This report contains “forward-looking statements” within the meaning of Section 21E of the Securities Exchange Act of 1934. All statements, other than statements of fact, that address activities, events or developments that we or our management intend, expect, project, believe or anticipate will or may occur in the future are forward-looking statements. Forward-looking statements are based on management’s assumptions and assessments in light of past experience and trends, current conditions, expected future developments and other relevant factors. They are not guarantees of future performance, and actual results, developments and business decisions may differ from those envisaged by our forward-looking statements. Our forward-looking statements are also subject to risks and uncertainties, which can affect our performance in both the near- and long-term. We identify the principal risks and uncertainties that affect our performance in our Form 10-K and other filings with the Securities and Exchange Commission.
UOP Investor Day: Key Themes

Market Conditions Remain Robust

• Worldwide Demand for Petroleum-Derived Fuel and Chemicals

UOP Positioned As Market Leader

• Leading Positions with Global Customers

• Extending Competitive Advantage Though New Technologies and Processes

• Investments in Attractive Growth Segments
What UOP Does

**UOP creates knowledge via invention and innovation and applies it to the energy industry**

- 1,570 Scientists and engineers
- 2,600 active patents
- Expertise
- Experience

- Process Technology
- Catalysts
- Adsorbents
- Equipment
- Services

Petroleum

Petrochemicals

Natural Gas

Renewables

Today more than 60 percent of the world’s gasoline and 85 percent of biodegradable detergents are made using UOP technology
UOP Overview

Business Units

- **Process Technology and Equipment**
  Licensing and service for refining, petrochemical and gas processing industries

- **Catalysts, Adsorbents and Specialties**
  Materials for process technology and manufacturing

- **Renewable Energy and Chemicals**
  Process technology for transportation fuels and chemicals

Revenue by Type

- **Equipment**
- **Licensing and Services**
- **Products**

Revenue by End Market

- **Refining**
- **Petrochemicals**
- **Natural Gas & Hydrogen**
- **Manufacturing Adsorbents and Aluminas**

Revenue by Region

- **Americas**
- **Europe /Africa**
- **India**
- **China**
- **Rest of Asia**
- **Middle East**

Global Business With Diverse Offerings
Refining And Petrochemical Industry

**Upstream**
Exploring for, drilling for and producing crude oil and natural gas

**Midstream**
Processing, storage and transportation

**Downstream**
Refining oil / gas into end products such as fuels and chemicals

Technology and materials for natural gas processing

Processing technology, equipment, materials and services
Refining And Petrochemical Landscape

End Products from a Barrel of Oil

UOP’s Process Technology, Catalysts & Adsorbents

Petrochemical Feedstocks
Naphtha, Ethylene, Propane
Kerosene, Propylene.

Total of 72% to transportation fuels

Aromatics Complex, Styrene
Production Phenol Production On-Purpose Propylene
Gas Processing, LAB Production
Isomerization

Hydrotreating & Hydrocracking
Hydrogen

Isomerization & Alkylation

Catalytic Reforming
Fluid Catalytic Cracking, Coking

Source:
Refining And Petrochemical Landscape

**Industry**

- Robust market outlook
  - Strong demand for fuels and petrochemicals in developing world
  - Retooling of refineries to process heavy crudes and improve efficiency
  - Nearly 63 percent of the energy consumed derived from oil and natural gas

- $21.4 trillion in industry capital expenditures between now and 2030

**Oil Consumption**

Source: UOP / US Energy Information Administration

**Natural Gas Consumption**

Source: US Energy Information Administration

Large, Global And Growing
Business Environment

• Demand for petroleum-derived fuels and chemicals remains strong worldwide – driving capacity growth and revenue opportunities

• Strong demand growth in China, India, Middle East, former Soviet Union (CIS)

• Natural gas expected to be the fastest growing energy source for next two decades

• Polyester demand expected to remain strong
Global Locations

16 Countries
19 Offices
11 Manufacturing Sites
5 Engineering Centers

Global Business Close To Customer And End Markets
Global Customer Base
Product Lines

**Licensing**
- Contract Vehicle – License Agreement
- Project Size - $500K to $50M Revenue
- Primary Driver – Capacity Increases
  - New Units, New Complexes
  - Revamp Capacity Upgrades
- Other Drivers
  - Product Slate / Specification Changes
  - Operating Efficiency

