American Fats & Oils Assc.
Tallow Forum

Tallow uses in the Oleo Chemical Industry
October 9th 2013

Joseph B. Jabczynski
Manager of Purchasing
Vantage Oleochemicals Inc.
Tallow Forum Outline

- Oleochemicals Defined
- Tallow – Uses (General)
- Demand – Tallow / Oleochemicals
- Oleochemical Process
- Oleochemical Products
- Product Specific Applications
- Summary
- Questions
Definition

- o·le·o·chem·i·cal
-ˌōlēōˈkemikəl/
- noun
- plural noun: oleochemicals
- a chemical compound derived industrially from animal or vegetable oils or fats.
Definition

- Oleochemicals are chemicals derived from biological oils or fats. They are analogous to petrochemicals which are chemicals derived from petroleum. The hydrolysis or alcoholysis of oils or fats form the basis of the oleochemical industry.

- Typically oleo-chemicals are made from vegetable and animal oils and fats and/or petrochemicals feed stocks.
### Historical Uses for Tallow

- **Biodiesel**
- **Direct burning**
- **Refinery blending**
- **Bioethanol**
- **Livestock feed**
- **Corn**
- **Oleochemicals**
- **Export**
Historical Inedible Tallow & Grease Demand

- **New demand segment**
  - Seasonal

- **Core demand segment**
  - Competes with corn
  - 30 – 50%

- **Biomass Based Diesel (BBD)**
  - 1.9 Billion Pounds

- **Export**
  - 1.1 Billion Pounds

- **Fatty Acid**
  - 1.9 Billion Pounds

- **Feed**
  - 2.4 Billion Pounds

- **Steady demand**
  - 20% of total supply
  - 50% (PBFT/BFT) supply

- Competes with palm stearin
  - Historically: 25 - 40%

Sources: Exports (United States Trade Commission); BBD (US Census Bureau, EMTS, EIA); Feed (US Census Bureau, Jan-Jul annualized); Fatty Acids estimated from market knowledge
US Oleochemicals Market 2012

(million pounds)

Oleochemicals by Type

- Fatty Acids & Soaps: 2,000, 78%
- Fatty Alcohol: 576, 22%

Fats & Oils Consumed In Oleochemicals

- Tallow: 1,800, 69%
- Palm Products: 300, 11%
- Coconut & Veg Oils: 506, 18%

Source: Market Knowledge
Oleochemical PROCESS

- FLOWCHART

- GENERAL PROCESS OVERVIEW
Process - Flowchart

- **Evaporation**
  - Crude Glycerine
  - Glycerine Refinery

- **Distillation**
  - Oleic Acid

- **Separation**
  - Crude Oleic Acid
  - Crude Stearic Acid
  - Tallow

- **Hydrogenation**
  - Crude Separated Stearic Acid
  - Hydrogenated Tallow Fatty Acid

- **Distillation**
  - Separated Stearic Acid
  - Hydrogenated Tallow Fatty Acid
  - Distilled Tallow Fatty Acid

- **SPLITTING**
  - Split Tallow FA
  - Crude Separated Stearic Acid

- **TALLOW**
Oleochemical Process

- **SPLITTING**
  - reactor
  - raw materials
  - water
  - fatty acid
  - crude glycerine

- **HYDROGENATION**
  - catalyst
  - H²
  - filter

- **SEPARATION**
  - oleic
  - stearic

- **DISTILLATION**
  - dryer

**GLYCERINE**
- evaporator
- filter
Fatty Acid Mechanism

Triglyceride + 3 Waters \xrightarrow{\text{High Pressure}} \xrightarrow{\text{High Temperature}} \text{Fatty acids} + \text{glycerine}
Natural Triglycerides

Diagram:

- **Fats Triglycerides**
  - Oxygen bonds
  - Chain structure

- **Soap**
  - Reaction with NaOH/H₂O
  - Formula: RC=O^− Na^+ + H₂O

- **Fatty Acid**
  - Reaction with H₂O
  - Formula: RC-OH

- **Methyl Esters**
  - Reaction with CH₃OH
  - Formula: RC-OCH₃

- **Renderers**

- **Intermediates**
  - Glycerine

Chemical Reactions:

- NaOH/H₂O: RC=O^− Na^+ + H₂O → Soap
- H₂O: RC-OH → Fatty Acid
- CH₃OH: RC-OCH₃ → Methyl Esters
Oleochemical PRODUCTS

- Merchant Products
- Markets
- Specific Applications
Merchant Oleochemicals Products

- **Fatty Acids**
  - Oleic Acid
  - Stearic Acid
  - Distilled Fatty Acid

- **Glycerine**

- **Fatty Alcohols**

- **Fatty Acid Derivatives**
  - Fatty Esters
  - Fatty Nitriles
  - Dimer acid
  - Azelaic acid
Some Oleochemical Markets

