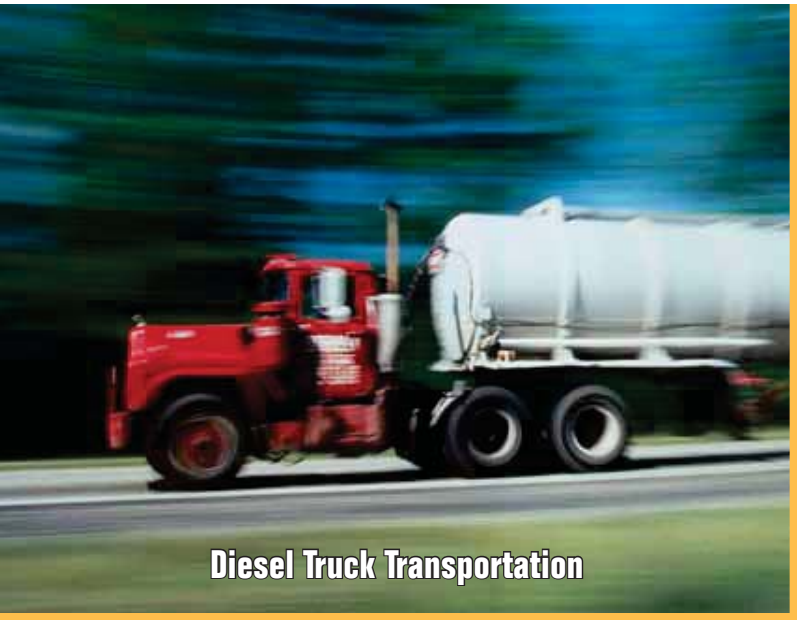
PUMPING BIOFUELS

- Pumps Designed For Every Stage of Biofuels Processing
- Variety of Problem-Solving Sealing Options
- High Efficiency Across All Viscosities

Experience Shows • Innovation Flows

VIKING PUMP

A UNIT OF IDEX CORPORATION



Diesel Truck Transportation

Transfer Application

OUR EXPERIENCE SHOWS IN...