**Products - Catalysts and Adsorbents**
- Contract Vehicle – Supply Agreement
- Project Size - $20K to $30M Revenue
- Primary Driver – Operating Efficiency
  - New Units, Revamps, Reloads
- Other Drivers
  - Product Slate Changes
  - Specification Changes

**Services**
- Contract Vehicle – Engineering / Services Agreement
- Project Size - $30K to $10M Revenue
- Primary Driver – Capacity Increases
  - New or Revamp Designs
  - Optimization / Configuration Studies
- Other Drivers
  - Operating Efficiency
  - Troubleshooting – Aftermarket Services
  - Profit Improvement and Optimization

**Equipment**
- Contract Vehicle – Supply Agreement
- Project Size - $100K to $30M Revenue
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  - New Units, New Complexes
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- Other Drivers
  - Operating Efficiency
  - Quality
  - Project Schedule Control
Typical Sale – Multiple Revenue Points

Multiple Technologies, Products, Services
Sales vs. Prior Year

Quarter Over Quarter Variability

-20% -10% 0% 10% 20%

1Q07 2Q07 3Q07 4Q07 FY07 1Q08 2Q08E 3Q08E 4Q08E FY08E
Refining Growth Strategy

Market Attractiveness

- Crudes becoming heavier
- Demand for transportation fuel increasing faster than fuel oil
- Coke by-product is increasingly stranded
- Stranded / heavy oil conversion to synthetic crude or transportation fuels
- Opportunity for high conversion heavy oil process

Value Segments for UOP

- Refining Complex:
  - Heavy Oil technology options will utilize current business model for technology, catalyst, and equipment
- Synthetic Crude Upgrading Complex:
  - Large potential currently untapped in Canada and Latin America
  - New opportunity for UOP

Commercializing Novel Technology To Upgrade Heavy Oils
Petrochemicals Growth Strategy

Market Attractiveness

- Ethylene is largest volume base chemical - growing at 4% / yr
- Demand for on-purpose propylene growing >20% / yr

Value Segments for UOP

- SynGas / Methanol
- Polyolefins
- Ethylene Oxide
- Propylene Oxide

UOP Opportunities

- Expand and strengthen current position via chain extensions
- Similar business model as core
- Leverage existing global sales and service
- Adjacent technology fields

On-Purpose Propylene Supply

Source: Chemical Market Associates Inc.

Propylene Position For Significant Growth, Oleflex, MTO, OCP
Gas Growth Strategy

**Market Attractiveness**
- Gas demand growth / depletion replacement > 8%
- More contaminants and tighter specs require more treating
- Alternate feedstocks for fuels and chemicals
- Carbon constraints – cleaner fuels
- Customers need new technology to realize full market value of gas resources

**Value Segments for UOP**
- Natural Gas Treating
- Conversion
- Remote Gas Monetization
- Syngas Treating
- CO2 Management

**UOP Opportunities**
- Apply value creation model from core
- Adjacent technology fields
- Leverage global sales and service

**Natural Gas Supply / Demand**

**Source:** International Energy Agency
Biofuels Growth Strategy

Market Drivers

- Government mandates and targets
- Energy security
- Climate change
- Rising crude prices
- Job creation in the agro sector in developing economies

Biofuels Production Volume

Global production, ~3M bpd by 2015, About 5 % of Global Transport pool

Source: PIRA Energy Group

UOP Opportunities

- Leverages UOP competencies in refining technologies
- Growth opportunity
- Strong technology fit – Hydroprocessing and Isomerization
- Application of standard UOP business model
- Technology, catalyst, equipment and services

Business Segments / End Customers

- Green gasoline and diesel: Refiners, ag firms, pulp and paper and entrepreneurs
- Green jet: refiners, entrepreneurs and airlines

New Ecofining Process, More Technology On The Way
# UOP - HPS Synergies

## Implemented Opportunities

- **Operator Training Simulator:** UOP Master Simulation Model in HPS products
- **Advanced Process Control:** UOP knowledge
- **Pre-configured HPS tools \ i-MAC:** Procedures, graphics, equipment limits
- **Consulting in UOP / HPS vertical markets:** Energy, Carbon Dioxide, Hydrogen using joint knowledge
- **Sales collaboration:** Access during project conceptualization planning by UOP

