

# Renewable Energy Group

[www.regfuel.com](http://www.regfuel.com)





Renewable Energy Group®

# Linking the Value Chain

## Biodiesel--Glycerin--Markets

Iowa Renewable Fuels Summit

January 27, 2009

Dave Elsenbast, Vice President, Procurement

# Glycerin— What is it?

---

- Glycerin—Glycerine—Glycerol
- Definition: A sweet syrupy trihydroxy, 3 carbon (sugar) alcohol obtained by saponification of fats and oils (COH)<sub>3</sub>H<sub>5</sub>
- Sold as
  - Crude, Kosher, Non-Kosher
  - Technical, Kosher, Non-Kosher
  - Refined, Kosher, Non-Kosher
- Refined Glycerin
  - Colorless, odorless, and viscous liquid
  - Very sweet taste
  - Hygroscopic
  - Used in products such as toothpaste, cosmetics, soaps, and food

# Glycerin- What is it?



# History of Glycerin

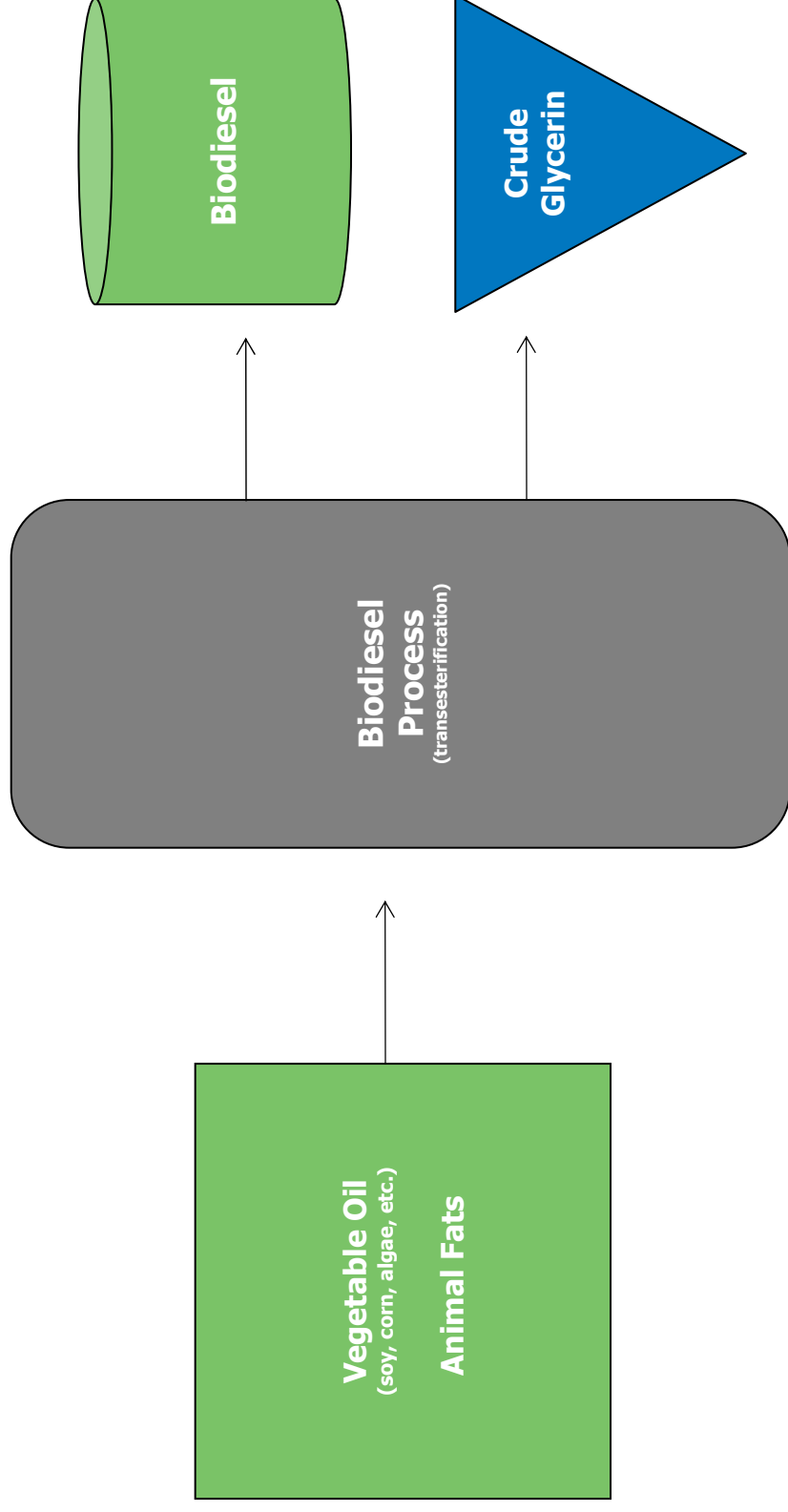
---

- 1779: Discovery of glycerin
- 1853: Splitting glycerin from vegetable oils and animal fat
- 1900-Today: Worldwide production

<u>Year</u>	<u>Pounds of Production</u>
1910	175 Million
2001	2 Billion
2006	3.1 Billion
2008 Projected	3.8 Billion

- Over the years, virtually thousands of uses for glycerin have been developed

# Glycerin from biodiesel



# Biodiesel – Crude Glycerin

---

- Why is glycerin important to the biodiesel producer?
  - It's a co-product, not a by-product
  - Consistency and quality is extremely important to glycerin users throughout the global marketplace
  - Many new, value-added uses looking at glycerin as an ingredient
  - New uses are replacing fossil fuel based derivatives
