Smart, Sustainable Growth

DuPont’s commitment:
Creating shareholder and societal value while decreasing the environmental footprint along our value chains

“Environmental footprint” = injuries, illnesses, incidents, waste and emissions, and depletable forms of raw materials and energy
DuPont Applied BioSciences Strategy

*Focus on large, market driven opportunities* enabled by the integration of chemistry and biology . . .

- Target areas with existing and emerging unmet needs where our integrated science creates *unique advantage*
- *Transform the targeted industries* with our integrated knowledge base
- *Use partnerships* to expand market opportunities, accelerate speed to market and maximize value capture
Biotechnology at DuPont

DuPont Ag & Nutrition  
DuPont Applied BioSciences™

Common Core Technologies

- Molecular Biology
- Metabolic Engineering
- Protein Engineering
- Genomics/Bioinformatics
DuPont Biofuels

3 Segments

- Seed & Crop Protection Solutions
- Biobutanol
- Advanced Biofuels
- Cellulosic Fuels
- Biofuels from Biomass

Agricultural Inputs
Seeds & Crop Protection
Biorefinery Value Chain
Carbohydrates to Fuels & Chemicals

- Agricultural Inputs
- Plant Feedstocks
- Conversion to Sugars
- Fermentation Processes
- Biofuels Biochemicals

Seed
Crop Protection
CO2

Differentiated Products

Sugar Starch

Biofuels
Biochemicals

Cellulose Conversion

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DuPont Science: Building a Better Biofuel

Enabling Technology – Cell “Software”

Metabolic Engineering

• Technology leader
• Leveraging our Bio-PDO™ success
• Engineering the cell to economically produce products of choice
Why a Bioprocess?

Targeted advantages over chemical process:

- ~25% Lower manufacture cost
- ~50% Lower capital
- ~50% Smaller environmental footprint

Chemical Process:

- CH₂=CHCH₃ Propylene
- Catalyst
- HOCH₂CH₂CH₂OH PDO

Bioprocess:

- C₆H₁₂O₆ Glucose
- Biocatalyst
- HOCH₂CH₂CH₂OH Bio-PDO™
DuPont BioFuels

• World is undergoing an historic change
  • Sustainable energy is society’s biggest challenge
  • Greatest economic opportunity over the next decade
  • New wave of innovation is needed
  • Movement towards biofuels is an economic reality

• DuPont in the lead
  • Technology is validated
  • Commercialization plan is solid & on track
  • Uniquely advantaged to win
# Biofuel Imperatives

<table>
<thead>
<tr>
<th>Upstream</th>
<th>Downstream</th>
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<tbody>
<tr>
<td><strong>Feedstock</strong></td>
<td><strong>Refinery &amp; Pipeline</strong></td>
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Current biofuel solutions are inadequate to meet global needs
DuPont Answer

Deliver Innovations that Transform the Market

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<td>Uncompromised Fuel Performance</td>
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Cellulosic Ethanol

Biobutanol
Biobutanol - Economic Value

Value proposition:
Biobutanol delivers significantly improved logistics & fuel performance across the value chain

Attributes → Price

- Lower Distribution Costs / Refinery Blending
- Higher Blending Value and Higher Blend Levels
- Infrastructure compatibility
- Higher energy density (26%)
- Greater compatibility with existing engine designs and other materials
- Synergistic with Ethanol

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* Normalized ethanol price / Graph illustrates sources of value / Not to scale
DuPont - BP Partnership
Resolving Ethanol Constraints

Biomass

Plant Feedstocks

Sugar

Fermentation

Butanol

Metabolic Engineering

Performance Fuels

Worldwide Fuel Markets

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Cellulosic Ethanol - Low Cost Carbon

- Value proposition vs. grain-based ethanol:
  - DuPont technology delivers lower-cost production by extension to cellulosic feedstocks

- Increase biofuel output per acre
  - e.g. corn stover, bagasse, wheat straw

- New feedstocks
  - e.g. fiber sorghum, switchgrass
Cellulosic Ethanol
Substantial market growth

Biofuel Estimated Volume Potential

- Grain / Sugar Feedstocks
- Corn stover / Sugarcane Bagasse
- Switch Grass / Fiber Sorghum
Cellulosic Ethanol
Substantial market growth and CO₂ reduction

Biofuel Estimated Volume Potential

- Grain / Sugar Feedstocks: 20-40% CO₂ reduction vs. gas
- Corn stover / Sugarcane Bagasse: 65-95% CO₂ reduction vs. gas
- Switch Grass / Fiber Sorghum:

% Reduction in CO₂ equivalents per the International Energy Agency
Cellulose to Ethanol
Low Cost Integrated Process

Milling → Pretreatment → Saccharification → Fermentation → Separation

Cellulose Conversion

Ethanol Production
Cellulose - Regional Market Execution

Low cost carbon

First Targets

North America
- corn stover

Brazil
- sugarcane bagasse

Europe - Asia
- corn stover

Next Cellulosic Feedstocks:
- Switchgrass
- Cavasse
- Sorghum
- Wheat Straw
Cellulosic Ethanol Process Performance
Integration of key process elements

- 15 patent applications
- Integrated process established
- Scale-up work in progress
- Cell software >80% complete

- Development plant operation
- Cell software optimization
- Process optimization

Commercial Goal: < grain-based ethanol total cost
Cellulosic Ethanol: Initial Focus on Corn Stover

Developing Enabling Technology

Images:  www.ca.uky.edu & www.nativeaccess.com

310 Gallons/Acre

40 Gallons/Acre

391 Gallons/Acre

155 Gallons/Acre

at 50% removal rate
Commercialization

Biomass Raw Material

Biomass Processing

Sugar

Fermentation

Cellulosic Ethanol

Global Trade

Retail Sale

✓ Corn cob & stover
✓ Sugarcane bagasse
✓ Wheat straw
✓ Rice straw
✓ Energy crops

DuPont Partnerships
Summary

• Integrated approaches are necessary
  • Large volumes and cost constraints require optimization through all process steps
  • Must balance needs for process flexibility with needs for low cost

• Partnerships are essential
  • Technology is complex

• Governmental support required
  • High risk/high investment
  • Value externalities

• Geographic specific strategy
  • Regions will require customized technology and business approaches
DuPont Biotechnology

Exploring and Inventing the Pattern
- Entrepreneurial
- Divergent
- Inventive
- Creative
- Exploratory

Extending and Improving
- Management
- Duplication
- Modification
- Improvement
- Commonality

Integrating the New and Different
- Shared Leadership
- Innovation
- Differentness
- Integrating
- Diversity
- Partnering
  - Vision

CORE VALUES

G. Land

Time (years)

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