## Potential Opportunities

- **Co-Design**
  - Reducing UOP licensees CAPEX and OPEX using advanced design and control techniques
- **Improved Process Operations**
  - Sustaining OPEX reductions using UOP technology imbedded in special HPS tools used by UOP licensees
- **Advanced Sensors**
  - Measure and control new variables in process units
- **Wireless**
  - Significantly expands process control diagnostics and trouble shooting opportunities

---

**Strengthens HON’s Competitive Offering**
New Materials Applications

Market Drivers

- High value creation for improved performance
- GDP growth in chemicals demand
- Often a limited number of important producers for specific chemicals
- Segment (oxid. catalyst): $500M / yr, >5% CAGR

Chemical Catalyst Value Driver

UOP Strategy

- Screen and pursue adjacent markets for UOP catalysts:
  - >$20 M / yr catalyst segments
  - High CCOP impact of catalyst performance
  - Fit with UOP unique capability
  - Addressable customer base

Adjacent Growth From Catalyst Technology Platforms
Why Customers Choose UOP?

- Recognized leader in process technology with history of reliability and excellence
- Strong portfolio of patent-protected technologies
- Deep customer intimacy
- Continuous R&D to improve process / product offerings

2003 National Medal of Technology Recipient

“For more than 85 years of sustained technical leadership and innovation for the petroleum refining and petrochemical industries; and for the invention and commercialization of adsorbents, catalysts, process plants, and process technology”
## Summary

<table>
<thead>
<tr>
<th>Market Outlook Remains Strong</th>
<th>Expanding Competitive Advantage</th>
<th>Growth into New Areas</th>
</tr>
</thead>
</table>
| • Continuing capacity gap in refining demand and supply | • Renewable technologies  
  - 1<sup>st</sup> generation  
  - 2<sup>nd</sup> generation | • Natural gas processing  
  - Methanol to olefins  
  - Membrane separations, offshore and onshore  
  - CO<sub>2</sub> to methanol  
  - Coal gasification  
  - Malaysia office |
| • Adoption of more stringent environmental specifications | • New diesel technology | • Renewable activity  
  - Jet fuel  
  - Diesel fuel |
| • World shift to diesel | • Commercializing four new processes | • Heavy oil  
  - Slurry hydrocracking  
  - De-sulfurization |
| • Aromatics cycle stretched | • New zeolite families  
  - Introduction of new catalysts | |
| • Strong activity in detergents and polypropylene | | |
| • $21.4 trillion in industry for capital expenditures through 2030 | | |
PT&E Overview

**Business**

- Single source for process technology / services for modern refineries producing ultra-clean gasoline, diesel, and jet fuel; aromatics; olefins
- Integration of processes with materials, design and equipment to meet production requirements
- 70+ processes in 6,000+ units in hydrocarbon processing industry
- 85% of world’s biodegradable detergents use UOP technology; 31 of 36 refining technologies in use today created by UOP

**Revenue by Type**

- Petrochemicals
- Gas & Hydrogen
- Refining

**Revenue by Region**

- Americas
- Europe / Africa
- Middle East
- India
- Rest of Asia
- China

Global Business With Diverse Offerings
Segments Served

**Refining**
- Gasoline
- Diesel
- Jet Fuel
- Lubricants
- Liquefied Gas
- Fluid Catalytic Cracking
- Hydroprocessing
- Alkylation
- Isomerization
- Reforming
- Hydrogen
- Heavy Oil
- Treating

**Petrochemical**
- Plastics
- Rubber
- Adhesives
- Fiber
- Paint
- Pharma
- Aromatics
- Derivatives
- Olefins
- Detergents

**Natural Gas**
- Treating
- Separation
- Treating
- Separations
- Conversion

**Broad Technology Offering**
Process Technology And Equipment (PT&E)

- Proprietary Equipment Design
  Design and third-party manufacturing of refining equipment

- Process License

- Process Design Engineering

- On-going Services, Revamps, Studies

- Start-up Services, Training

- Catalysts, Adsorbents, Equipment

- Technology Transfer/Plant Start-up
  Engineering design - including Schedule A - through plant commissioning