  - Glycerin provides an important source of revenue to the biodiesel producer

# Traditional Glycerin Markets

---

Refined glycerin is used in:

- Skin moisturizers
- Lotions
- Deodorants
- Make-up
- Lipstick
- Food and sweeteners
- Soft drinks
- Pharmaceuticals (ex: cough syrup, toothpaste),
- Paper manufacturing and printing ink
- Textiles and plastics
- Electronic components
- Dynamite
- Tobacco
- And more...

# Glycerin Emerging Markets

---

- Growth of the biodiesel industry brings on vast new quantities of glycerin
- New uses for glycerin must be developed
  - Great strides are being made from private and public research activities
  - Using new or renewable carbons to replace fossil carbons
- Traditional fossil petroleum cracking (high energy) used to break the carbons apart
- Being replaced with biology, microorganisms and renewable carbon sources

# Glycerin Emerging Markets

---

- Animal Nutrition
  - Energy source for laying hens, broilers, swine, dairy, and beef cattle
  - Energy from glycerin replaces calories from corn and fats in diets
  - Ongoing research at USDA-ARS and many of the top agricultural universities
- Boiler fuels
- Dust controls
- Agricultural chemical adjuvants

# Glycerin Emerging Markets

---

- Renewable Epichlorohydrin (ECH)
  - Serves as a carbon building block for polymers and plastics
  - Glycerin to epichlorohydrin plants have been constructed and are in production
- Renewable Propylene Glycol
  - Substitute for petroleum based propylene glycol
  - De-Icers, Windshield cleaners, Anti-freeze