- Chemical Derivatives
- Rubber and Polymers
- Household, Industrial, & Institutional
- Lubricants & Metalworking Fluids
- Oil Field and Fuel Additives
- Plastic additives
- Soaps and Detergents
- Mining
- Paper
- Paints and Coatings

- Food
- Pet Food
- Personal Care
- Pharmaceutical
- Polyurethanes
End Markets

- Markets

- Personal Care
  - Cosmetics
  - Hair Care
  - Moisturizers

- Industrial
  - Lubricants
  - Rubber / Plastics
  - Fuel Additives

- Consumer Products
  - Detergents
  - Fabric Softeners
  - Crayons

- Food
  - Cooking Spray
  - Baking Emulsifiers
  - Snack Cakes
Some Specific Applications

- **Oleic Acid**
  - Surfactants (Oleic Esthers)
  - Metal Working Lubricants
  - Amides (Slip and Anti-block agents)
  - Oil field fluids
  - Industrial cleaners
  - Cutting Oils
  - Adhesives for automotive applications
  - Hair colorings
  - Fermentation aid
  - Dimers (Building Blocks for Adhesives)
  - Azelaic (Personal Care Applications)
  - Special greases
  - Lubricant base fluids
Some Specific Applications

- **Stearic Acid**
  - Syndet Bars (e.g. Bar Soap)
  - Rubber Accelerators
  - PVC Stabilizers
  - Tires Processing aid
  - Paper Sizing emulsions / AKD’s
  - Candles and Crayons
  - Stearates (Processing Aids to help Flow)
  - Wire Drawing Lubricants
  - Hot Melt Adhesives
Some Specific Applications

- Distilled Fatty Acids
  - Bar Soap
  - Amines (Chemical Intermediate & Processing Aid)
  - Liquid Detergents
Some Specific Applications

- **Glycerine**
  - Toothpaste
  - Polyurethane
  - Tobacco (Humectant – retains moisture)
  - Antifreeze
  - Esters (Food Emulsifiers, Personal Care)
  - Alkyd Resins (Paint ingredients)
  - Creams / lotions
Vantage Oleochemicals - Chicago Site

- Chicago Site – 34 acres (part of an industrial estate – ‘Stockyards’)
- Site ownership:
  - Originally was a small Operation acquired by Unilever from Darling in 1985
  - Undergone several purchases and expansions including ICI (Jul’97), Croda (Sep’06), HIG Capital (May’08), and currently The Jordan Company (Jan’12) with no customer supply interruption.
- Capital investment of circa. $165 million in capacity extension and facilities upgrades including $15 million since 2008
- Approximately 150 employees
  - Including 60 plus union personnel in production/warehousing, maintenance and utilities
Vantage Oleochemicals Capabilities

- World class manufacturer of fatty acids and glycerine.
- ISO certified since 1993
- VPP Award January 2006 and renewed again in 2009.
- Apply cGMP and FSSC (food safety) to our Chicago Glycerine Plants – FDA Registered.
- Chicago site won ICI Best Factory award in 2001 – (out of 100 factories)
- Expansions and upgrades have also focused on redundant operations and reliability.
- Site wide involvement in Continuous Improvement to maintain high levels of manufacturing and safety standards
Vantage Oleochemicals Manufactured Products

- **Oleic Acid.... VOLEIC™**
  - Various grades.....quality/composition dependent on raw materials and distillation conditions

- **Stearic Acid.... VSTEARIN™**
  - Both "separated" stearic and fully hydrogenated tallow Fatty Acids

- **Distilled Fatty Acids....VDISTILL™**
  - Both tallow and coconut oil based

- **Hydrogenated Coconut Fatty Acids....VDISTILL™**

- **Glycerine ....VYCERIN™**
  - USP grade, chemical grade, technical grade, yellow glycerine
Tallow Forum Summary

- Oleochemical Products are the **building blocks** for multiple products in a wide variety of Market Sectors.

- All of us use one or more of these products that were derived from Tallow.

- The US based Oleochemicals industry has been the most consistent market for the consumption of Tallow from Packers and Renderers.

- Oleochemicals and soap (both from direct saponification and from fatty acids) are a 2 billion pound market.
  - This is 20% of the total fat & grease supply and ~50% of the inedible tallow supply.
- Oleochemicals is an unsubsidized industry and has thrived despite market distortions caused by subsidies provided to other industries.

- It is imperative that our industries work together to grow the market for Tallow based products in the short to medium term.

- Oleochemicals was the first and original green chemistry having their roots in over 150 + years of history!!

- Due to the functional chemistry in the production of fatty acids, the Oleochemical Industry Demand for Tallow will remain strong and consistent for years to come.
Questions
Contact Information

Vantage Oleochemicals, Inc.
4650 S. Racine Avenue
Chicago, IL 60609

Joseph Jabczyński
Purchasing Manager
Cell#: 630-561-5530
E-Mail: joseph.jabczynski@VantageOleo.com
Thank You