Close Customer Interaction Through Life Of Project
# Product Lines

## Licensing
- **Contract Vehicle – License Agreement**
- **Project Size** – $500K to $50M Revenue
- **Primary Driver – Capacity Increases**
  - New Units, New Complexes
  - Revamp Capacity Upgrades
- **Other Drivers**
  - Product Slate / Specification Changes
  - Operating Efficiency

## Products - Catalysts and Adsorbents
- **Contract Vehicle – Supply Agreement**
- **Project Size** – $20K to $30M Revenue
- **Primary Driver – Operating Efficiency**
  - New Units, Revamps, Reloads
- **Other Drivers**
  - Product Slate Changes
  - Specification Changes

## Services
- **Contract Vehicle – Engineering / Services Agreement**
- **Project Size** – $30K to $10M Revenue
- **Primary Driver – Capacity Increases**
  - New or Revamp Designs
  - Optimization / Configuration Studies
- **Other Drivers**
  - Operating Efficiency
  - Troubleshooting – Aftermarket Services
  - Profit Improvement and Optimization

## Equipment
- **Contract Vehicle – Supply Agreement**
- **Project Size** – $100K to $30M Revenue
- **Primary Driver – Capacity Increases**
  - New Units, New Complexes
  - Revamp Capacity Upgrades
- **Other Drivers**
  - Operating Efficiency
  - Quality
  - Project Schedule Control
Sales Cycle / Revenue Flow By Product Type

**Licensing**
- Longest sales cycle, revenue flow over 3-5 years

**Equipment**
- Medium sales cycle, percent completion revenue

**Services**
- Variable sales cycle, percent completion revenue

**Catalyst and Adsorbents**
- Short and long sales cycle, revenue upon delivery
Worldwide Refined Product Demand

Increased Heavy Crude Use

Heavy Crude as % of Oil Production

- 1990: 0%
- 2000: 5%
- 2010: 10%
- 2020: 15%

Source: Purvin & Gertz

Refining Capacity Utilization

U.S.

Europe

Asia

Utilization %
- 1986: 60%
- 1990: 65%
- 1994: 70%
- 1998: 75%
- 2002: 80%
- 2006: 85%
- 2010: 90%

~ 90% estimate for next five years

Source: Purvin & Gertz

Crude Sulfur Content

Sulfur %
- 1990: 1.14
- 1994: 1.18
- 1998: 1.22

Source: International Energy Agency, Mid-Term Oil Market Report

Refined Product Demand

Million barrels/day
- 1985: 0
- 1993: 20
- 2001: 40
- 2009: 60
- 2017: 80
- 2025: 100

Source: Purvin & Gertz
Refining Landscape

UOP Business Area

Crude Oil

Fractionation

C4-C6 Isomerization
Leading Position

Catalytic Reforming
Leading Position

Hydrotreating
Leading Position

Hydrocracking
Leading Position

Fluid Catalytic Cracking
Leading Position

Residual Hydrotreating
Coking

Alkylation
Leading Position

Hydrogen
Leading Position

Impure H2

COKE

End Products

Gasoline

Jet Fuel/Kerosene

Diesel

Fuel Oil

Petrochemical Feedstocks
UOP Petrochemical Landscape

**Intermediates** (Building Blocks for Polymers)

- p-Xylene (Polyester)
- Styrene (Polystyrene)
- Phenol (Polycarbonate)
- Propylene (Polypropylene)
- Linear-Alkyl Benzene

**End Products**

- Plastics and Chemicals
- Synthetic Detergents

**UOP Business Area**

- **Aromatics Complex (Leading Position)**
  - Catalytic Reforming
  - Parex
  - Isomar Tatoray

- **Styrene Production (Leading Position)**
  - Ethyl-Benzene
  - Styrene

- **Phenol Production (Leading Position)**
  - Cumene
  - Phenol

- **On-Purpose Propylene (Leading Position)**
  - Oleflex

- **LAB Production (Leading Position)**
  - Molex
  - Pacol
  - Detal

**Strength In Plastics Building Blocks, Detergents**
Gas Processing

- UOP technologies used to “upgrade” raw natural gas streams
  - Separations
  - Purifications
  - Gas Treating
  - Natural Gas Liquids Recovery