Service to the Biodiesel Industry

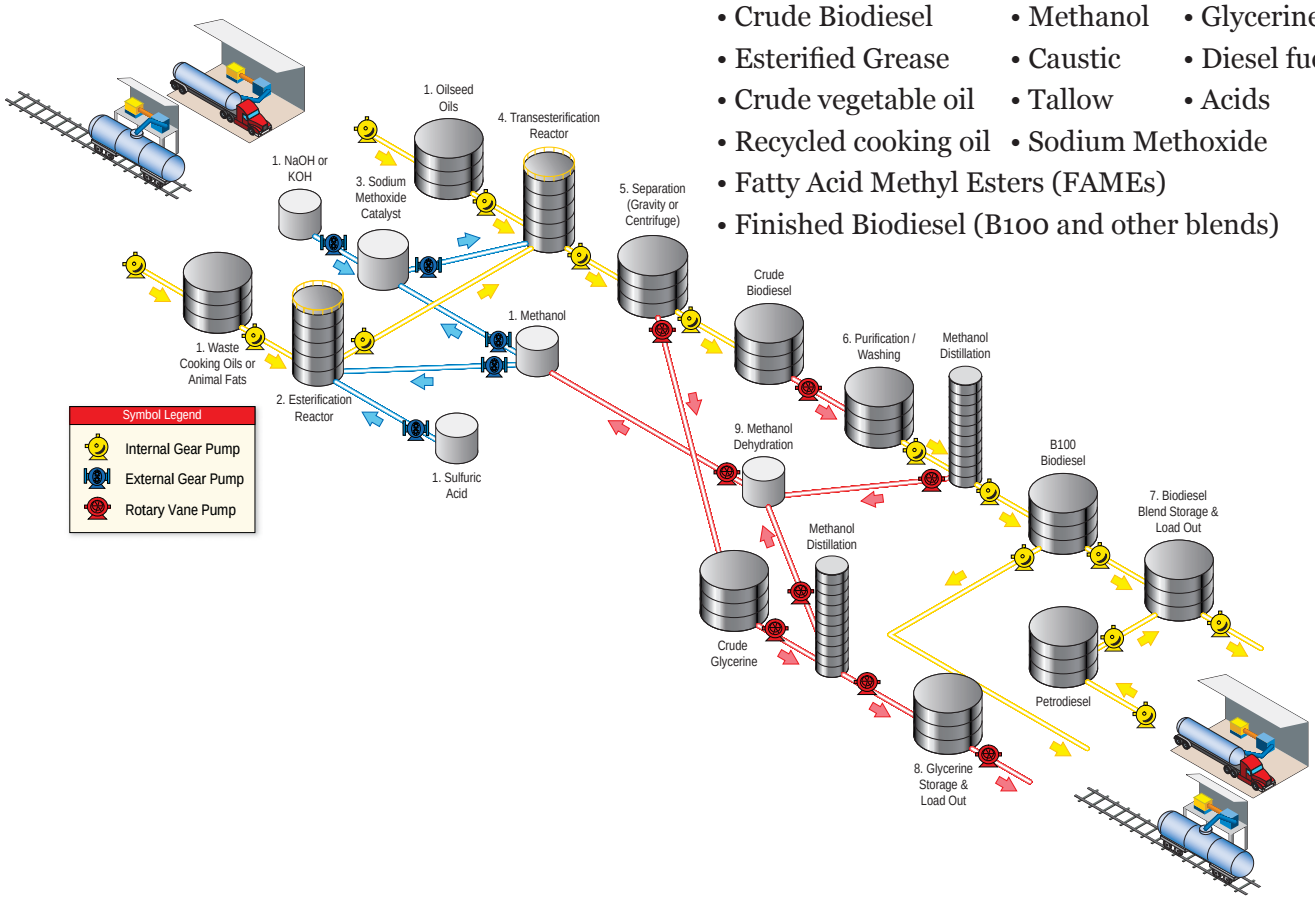
Viking Pump's positive displacement pumping solutions are used extensively in the Biodiesel industry for raw materials, processing, transfer, and terminals.

Viking pumps can be utilized for Biodiesel produced from vegetable oils, waste fryer oil, animal fats, or other sources.

Liquids commonly handled by Viking pumps include, but are not limited to:

- Crude Biodiesel
- Esterified Grease
- Crude vegetable oil
- Recycled cooking oil
- Fatty Acid Methyl Esters (FAMEs)
- Finished Biodiesel (B100 and other blends)
- Methanol
- Caustic
- Tallow
- Sodium Methoxide
- Glycerine
- Diesel fuel
- Acids

Biodiesel - Typical Layout Process Map



CMD Composite Mag Drive Pump

RL Rotary Lobe Pump

CMD Mag Drive Pumps

- Carbon reinforced ETFE
- 5 Displacements available
- Capacities to 20 LPM (20 GPM)
- Pressures to 10 BAR (150 PSI)
- Temperatures to 65°C (150°F)

Customer Benefits

- Sealless, non-metallic all wetted component construction eliminates mechanical seal and eddy current energy loss for lower cost of ownership
- Robust design includes heavy-duty, self lubricating materials and patent pending geometry for run-dry capabilities
- Front pullout design provides simplified in-line servicing
- Patent pending liner protects casing from wear, extending pump life
- Regain 100% performance with recommended spare parts kit, for optimal productivity
- Universal flanges with PTFE inserts mate to both ANSI and DIN flange systems for ease of installation and retrofit
- NPT or ANSI flange available

RL Lobe Series Pumps

- 316 Stainless Steel
- 3 Displacements available
- Capacities to 186 M^3/Hr (820 GPM)
- Pressures to 27 BAR (400 PSI)
- Temperatures to 204°C (400°F)

Customer Benefits

- Timed rotors to eliminate metal-to-metal contact and protect product integrity
- Front loading mechanical seals for ease of maintenance
- Large fluid cavities for superior solids handling
- Solvent or steam-flushable for in-line cleaning between batches to prevent product cross-contamination
- Vertical or horizontal porting for installation flexibility
- Optional seal flush allows run-dry capabilities

Ethanol


Denaturant Application

OUR EXPERIENCE SHOWS IN...

