ Units function off line until “polled” or alarm condition initiates communication

♦ 24/7 Operation and back-up power and communications
APPENDIX
Chemical Vapor Deposition Precursors

What is it used for?
Developing next generation liquid CVD precursors for depositing metal and metal oxide films - Hf, Ru, Ta, others

How it works
Materials present in vapor react on chip surface to form thin film

Application
Enables advanced devices @ 65nm and below: high k dialectrics, DRAM, gate stack, inter connection barrier films

Misc
Ceramic Membranes

**What is it used for?**
Low cost gas production: O2, H2, syngas, on-site, small bulk and packaged

**How it works**
Ceramic membranes separate oxygen using pressure difference or applied voltage.

**Application**
Glass, metals, refining, healthcare, laser cutting

**Misc**
Vertical integration with PST.
Oxyfuel Combustion - NOx Reduction and CoJet

What is it used for?
Replacing combustion air with oxygen improves energy efficiency, increases productivity and reduces emissions.

How it works
NOx: replacing air with oxygen minimizes nitrous oxide production.
CoJet: proprietary coherent jet technology improves oxygen injection for primary metal manufacturing.

Application
NOx reduction - Power production, glass, refining, and metals
CoJet - Primary metals

Misc
NOx reduction - several successful demonstrations in various markets

Glass Furnace - Praxair’s WideFlame™ Burner
Reactor Cooling

**What is it used for?**
Precise control of reaction temperature by either direct or indirect cooling using liquid nitrogen.

**How it works**
Two patented configurations provide precise cryogenic temperatures to improve product yield: 1) non-freezing liquid nitrogen injector 2) heat exchanger system for jacketed cooling.

**Application**
Pharmaceutical, fine and specialty chemicals.

**Misc**
Systems installed at more than 50 locations
Investor Trip: Growth and Profitability in the Base Business

Metals Fabrication/Robotics

**What is it used for?**
Development of new welding processes that enable sale of premium shielding gases and consumables.

**How it works**
Patented shielding mixtures increase productivity and product quality. Robotic equipment needed to model high end customer processes.

**Application**
Automotive, Durable goods, Machinery and fabricated metal products

**Misc**
Enables sale of custom blend gases such as Stargon™ SS and Helistar ™ GV used for welding stainless and galvanized steel
Mixed Gas Refrigeration

What is it used for?
Producing liquid nitrogen and oxygen.

How it works
Uses patented blends of environmentally friendly gases in ordinary refrigeration equipment.

Application
Reduces the cost of incremental liquid production by up to 50% compared to conventional technology. Can be installed on new or existing cryogenic plants.

Misc
Commercialized at 2 Praxair facilities (Texas - shown in photo and Korea). 2003 R&D 100 Award for innovative new process
Pulse Tube Refrigeration

**What is it used for?**
Producing small volumes of merchant liquid, and point of use cryogenic refrigeration.

**How it works**
Converts electricity into cold using sound waves.
High reliability due to no wearing parts.

**Application**
Small liquid systems, cooling for medical imaging, storage of biological materials, and power superconductors

**Misc**
Praxair awarded $5.5MM DOE contract for improving pulse tube capacity and efficiency for use in power transmission.