- Gas treating growth continues strong ~ 10%

- Key regions: Middle East, Former Soviet Union and Southeast Asia

Source: International Energy Agency, UOP Estimates
UOP Natural Gas Landscape

Gas Production Sources

- Gas Wells
- Secondary:
  - Gasification
  - Landfill
  - Industrial

UOP Business Area

Treating
- Contaminant Removal
- Liquids Separation
- CO₂ Separation
- Sulfur Removal
- Liquefaction (LNG)

Conversion
- Power Generation
- Chemical
  - Hydrogen PSA
  - Ammonia-UREA
  - Methanol DME
  - Fischer-Tropsch

Direct Conversion

End Uses

- Power
- Industrial
- Commercial
- Residential

- Fuel
- Industrial
- Commercial
- Residential
- Transportation

Growth Drivers:
- Demand - power, fuels, chemicals
- Depleted well replacement
- Stranded gas monetization
- Refinery H₂ Demand – Clean Fuels, Upgrading

Natural Gas Demand Rising, UOP Well Positioned
<table>
<thead>
<tr>
<th>Company</th>
<th>Segment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UOP</strong></td>
<td><strong>All</strong></td>
</tr>
<tr>
<td></td>
<td>• Refining</td>
</tr>
<tr>
<td></td>
<td>• BTX</td>
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<tr>
<td></td>
<td>• Petrochemicals</td>
</tr>
<tr>
<td><strong>Axens</strong></td>
<td>• BTX</td>
</tr>
<tr>
<td></td>
<td>• Methanol-to-Olefin</td>
</tr>
<tr>
<td></td>
<td>• HC</td>
</tr>
<tr>
<td><strong>ExxonMobil</strong></td>
<td>• Petrochemicals (Olefins)</td>
</tr>
<tr>
<td></td>
<td>• Refining</td>
</tr>
<tr>
<td></td>
<td>• HC w/ Chevron</td>
</tr>
<tr>
<td><strong>Shell</strong></td>
<td>• Refining</td>
</tr>
<tr>
<td><strong>Global Solutions</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cynara</strong></td>
<td>• Natural Gas Treating with Membranes</td>
</tr>
<tr>
<td><strong>Linde</strong></td>
<td>• H2/PSA, Gas</td>
</tr>
<tr>
<td></td>
<td>• Other Industrial Gas</td>
</tr>
</tbody>
</table>

- UOP only company active in all segments – allowing it to offer the broadest range of solutions to varied customer base

- Considerable barriers to entry – high capital, technical knowledge

- Customer intimacy, technology advantage key competitive advantage for UOP
PT&E – Summary

• Market conditions remain robust

• PT&E has strong position in key refining, petrochemical and gas processing segments

• Superior customer intimacy

• Focused on emerging trends – heavy crudes, natural gas – to maintain and augment current positions
CA&S Business Overview

**Leading Supplier of Catalysts**
- Catalysts to support UOP licensed technologies
- More than 300 catalysts supplied globally
- Catalysts to support non-refining and petrochemical technologies

**Leading Supplier of Molecular Sieve Adsorbents**
- Manufacture more than 140 MM lbs. annually
- Portfolio of more than 150 products
- Diverse application including natural gas, mercury removal, pollution abatement and deodorization
- Normal / iso paraffins, aromatics, O2 and N2 from air

**Services**
- Performance Improvement Partner
- Consulting services
- Technical support alliances
- Technical personnel training and development

**Revenue by Region**
- Americas
- Europe & Africa
- China
- India
- Middle East
- Asia Pac

**Revenue by Type**
- Refining
- Adsorbents
- Aluminas
- Petrochemicals
## What Are Catalysts And Adsorbents?

<table>
<thead>
<tr>
<th>Catalysts</th>
<th>Adsorbents / Molecular Sieves</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A substance that alters the speed of a chemical reaction but does not appear in the final product and undergoes no permanent changes</td>
<td>• Adsorbents and molecular sieves are substances used to selectively remove chemicals / materials from gases and liquids</td>
</tr>
<tr>
<td>• The production of most industrially important chemicals involves catalysis</td>
<td>• Molecular sieves also adsorb, but their uniform pore size allow them to exclude larger molecules while letting smaller ones pass through</td>
</tr>
<tr>
<td>• Used in a wide range of applications, from catalytic converters to refining and petrochemical production</td>
<td>• Often used to remove impurities (upgrade) from natural gas, refrigerants, etc.</td>
</tr>
<tr>
<td>• UOP specializes in higher-end refining and petrochemicals catalysts</td>
<td>• UOP is a pioneer in molecular sieve adsorbents</td>
</tr>
</tbody>
</table>