Service to the Ethanol Industry

Viking Pump's positive displacement pumping solutions are used extensively in the Ethanol industry for raw materials, processing, transfer, and terminals.

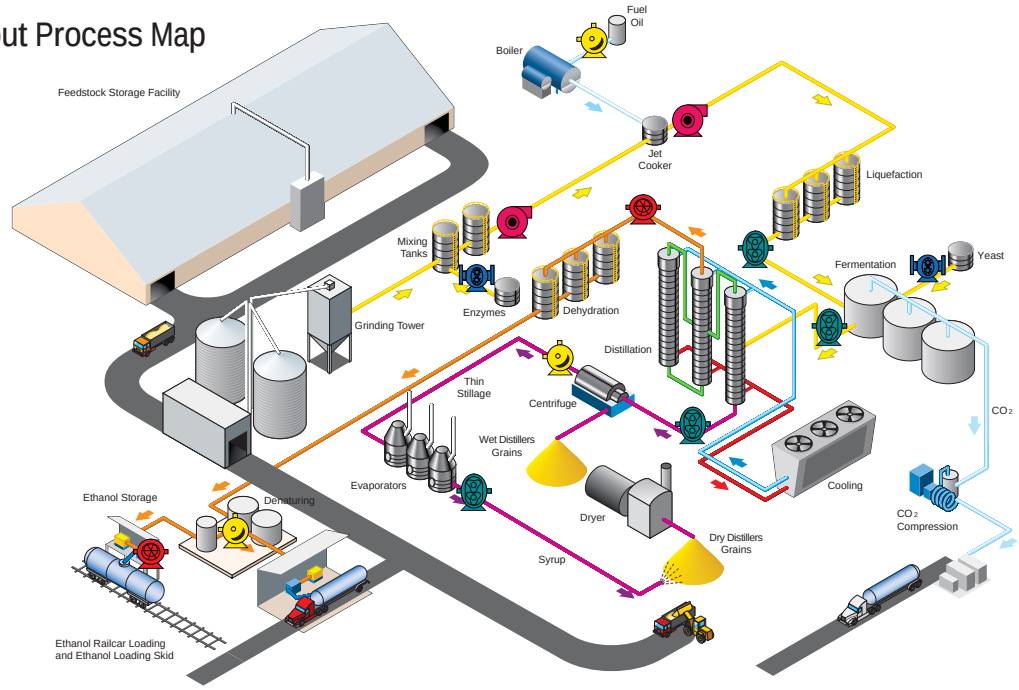
In the US, the majority of ethanol plants are using Viking® pumps in their processes. These producers have realized the advantages of repeatable accuracy, high efficiency, corrosion resistance, bi-directional flow and unmatched reliability delivered by their Viking pumps.

Liquids handled include:

