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***MARKET DEVELOPMENT  
ISSUES FOR ALTERNATIVE  
DIESEL ENGINE OILS***

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***PRESENTATION FOCUS***

***CROP SOURCED FLUIDS***

**Canola**

**Corn Oil**

**Soy Oil**

**Sunflower Oil**

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# ***MARKET POTENTIAL OF CROP SOURCED FLUIDS***

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- Total Loss Applications**
  - ◆ Relatively Low Volume
  - ◆ Do Not Require High Temperature Stability
- Biodegradable Hydraulic Fluids**
  - ◆ Initial Large Volume Potential Use
  - ◆ Can Be Short on Performance vs. MO
- Motor Oils**
  - ◆ Attractive Volume Potential (Even @ Low %)
  - ◆ Usefulness Needs To Be Proven

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## **QUESTION ?**

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**Why Would Anyone Want To  
Market a Diesel Engine Oil  
Containing a Crop Based Fluid?**

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## ***WHY CONSIDER CROP SOURCED FLUIDS FOR ENGINE OILS?***

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### **ATTRACTIVE PROPERTIES**

- Renewable**
- Biodegradable**
- Non-Toxic**

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## ***WHY CONSIDER CROP SOURCED FLUIDS FOR ENGINE OILS?***

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### **POTENTIAL PERFORMANCE BOOSTS**

- Very Low Volatility**
- Very High Viscosity Index**
- Active Molecule Potential**
  - » Improved Anti-wear**
  - » Better Fuel Economy**

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# ***MOTOR OIL - Base Oil Properties***

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## **NOACK Volatility**

PAO 4	12
GROUP III	15
GROUP II+	15
GROUP II	23
GROUP I	29
CROP FLUID	1

## **Viscosity Index**

PAO 4	120
GROUP III	120-145
GROUP II+	115-120
GROUP II	95-115
GROUP I	95-100
CROP FLUID	220

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## ***CROP BASED FLUIDS***

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**ATTRACTIVE COMBINATION OF  
VERY HIGH VI AND VERY LOW  
VOLATILITY**

**– Potential Blending Component to Reduce  
Oil Consumption**

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# ***MARKETING CROP SOURCED FLUIDS FOR ENGINE OILS***

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**SUCCESS WILL DEPEND ON  
FINDING ECONOMIC ADVANTAGE  
FOR SOME OR ALL OF THESE  
UNIQUE PROPERTIES**

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## ***HISTORICAL PERSPECTIVE ON CROP SOURCED FLUIDS***

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**Early Lubricants**  
**Wide Variety of Crop Sources**  
**Varying Compositions**  
**Performance Issues**  
**High Temperature Stability**  
**Cold Flow**

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# ***MARKETING CROP SOURCED FLUIDS FOR ENGINE OILS***

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**SUCCESS WILL ALSO DEPEND ON  
PROVING THE PERFORMANCE OF  
THESE FLUIDS IN FULL-SCALE  
ENGINE TESTING**

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## ***HOW CROP SOURCED FLUIDS CAN BE USED IN ENGINE OILS***

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### **What Is Known**

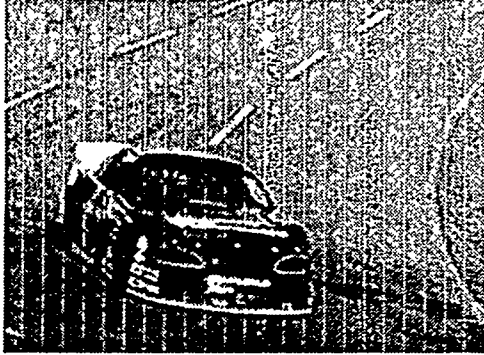
- ◆ **VI & Volatility Can Be Controlled With a Crop Fluid**
  - Cost Vs Current Alternates?
- ◆ **Engines Can Be Lubricated With Motor Oils  
Containing 20+ % of a Crop Fluid**
- ◆ **High Temperature Stability Can Be Controlled**
  - High Oleics Better
- ◆ **Notational Fuel Economy**
- ◆ **Indications of Improved Anti-wear**