**25% Of Sales From New Products**
## CA&S Product Offerings

<table>
<thead>
<tr>
<th>Product</th>
<th>Customers</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Refining</strong></td>
<td>Global Oil Majors, Integrated Regional Majors, National Oil Companies, Independents</td>
<td>• Gasoline, • Diesel, • Jet Fuel, • Petrochemical Feedstocks</td>
</tr>
<tr>
<td><strong>Petrochemicals</strong></td>
<td>Global Oil Majors, Integrated Regional Majors, Specialty Petrochemicals (LAB, PET)</td>
<td>• Polyester, • Detergents, • Polypropylene</td>
</tr>
<tr>
<td><strong>Molecular Sieves/Adsorbents</strong></td>
<td>Refiners (all), Specialty Petrochemicals (LAB, PET), Natural Gas, Ethanol, Air Separation, Manufacturing Industries</td>
<td>• Air Separation, • Refining, • Air Brakes, • Insulated Glass, • Medical Oxygen, • Refrigeration</td>
</tr>
<tr>
<td><strong>Aluminas</strong></td>
<td>Refiners (all), Specialty Petrochemicals (LAB, PET), Automotive, Catalyst Manufacturers, Abrasive Industry</td>
<td>• Refining, • Air Separation, • Ethylene, • Natural Gas</td>
</tr>
</tbody>
</table>
Served Segments

**Refining Catalyst**
- Hydrotreating
- Hydrocracking
- Alkylation
- Reforming, Isom, Other
- FCC

**Petrochemicals**
- Olefins
- Detergents
- BTX
- Derivatives

**Zeolite/Adsorbents**
- Process Industries
- Manufacturing

**Target Segments: ~$3.2B**
- UOP has strong positions in high-margin segments – reforming, hydrocracking, alkylation
- UOP Hydrotreating sales via alliance with Albemarle
- Common customers

**Target Segments: ~$0.4B**
- UOP a very small, but high margin, part of overall $7B+ segment
  - Benzene/toluene/xylene (BTX) production and separation technologies for polyester
  - Paraffin dehydrogenation and linear alkyl benzene production for detergents
  - Olefins production (via catalysis)

- UOP is a major player
- Each market segment has 5-7 sub-segments
- Manufacturing Industries is characterized by higher volume / lower price with sufficient quality for the application
- Process Industries are higher value, includes service and performance guarantees

**Strong Positions In Catalysts And Adsorbents**
Catalyst Sales Process

- Initial load with start-up of new units using PT&E process technology
- Catalyst last 3 to 5 years; reloads necessary
- Competitors can replace UOP catalysts, but UOP has strong technology position
- Opportunities for new sales by upgrading catalyst

Catalyst Sales Cycle

- 1 month - 2 years: Proposal
- 6 months: Signing/PO
- Delivery

Short and long sales cycle, revenue upon delivery

Refining / Petrochemical Catalysts

- New loads
- Re-loads

85% of catalyst sales from refining/petrochemical reloads
## Industry Participants

<table>
<thead>
<tr>
<th>Company</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>UOP</strong></td>
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<tr>
<td><em>A Honeywell Company</em></td>
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<tr>
<td><strong>Axens</strong></td>
<td>• FCC HC</td>
</tr>
<tr>
<td><em>BP Group Technologies</em></td>
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<tr>
<td>• Petrochem</td>
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<tr>
<td><strong>Criterion</strong></td>
<td>• Residual HT</td>
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<tr>
<td><em>Catalysts &amp; Technologies</em></td>
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<td>• FCC HC</td>
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<tr>
<td><strong>Grace Davison</strong></td>
<td>• BTX</td>
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<tr>
<td><em>ExxonMobil</em></td>
<td>• Petrochem</td>
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<tr>
<td>• BTX</td>
<td>• Petrochem</td>
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<tr>
<td><strong>Sinopec</strong></td>
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<tr>
<td>• Petrochemicals</td>
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</tr>
<tr>
<td>• BTX</td>
<td>• BTX</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>• Molecular Sieves</td>
</tr>
<tr>
<td><strong>Zeotech</strong></td>
<td>• Molecular Sieves</td>
</tr>
<tr>
<td>• Adsorbents</td>
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- **UOP** only company active in all segments – allowing it to offer the broadest range of solutions to varied customer base.

