Reducing our dependence on fossil fuels: An industrial perspective on energy research

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DuPont’s perspective

- Challenges drive opportunity
- The key to solutions is science through collaboration
Our vision is to be the world’s most dynamic science company, creating sustainable solutions essential to a better, safer, healthier life for people everywhere.
DuPont is focused on 3 science domains

- Agriculture and Nutrition
- Industrial Biosciences
- Advanced Materials
DuPont applies science to develop solutions for these major challenges

FOOD
FEEDING THE WORLD

ENERGY
REDUCING OUR DEPENDENCE ON FOSSIL FUELS

PROTECTION
KEEPING PEOPLE AND THE ENVIRONMENT SAFE
What does it take to be successful?

Great science
Oil and gas
Protecting the environment and enhancing productivity
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Protecting the environment and enhancing productivity

- Pipe coatings for corrosion protection, flow assurance & cost effectiveness
- Metal alternatives for pump wear rings
- DuPont™ Glycolic Acid for cleaning & descaling
Fuel Efficiency
Make planes and Automobiles lighter
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Renewable materials
Durable lightweight materials
Metal-Like Performance
Solar energy
Transform the sun’s power into clean, efficient energy
Solar energy
Transform the sun’s power into clean, efficient energy

High Efficiency Metallization Pastes
Ionomer Encapsulant Films
Polyvinyl Fluoride Films
Energy storage
Material solutions for longer life and greater efficiency
Energy storage
Material solutions for longer life and greater efficiency

Voltatex® resin insulates, improves energy transfer
Nomex insulation for transformers
Energain™ separators for high-performance lithium ion batteries
Sorona
Renewably sourced fiber
Sorona
Renewably sourced fiber

Carpet

Apparel

Automotive - carpet, fabric and plastic parts
What does it take to be successful?

Great science & Great collaborations
Advanced biofuels

Low carbon, scalable, sustainable
DuPont cellulosic ethanol conversion process

Feedstock
- Large-scale test harvest
- Commercial equipment
- Agronomic understanding
- Multi-year grower involvement

Milling & Pretreatment
- Minimal capital
- Facilitate enzymes
- Minimize inhibitors
- Mild process

Saccharification
- High solids
- High sugar yield
- High sugar titers
- Low enzyme loading
- Minimize inhibitors

Fermentation
- C5/C6 utilization
- High ethanol yield
- High ethanol titer

Separation
- Recover product
- Recover lignin
- Recycle water

Integrated Science is Key to Low Cost
Z. Mobilis maximizes efficiency

Biocatalyst approach to robust C5/C6 sugar consuming ethanologen

- Process flexible - performs well on a variety of hydrolysates
- Performance enhancing - capability for higher rates, titers, and yields vs. alternative choices

Natural Substrates

- Glucose
- Fructose
- Sucrose

Natural fermentative microbe
- High ethanol yield (>0.48 g/g)
- High ethanol tolerance (>100 g/L)
- High productivity
- Tolerant to high sugar concentrations
- Higher yield & productivity than yeast
DuPont cellulosic ethanol nearing commercialization

Integrated science and engineering allows optimization of the entire process, leading to lower-cost, lower-capital production technology.
Cellulosic ethanol project approach

Originated through a government collaboration

Feedstock Harvest

Feedstock Transport

Feedstock Conversion

Fermentation Production

Ethanol & Chemicals

Separation

Downstream Markets

Chemicals

Biofuels

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Together we can accomplish what no one can do alone.