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# HOBS

## High Output Engine Demos

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Source: RLI

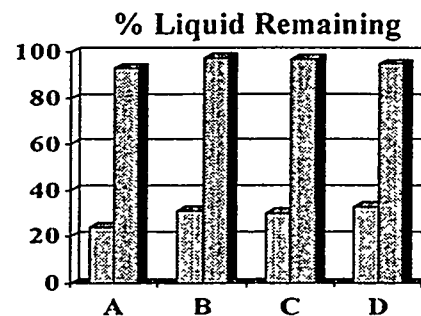
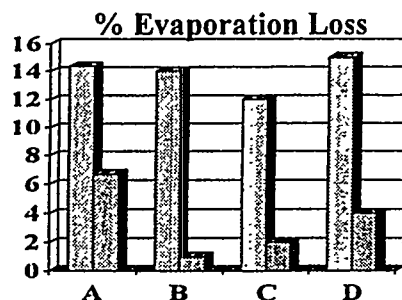
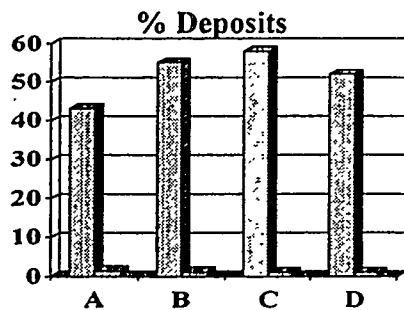
- ◆ High Output 358 V-8
- ◆ 800 Lap Break-In
- ◆ Short Track
- ◆ 8000 - 8300 RPM
- ◆ Gasoline Fueled
- ◆ SAE 20W-50 with 20% Crop Fluid
  
- ✓ Engine - No Change After Day's Run
- ✓ Idle Oil Pressure Stabilized
- ✓ 200-300 More RPMs

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## STABILIZATION OF HIGH OLEIC CROP FLUID (HO CF)

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Micro-Oxidation Test  
(30 Min @ 225°C)

HO CF - No Additives

HO CF Plus Chemistry

A = HO Soy

B = Holly Canola

C = HO Corn

D = HO Sun

Source: RLI

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# ***ANTI-WEAR INDICATION OF HIGH OLEIC CROP FLUIDS (HOCF)***

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	<b>4-Ball Steady State 30 Min mm Scar</b>	<b>4-Ball Scuffing Load kg</b>
<b>Mineral Oil</b>	<b>0.64</b>	<b>40</b>
<b>Sunflower Oil</b>	<b>0.51</b>	<b>50</b>

Lower = Better

Higher = Better

Source: RLI

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## ***HOW CROP SOURCED FLUIDS CAN BE USED IN ENGINE OILS***

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### **What Is Not Known**

- ◆ **Performance in Sequence Engine Tests**
  - Cost Factor
- ◆ **Solid Reason for OEMs / Oil Marketers To Be Interested**

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***PRAGMATICS OF BRINGING CROP  
SOURCED FLUIDS TO DIESEL  
ENGINE OIL MARKET***

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**Usage Considerations**

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**Better Potential For Impact**

- Blending Component**
- Additive**

**Lower Potential**

- Major Base Fluid Component**

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## ***USING ATTRACTIVE PROPERTIES***

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### **Renewable Aspect**

**Need Help From Governments**

**Regulations / Mandates**

### **Biodegradability**

**May Not Matter**

### **Non-Toxicity**

**May Not Matter**

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## ***PRAGMATICS OF USING POTENTIAL PERFORMANCE BOOST***

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### **High VI & Low Volatility**

**Potential Component**

### **Active Molecule Impact**

**Need Targeted Research To Quantify**

**Potential Benefits & Cost Effectiveness**

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# ***PRAGMATICS OF USING POTENTIAL PERFORMANCE BOOST***

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## **Ideas for Targeted Research**

- ◆ **Fully Document Improved Fuel Economy Vs. Industry Specifications**
- ◆ **Unique Engine Component Durability**
- ◆ **Enhanced Exhaust Control System Durability**
- ◆ **Ability to Economize with Additive Packages**
- ◆ **Other?**

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# ***PRAGMATICS OF BRINGING CROP SOURCED FLUIDS TO DIESEL ENGINE OIL MARKET***

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## **THE BOTTOM LINE**

**Once There Is A Reason To Use - Performance Must Be Documented**

**Two Ways To Approach Performance**

- 1 **Proof-of-Performance Truck Testing**
- 2 **Full-Scale Engine Testing**

**Which Ever Way You Start -**

**Both Must Be Done To Achieve Large Volume Use!**

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