- **Strength from connection with PT&E** – catalysts designed for process technology.

- **Customer intimacy, technology advantage key competitive advantage** for UOP.

- **Step-out opportunities into chemicals and other adjacencies to leverage technology strengths**.
CA&S Summary

• Many catalysts and adsorbents tied to UOP licensed process technology

• Recurring base of business based on reloads

• Opportunities in adjacent areas such as new chemical catalysts
UOP Biofuels Vision

• Building on UOP technology and expertise

• Produce **real** fuels (gasoline, diesel, jet) instead of fuel additives/blends (ethanol, biodiesel)

• Leverage existing refining/transportation infrastructure to lower capital costs, minimize value chain disruptions, and reduce investment risk

• Build beyond fuels to chemicals

• Focus on path toward second generation feedstocks

*Leveraging UOP Technology Leadership*
Ecofining™ Green Diesel

- Superior technology that produces diesel, rather than an additive
- Uses existing refining infrastructure, can be transported via pipeline, and can be used in existing automotive fleet
- Two units licensed in Europe with first commercial start-up in 2010
- Excellent blending component, allowing refiners to expand diesel pool by mixing in “bottoms”
- Excellent results from carmaker tests

### Performance Comparison

<table>
<thead>
<tr>
<th></th>
<th>Petrodiesel</th>
<th>Biodiesel</th>
<th>Green Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td>Baseline</td>
<td>+10</td>
<td>-10 to 0</td>
</tr>
<tr>
<td>Cetane</td>
<td>40-55</td>
<td>50-65</td>
<td>75-90</td>
</tr>
<tr>
<td>Cold Flow Properties</td>
<td>Baseline</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
<tr>
<td>Oxidative Stability</td>
<td>Baseline</td>
<td>Poor</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
Green Jet Fuel

- DARPA-funded project to develop process technology to produce military jet fuel (JP-8) from renewable sources

- Leverage Ecofining process technology

- Fuel meets stringent requirements for flash point, cold temperature performance, etc.

- Extend to commercial aircraft
Renewables Drivers / Challenges

Drivers

- Demand for energy drives need for broader sources of liquid transportation to complement petroleum and natural gas
- Government mandates in some regions and global concerns over sustainability and greenhouse gas emissions

Challenges

- Concerns over “first generation” feedstocks, i.e., food vs. fuel, deforestation
- Need to develop “second-generation” feedstocks to allow biofuels to reach significant participation in market, i.e. 20 percent of expanding fuels demand

First Generation

Inedible Oils: Camelina, Jatropha

Natural oils from vegetables and greases

Second Generation

Lignocellulosic biomass, algal oils
Waste Biomass To Fuels Via Pyrolysis

- Collaboration with DOE, NREL, PNNL
- Have demonstrated conversion to high octane gasoline
- Process commercialization in progress
Next Opportunities

- Extending military jet fuel success to commercial jets
- Expand process portfolio to green gasoline and renewable chemicals, including olefins for plastic production
- Work with partners to commercialize technology to convert second generation feedstocks including cellulosic sources
- Participate in rapidly growing bioenergy area
RE&C Summary

- Renewables efforts building on UOP technology base and experience

- Focused on producing real fuels using existing infrastructure

- Expanding beyond green diesel to jet fuel, gasoline and chemicals
Research and Development

Rajeev Gautam
Vice President, Technology
## Challenges Are Not New In Refining

<table>
<thead>
<tr>
<th>Period</th>
<th>Challenge</th>
<th>Technology Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900s</td>
<td>Kerosene Yield</td>
<td>Dubbs Cracking, Houdry Cracking</td>
</tr>
<tr>
<td>1920s</td>
<td>Gasoline Yield</td>
<td>Isomerization, Cat Poly</td>
</tr>
<tr>
<td>1940s</td>
<td>Gasoline Octane</td>
<td>FCC, Alkylation</td>
</tr>
<tr>
<td>1950s</td>
<td>Heavier Oils</td>
<td>Hydrocracking, Coking</td>
</tr>
<tr>
<td>1960s</td>
<td>Petrochemicals</td>
<td>Steam Cracking, Sulfolane, Parex</td>
</tr>
<tr>
<td>1970s</td>
<td>Lead Phase Out</td>
<td>CCR Platforming</td>
</tr>
<tr>
<td>1980s</td>
<td>Clean Fuels</td>
<td>LAB, Ethers, Oleflex</td>
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<tr>
<td>1990s</td>
<td>Lower Sulfur</td>
<td>Selective Hydrotreating, ULSD HT</td>
</tr>
<tr>
<td>2000s</td>
<td>Diversified Feedstocks</td>
<td>MTO, Renewables, Optimization</td>
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</tbody>
</table>

