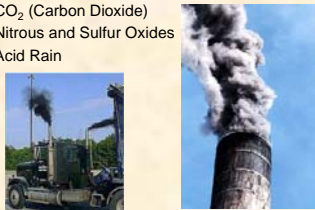



The Problem with Petroleum

- CO₂ (Carbon Dioxide)
- Nitrous and Sulfur Oxides
- Acid Rain



The Problem with Petroleum

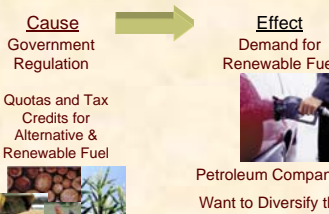
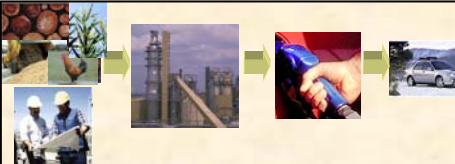
- Non-Renewable
- U.S. Dependent on Imports
 - 53% of oil imported



Cause and Effect

Cause
Government Regulation
Quotas and Tax Credits for Alternative & Renewable Fuel

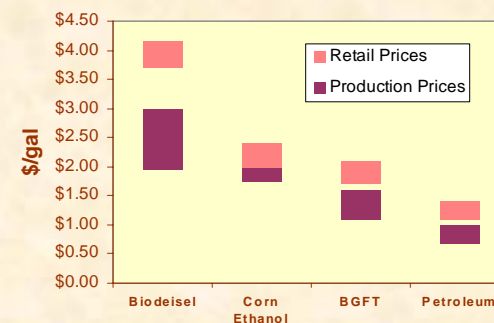
Effect
Demand for Renewable Fuel
Petroleum Companies: Want to Diversify their Energy Portfolio

Renewable Fuel Solution → Biomass converted to Renewable Fuel → Petroleum companies blend and distribute → You and I drive on renewable fuel

Impurity	Removal level
H ₂ S + COS + CS ₂	< 1 ppmV
NH ₃ + HCN	< 1 ppmV
HCl + HBr + HF	< 10 ppbV
alkaline metals	< 10 ppbV
solids (soot, dust, ash)	essentially completely
organic compounds (tars)	below dew point
- class 2 (hetero atoms)	< 1 ppmV

Biomass Producer Gas as Transportation Fuel Feedstock



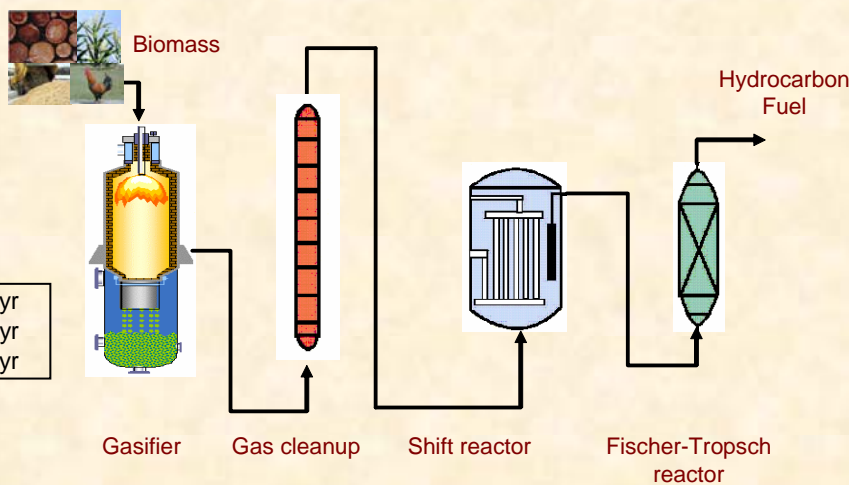
Feedstock worth

Worth of BL as Deisel
\$73.14 \$/ton
Worth of BL in Recovery Bioler
\$13.78 \$/ton

U.S. consumption

US Oil Consumption	289,737,000,000 gal/yr
Motor Fuel	130,381,650,000 gal/yr
Import Oil	174,762,000,000 gal/yr

Technology Overview



Input Output

	Biomass/Black Liquor	Diesel additive produced
North America	2.22E+08 ton/yr	8,119,000,000 gal/yr
Black Liquor	1.75E+08 ton/yr	6,411,000,000 gal/yr
One Plant	7.28E+05 ton/yr	26,620,000 gal/yr
U.S.	1.40E+08 ton/yr	5,120,000,000 gal/yr

	Barrels	\$/yr
North America	193,309,524 barrel/yr	\$16,238,000,000
Black Liquor	152,642,857 barrel/yr	\$12,822,000,000
One Plant	633,810 barrel/yr	\$53,240,000
U.S.	121,904,762 barrel/yr	\$10,240,000,000

© \$2 per gallon

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BYU