# Glycerin Emerging Markets

---

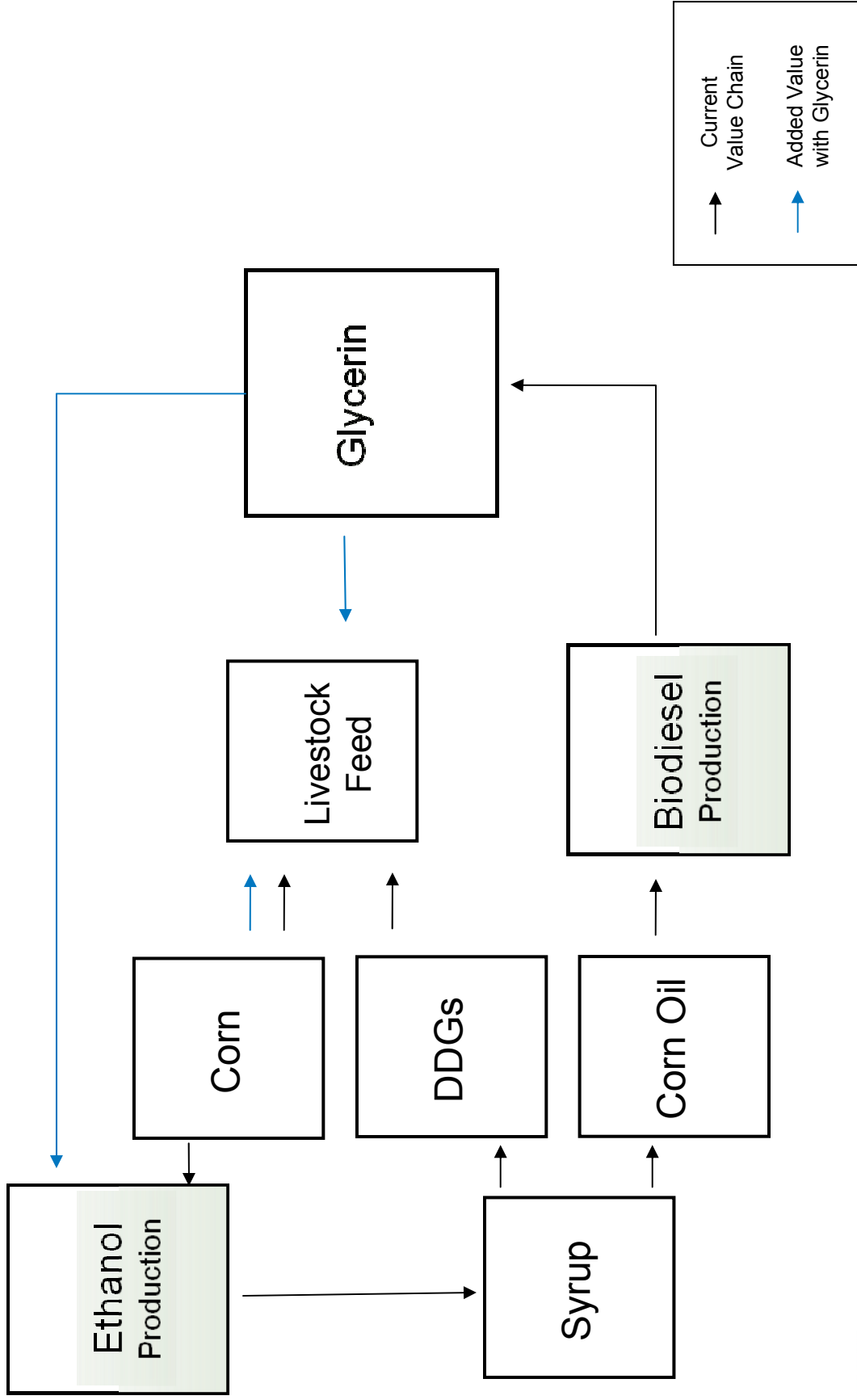
- Glycerin to 1,3 Propanediol
  - Used as a building block in the production of polymers to be used in industrial products
  - Adhesives, laminates, coatings, moldings, carpets, clothing fibers, and polyesters
- Natural oil polyols from glycerin
  - Used in the manufacturing of flexible foams in furniture and bedding
  - Replaces traditional petroleum based products

# Glycerin Emerging Markets

---

- Glycerin as fuel or power source
  - Conversion into ethanol, methanol, acetates (fuel additive), and some gassifiers
  - Being used to power diesel generators
- Glycerin for industrial purposes
  - Converting crude glycerin into hydrogen gas
  - A feedstock to turn fatty substances in wastewater facilities into triglycerides
  - Replacement carbon source for methanol for denitrification in wastewater facilities
- Medical solvents
  - Generation of glycerol carbonate (GC)
  - Serves as replacement for propylene carbonate.

# Ethanol-Biodiesel Value Chain



# Summary

---

- Biodiesel and glycerin are both domestic, renewable sources that go to decrease our dependency on imported, petroleum based products
- Continual R&D efforts will offer biodiesel producers many value added and environmentally friendly markets for Glycerin in the future
- There are excellent synergies between the biodiesel and ethanol producer



Renewable Energy Group®

**Dave Elsenbast**  
Vice President of Procurement  
515.239.8000  
[www.regfuel.com](http://www.regfuel.com)

416 S. Bell Ave.  
Ames, IA 50010  
888-REG-8686  
[www.regfuel.com](http://www.regfuel.com)