Challenges Are Not New In Refining

- **1900s**: Kerosene Yield
- **1920s**: Gasoline Yield
- **1940s**: Gasoline Octane
- **1950s**: Heavier Oils
- **1960s**: Petrochemicals
- **1970s**: Lead Phase Out
- **1980s**: Clean Fuels
- **1990s**: Lower Sulfur
- **2000s**: Diversified Feedstocks
UOP R&D Strengths

- More than 2,600 active patents worldwide
- 1,570 scientists and engineers
- Characterization and combinatorial chemistry tools for technology step changes
- Advanced Pilot Plant capabilities
  - Rapid scale-up and commercialization
  - Quick screening tests and detailed commercial simulations
  - Demonstration runs in support of sales activities
  - Flexible, integrated flow schemes
  - State-of-the-art data acquisition and control
UOP’s Technology Delivery Process

A Structured Technology Delivery Process
Global Innovation Framework

Webs of Collaboration

- Quill (Ireland, Ionic Liquids)
- Dalian Inst. (China, Membranes)
- Sintef
- Norsk Hydro
- Norway (Natural Gas)
- Zelinsky
- Russia (Catalysis)
- Loker Inst.
- USA (Super Acids)
- Singapore (Adv. Materials)
- National Univ. Singapore
- Canada (Heavy Oil)
- China (Membranes)
- Singapore (Adv. Materials)
UOP Adjacency Growth

- Material Science
- Biorenewables
- Coal
- Heavy Oil
- Light Olefins
- Gas

Step-out Technology
Extension of the Core

Organic And External Growth Opportunities
HON / UOP Opportunities

Cross-Portfolio Technology Opportunities
Extending Technology Leadership

**Near Term**

**Market/Technology Readiness**

**Methanol-to-Olefin**

**Drivers:** Availability of “Stranded Gas” and Need for Alternative Uses  
**Technology:** MTO Technology Chosen for Major Plant

**Heavy Oil**

**Drivers:** High Oil Prices, Oil Demand Growing, Declining Sources of Light Sweet Crude; Energy Security  
**Technology:** Added Slurry Hydrocracking Technology, Exploring Gasification

**Renewable Energy and Chemicals**

**Drivers:** Energy Demand, Sustainability  
**Technology:** Ecofining® Technology Commercialized; Jet Fuel Project with DARPA and Aerospace. Path to Other Fuels, Chemicals

**Coal Gasification**

**Drivers:** Energy Demand; High Oil Prices; Energy Security  
**Technology:** Syngas, Gas Purification; Path to Other Fuels, Chemicals

**Long Term**

**CO₂ to Methanol**

**Drivers:** CO₂ Concerns; Energy Demand  
**Technology:** Agreement With USC to Develop and Commercialize Technology
## UOP Tour

### Characterization Lab
- Ability to understand materials at the atomic level, which is key in catalyst development
- Transmission electron microscope enlarges up to 1 million times
- Shortens time to commercialize a new process, and allows us to troubleshoot any issues with existing catalysts

### Pilot Plant Control Room
- Control center using HPS technology for the pilot plants
- 10 large blade servers run Experion software, which monitors the pilot plants, and collect and store data
- With Experion functionality, we are able to design the systems to run with minimal human interaction

### Combi Lab
- Ability to rapidly and simultaneously test large numbers of materials
- Critical to meet customer needs and introduce new catalyst rapidly
- We can test up to 100 times faster than conventional techniques allowing us to accelerate the discovery of new breakthrough materials and catalysts

### Pilot Plants
- Data source for process scale-up and design and scale-up of catalyst and adsorbent prototypes
- The Des Plaines pilot plants alone participated in the development of >15 new catalysts in the last 6 years that have generated over $1 billion in revenue