



# Sugar is a viable alternative energy source

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# History

- Word Origin - *Sanskrit* meaning “grain” or “pebble”
- 500 BC – process of making sugar starts in India
- Expansion of Arab people spreads sugar
- Western Europeans discovered sugar through the Crusades
- 1099 AD - First recorded sugar in England
- “White Gold”



- Columbus brought sugar to New World
- Found Caribbean is a great place to grow sugar cane



- Industry Growth

# Growing

- Climate – subtropical and tropical
- Sugar cane can take anywhere from 6 to 12 months to grow
- Sugar cane will re-grow from the root



# Processing

- Sugar cane is crushed after harvesting
- Evaporation process
- Boiling syrup
- Centrifuge spin
- Final drying process of crystals



# Sugar Use As Energy in Brazil

- 70's – Energy crisis
- 1975 – National Ethanol Program
- Subsidies and ethanol pumps
- Democracy
- Center for Sugarcane Technology
- 2003 – Ethanol viable again



# Where Brazil Is

- Re-introduced the use of ethanol in 2003, still had pumps in place from the 80s.
- Spent 30 years developing ways to cut costs in production and increase efficiency of ethanol.
- Working with the US in helping to develop our ethanol potential.

# Challenges of Using Sugar

- Where do we grow it?
  - Brazil has plenty, the US has some, Europe doesn't have any...SPACE!
- How do we pay for it?
  - Subsidies? Balanced farming? Economical balance?
- How do we get started?
  - What information do we have? How do we gain more insight? Who can we work with?





# Current Sugar Ethanol in the States

- Cheaper to produce, and therefore use, corn-based ethanol
- Sugar in US is too expensive to make viable
- Importing sugar from Mexico leads to uncertain conditions



What the Future Holds...

for Sugar Cane Ethanol

# Vehicles

- Flexible fuel vehicles (FFVs) are designed to run on gasoline or a blend of up to 85% ethanol (E85). Except for a few engine and fuel system modifications, they are identical to gasoline-only models.
- FFVs experience no loss in performance when operating on E85. However, since a gallon of ethanol contains less energy than a gallon of gasoline, FFVs typically get about 20-30% fewer miles per gallon when fueled with E85.
- Flex-fuel" cars, which run on any combination of ethanol and petrol, took 53.6% of the Brazilian market in 2005.
- <http://www.zapworld.com/ZAPWorld.aspx?id=3538>



## GM's 2007 E85 FlexFuel Vehicles :

- Chevrolet Express GMC Savana
- Chevrolet Tahoe GMC Yukon
- Chevrolet Suburban GMC Yukon XL
- Chevrolet Avalanche GMC Sierra (Regular & Extended)
- Chevrolet Silverado (Regular & Extended) GMC Sierra (CrewCab)
- Chevrolet Silverado CrewCab
- Chevrolet Uplander
- Chevrolet Impala
- Chevrolet Monte Carlo



# Laws and Legislation

- A mandatory US standard requires 35 billion gallons of renewable and alternative fuels in 2017 - nearly five times the current target.
  - “For too long our nation has been dependent on foreign oil, It’s in our vital interest to diversify America’s energy supply. The way forward is through technology.”  
President Bush.
- The Global Warming Solutions Act of California is designed to limit the state's global warming emissions to 1990 levels by 2020
- The Global Warming Solutions Act is designed to limit the state's global warming emissions to 1990 levels by 2020, the Texas incentive is 20 cents per gallon.
- Missouri Governor Matt Blunt signed legislation into law on July 5 that will require 10 percent ethanol to be blended in gasoline sold in Missouri. The legislation takes effect in 2008.
  - “I am pleased to sign this bill giving Missourians access to the affordable, homegrown gasoline they want and that they can be proud to use when they fill their tanks,” Blunt said. “This renewable fuel standard benefits consumers, our economy, the environment, and Missouri farmers.

# Laws and Legislation

- Michigan Governor Jennifer Granholm signed into law legislation that seeks to expand the renewable fuels industry in the state. The sevenbill package reduces the gas tax by 36 percent on fuel that contains ethanol and by 20 percent on biodiesel blends. The legislation also provides grants to service station owners who want to renovate or expand their existing stations to make E85 and biodiesel available and allows for the creation of new agriculture renaissance zones to help spur additional ethanol and biodiesel plants.
- Louisiana Governor Kathleen Blanco signed legislation in June that will require a two percent biofuel blend in Louisiana fuel when the state is able to produce 50 million gallons of ethanol and 10 million gallons of biodiesel annually.



# Problems?

- “Growing plants for fermentation using nitrogen fertilizers does not necessarily cut down on carbon emissions. Those fertilizers may well have been made in factories that burn fossil fuels, either oil or coal, so you would still be pumping carbon dioxide into the atmosphere.” ~ Sir Peter Crane
- Planting crops - such as sugar cane or sugar beet - for use as sources of biofuels either means that fields are no longer used for food production or that wild habitats have to be cultivated over.
- The Royal Society for the Protection of Birds points out that lapwings, skylarks and bunting are suffering major declines in numbers. These birds reside in land that has been taken out of agriculture and allowed to go wild. If farmers are offered high prices for growing 'energy crops' on this land, they may be tempted to replant for bio-energy crops.
- Making sugar-cane bioethanol can produce silage that pollutes local rivers.
- The likely need of some countries to import at least some bio-fuel from as far away countries means the environmental balance sheet must include transport, potentially reducing the carbon-emissions gains.
- "Some of the cane plantations are the size of European states, these vast monocultures have replaced important eco-systems," Fabio Feldman, a leading Brazilian environmentalist said. "If you see the size of the plantations in the state of Sao Paulo they are oceans of sugar cane. In order to harvest you must burn the plantations which creates a serious air pollution problem in the city."



# Optional page if no one else has this data, it is not necessarily sugar ethanol

World Ethanol Production, 2004	
Country	Million Gallons
Brazil	3,989
United States	3,535
China	964
India	462
France	219
Russia	198
South Africa	110
United Kingdom	106
Saudi Arabia	79
Spain	79
Thailand	74
Germany	71
Ukraine	66
Canada	61
Poland	53
Indonesia	44
Argentina	42
Italy	40
Australia	33
Japan	31
Pakistan	26
Sweden	26
Philippines	22
South Korea	22
Guatemala	17
Cuba	16

World Ethanol Production, 2004	
Country	Million Gallons
Ecuador	12
Mexico	9
Nicaragua	8
Mauritius	6
Zimbabwe	6
Kenya	3
Swaziland	3
Others	338
<b>Total</b>	<b>10,770</b>

Source: F.O. Licht, cited in Renewable Fuels Association, **Homegrown for the Homeland: Industry Outlook 2005**, (Washington, DC: 2005), p. 14.



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