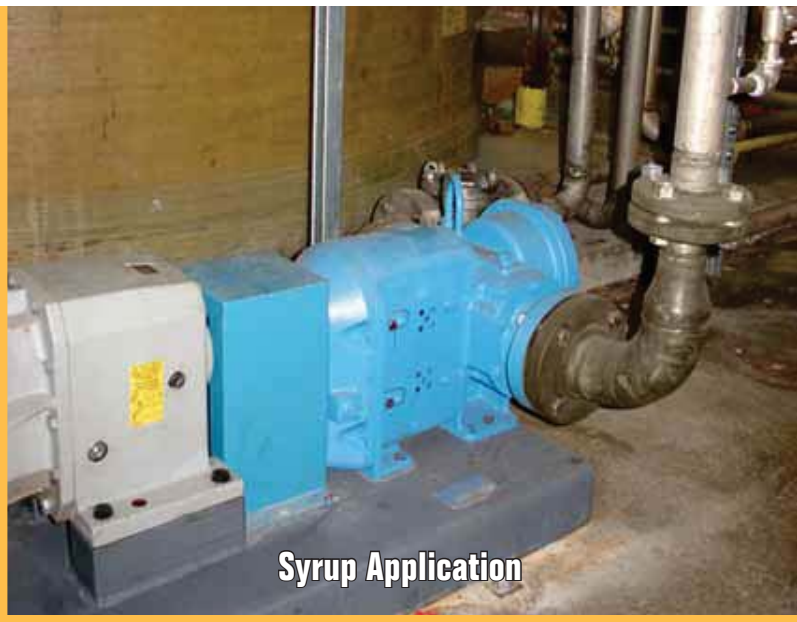
- Ethanol (pure and denatured)
- Gasoline
- Additives
- Enzymes
- Yeast
- Syrup
- Sulfuric acid (water treatment)
- Beer

Ethanol - Typical Layout Process Map

Symbol Legend
Internal Gear Pump
Rotary Vane Pump
Rotary Lobe Pump
Centrifugal Pump
External Gear Pump



Fuel Mixing



Syrup Application

Choosing the Right Pump

While Viking pumps are used in many of the simple processing or transfer applications, they are critical to some of the more difficult ethanol process applications that include:

- Operating under vacuum when pulling off distillation columns
- Handling hot, high vapor pressure liquids from fermentation tanks without cavitation
- Generating up to 14 BAR (200 PSI) handling <1 cSt alcohol
- Accurately metering denaturant and other additives
- Handling solids-laden syrup

As ethanol feedstocks shift from raw sugars to sugars derived from cellulosic materials, Viking pumps can be easily adapted to satisfy fluid handling requirements for cellulolysis processes, including acid or enzyme metering, and transferring cellulosic slurries, lignins and other materials.

Ethanol Syrup Handling

Ethanol syrup is no ordinary corn syrup. Like corn syrup it's viscous and sticky. However, unlike corn syrup, it has a high solids content that consists of abrasive corn processing waste. The combination of the viscosity, stickiness and abrasive solids make this syrup difficult to pump and to seal.
Viking lobe and internal gear pumps with flushed single and double mechanical seals have been successful. In some climates the seal flush lines have experienced freezing and generate excessive wastewater, increasing utility costs.
Viking Pump is now providing a unique, easy-to-maintain cartridge seal on both the gear and lobe pumps which uses a simple, oil-filled standpipe to lubricate the seals, eliminating both the freezing issues and the wastewater discharge. This solution increases seal life, improving reliability and reduces maintenance costs, as well as reduces wastewater treatment costs

Biofuels Application Quick Reference Chart

		VIKING PUMP PRODUCTS					
	APPLICATIONS	Universal Seal Series	Viking Mag Drive Series	LVP Vane Series	CMD Mag Drive Series	RL Lobe Series	Viking Pump Accessories
BIODIESEL	Oils & Tallow	■				■	■
	Sulfuric Acid				■		
	Methanol	■	■	■	■		■
	Sodium Hydroxide		■	■	■		■
	Sodium Methoxide (Catalyst)	■	■	■	■		■
	Crude Biodiesel (FAMEs)	■	■	■		■	■
	Glycerine	■	■	■			■
	Diesel	■	■				■
ETHANOL	Enzymes / Yeast	■	■		■		■
	Thin Stillage	■				■	■
	Beer	■				■	
	Syrup	■				■	■
	Additives	■	■		■		■
	Denaturant	■	■	■			■
	Ethanol	■	■	■			■

Emerging Biofuel Technologies

As new feedstocks and processes are adopted for biodiesel and ethanol, Viking® is developing optimal pumping technologies to handle them. Similarly, as completely new biofuels are developed, Viking offers a completely scalable line from gallon/hour pilot plant pumps to multi-million gallon/year full scale production pumps to minimize scale-up risk.

Some emerging biofuels technologies where Viking pumps are applicable include:

- Butanol - Non-fermentation process where engineered bacteria directly convert sugars to butanol.
- Biocrude - Fermentation process where engineered bacteria create crude hydrocarbons
- Methanol – Fermentation process derived from wood waste and other biomass sources.
- Methane – Through anerobic digestion of animal, human and food waste

Viking Pump Benefits

Low shear - Viking® pumps operated at low speeds minimize liquid shear and protect the product integrity.

Ability to handle thin or thick liquids - the same Viking pump can handle solvents less than 1 cSt or polymers more than 500,000 cSt.

Shaft sealing - Viking offers a broad array of shaft sealing solutions, including packing, lip seals, component mechanical seals, and off-the-shelf cartridge seals from virtually every major manufacturer. Viking also offers sealless, Mag Drive pumps for the highest level of liquid containment available.

Customizable - Viking pumps can be easily customized with thousands of options for materials, porting and sealing, to ensure that each pump is optimized for the material and the application.

Accessories - The Viking Lid-Ease® Strainers provide protection for the pump by preventing solids or foreign materials from entering. Inexpensive insurance for the pump and downstream system components to maximize life for a lower overall cost of ownership.

Universal Seal Internal Gear Pumps

- Cast iron, ductile iron, steel and stainless steel construction
- 16 Displacements available
- Capacities to 360 M^3/Hr (1600 GPM)
- Pressures to 14 BAR (200 PSI)
- Temperatures to 420°C (700°F)
- Industry leading 3-year warranty

Customer Benefits

- Pumps accommodate virtually all sealing types and manufacturers
- Industry leading selection of application specific material options to maximize pump life
- Design adaptability for an unequalled range of viscosities and temperatures
- Easy clearance adjustment to maintain high efficiency
- Simple design with only two moving parts
- Back pull-out seals
- No special tools required for service

OUR EXPERIENCE SHOWS IN...

Viking Mag Drive Pumps

- Internal and external gear pump designs available
- Cast iron, steel and stainless steel construction
- 39 Displacements available
- Capacities to 114 M³/Hr (500 GPM)
- Pressures to 14 BAR (200 PSI)
- Temperatures to 260°C (500°F)
- Industry leading 3-year warranty on Universal Mag Drive series

Customer Benefits

- Universal Mag Drive series is dimensionally interchangeable with its Universal Seal series counterparts
- Proven internal gear design provides superior flexibility to the most challenging applications where shaft sealing is crucial
- Wide flow range to better match application requirements
- Pump design offers ANSI or DIN flanges, and IEC or NEMA motor mounts conform to international standards for enhanced application flexibility
- Short-term run-dry capabilities provide for line clearing or empty tank situations without damaging pump
- Space-saving mounting configurations available

LVP Series Vane Pump

- Stainless steel construction
- Sealing options: single and double lip seals, mechanical seals
- 6 Displacements available
- Capacities to 36 M³/Hr (160GPM)
- Pressures to 14 BAR (200 PSI)
- Temperatures to 107 °C (225 °F)

Customer Benefits

- Harder components than other vane pumps extend pump life
  - 62 Rockwell C surface-hardened one-piece, 316 stainless steel casing
  - Silicon Carbide sleeve bearings
  - Chrome oxide shaft coating
- Superior suction lift capability
- Non-metallic vanes and push rods extend pump life
- Short-term dry-run-capability tolerates process upsets without pump damage
- Tailored sealing solutions for application flexibility
- Pump design offers ANSI or DIN flanges, and IEC or NEMA motor mounts conform to international standards for application flexibility

Fueling Station


Drying Application

Choosing the Right Pump

Since 1911, Viking® pumps have been used in processing oils, fats and fuels. Nearly a century later, we are delivering innovative pumping solutions to the industry for these and other liquids used in biodiesel production.

Viking positive displacement pumps provide smooth, pulseless flow, low shear, repeatable accuracy, high efficiency across many viscosities, corrosion resistance, high pressures, and unmatched reliability.

Viking pumps are used on all of today's biodiesel feedstocks, including:

- Vegetable Oils – soy, palm, canola, sunflower, cottonseed, etc.
- Vegetable oil soapstock
- Tallow
- Yellow Grease

Viking pumps can be easily adapted to satisfy the future fluid handling requirements for new feedstocks like sugar cane, oils from jatropha, camelina and algae.

Centrifugal or Vane?

At a diesel terminal, one customer was trying to decide between a leading ANSI centrifugal and a Viking LVP series stainless steel vane pump for pipeline transfer. The centrifugal was a 1.5 x 1.5 x 13.5 at 1750 RPM. The comparison showed:

• Efficiency: Centrifugal: 20% efficiency (running on left hand side of curve), LVP: 60% efficiency

• Motor Power: Centrifugal: 11 kW motor, LVP: 5.5 kW motor

• Price: Centrifugal: 20% to 25% higher than LVP

Based on these criteria, the choice was clear and the Viking LVP series stainless steel vane pump was selected instead of the ANSI pump.

VIKING PUMP
A Unit of IDEX Corporation

Worldwide Leader Since 1911 for Positive Displacement Pumping Solutions for Industrial, OEM, and Sanitary Applications.

Innovation and Experience

Viking Pump has been a pump industry leader and innovator since its founding in 1911. We continue to build on our ever growing experience delivering innovative new pumping solutions, including custom designs, to many thousands of customers who use millions of Viking® pumps in some of the world's toughest applications.

Broad Performance Range

Capacity:
0.5 to 360 M³/Hr (0.1 to 1,600 GPM)
Pressure:
0 to 172 Bar (0 to 2,500 PSI)
Temperature:
-40°C to 370°C (-40°F to 700°F)
Viscosity:
0.5 to 1,000,000 cSt (28 to 4,500,000 SSU)

Ultimate in Sealing Solutions

Viking's offering of packing, component mechanical seals, cartridge seals, and sealless Mag Drive technology provides the best choices for sealing flexibility needed to provide your application a customized sealing solution every time - saving you money, time, and unplanned downtime.

Material Options Matched to Application

Viking's dedicated iron and alloys foundries provide pump construction materials from cast iron to Alloy C. Application-specific materials of construction extend pump life significantly, while reducing maintenance and unplanned downtime, which enables increased production and a better bottom line.

Liquid Integrity Protection

Viking has developed multiple positive displacement pump principles to protect shear-sensitive liquids, and low-shear options to prevent damage to fibers, polymers, and solids. Full-jacketing options provide precise temperature control throughout the pump. The Viking Mag Drive® and other seal options prevent fluid contact with air, assuring liquid integrity.

Local Applications and Engineering Support

Over 245 Authorized Viking Pump Distributors in 68 countries provide local application support and service, backed by Viking Application Engineers and Viking Region Managers strategically located around the world.

Quality Manufacturing

Viking uses ISO9001-2000, Six-Sigma, and Lean/Kaizen in its worldwide manufacturing and assembly processes to remove waste, reduce development costs, and deliver superior products on schedule. Dedicated Viking foundries and manufacturing facilities utilize state-of-the-art CNC equipment to assure unmatched quality is built into every pump.

Custom Designed Solutions

Viking has provided custom designed pumps to end-users and OEMs since its first pump in 1911, when Viking invented the gear-within-a-gear pumping principle to remove water from a rock quarry. Today, enabled by Viking's engineering staff, extensive applications experience, and in-house foundries, more than 20% of Viking's sales are new Viking designs, or pumps designs derived from more than 1,000 Viking catalog pumps with more than 40,000 active configurations. So, whether you are an end-user or an OEM, Viking can provide custom designed pumping solutions to meet your specific needs.

IDEX CORPORATION

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 Printed in U.S.A. 5/2008 Form No. 351-B