Soy Lubricant: Benefits of Bioproducts

Objective:

Investigate the characteristics & effectiveness of bio-based lubricant versus synthetic-based lubricants.

Keywords:

- Bioproduct
- Lubricant
- Aroma
- Viscosity
- Resource input

21st Century Skills Represented:

- Environmental Literacy
- Economic & Business Literacy
- Problem Solving and Critical Thinking
- Communication and Collaboration

National Science Education Standards:

- Physical Science: Matter and its Interactions
- Earth & Space Sciences: Earth & Human Activity
- Engineering Technology & Applications of Science: Engineering Design; Links Among Engineering, Technology, Science & Society

feedstocks	processes	uses
Crops – oil from soybeans	Chemical conversion	Lubricants

Background

What are bioproducts? Do they work? What are their performance characteristics and environmental benefits?

Across the nation and around the world, companies are now offering thousands of biobased products, ranging from lubricants and cleaning supplies to carpet backing and energy efficient roofing materials made with ingredients grown on the farm. While farmers offer an abundant and renewable supply of ingredients for food and livestock feed, they also make it possible for companies to use chemicals or feedstocks which reduce the petroleum content in commercial and industrial products. Bioproducts are materials, chemicals or energy, derived from renewable biological resources.

While it is important to learn what goes into the products we use and where to find bio-based alternatives, consumers want products that will perform. In the case of lubricants, the product needs to out-perform when it comes to lubricity, friction and rust inhibition. Develop a test to see for yourself. Even small choices can make a real impact today and for years to come.

Materials – see next page

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Materials

Materials per student:

- Lab book for recording observations

Materials per station:

Station 1	*Station 2*	*Station 3*
• 3 - 6 oz. clear plastic cups, interior sprayed lightly with Nutek's Simply Soy or LubFix* lubricant, labeled "A" • 3 - 6 oz. clear plastic cups, interior sprayed lightly WD-40lubricant, labeled "B" • Instructions on wafting: hold the cup at chin level about 6-8 inches away and "wave" the smell towards your nose. • Products with prices: Simply Soy or LubFix and WD-40	• 3 sheets of material to use as a ramp for matchbox cars (variety of sizes will work) • Can of Simply Soy or LubFix • Can of WD-40 • 2 of the same matchbox cars per group of students • 2 pieces of metal gutters – at least 8 feet • 2 metal washers: 2-3 inches wide • Paper towels (or similar de-greaser product to clean off ramps, cars & washers after each test) • 1 trash bag • Hand-wipes for clean-up • 6 containers to hold lubricants	• MSDS sheets for both products: Simply Soy or LubFix and WD-40

**Note: Nutek markets Simply Soy as a 100% soy-based lubricant that is 100% biodegradable and safe for food areas. However, Nutek markets LubFix, which is also made from a biodegradable soy formula, as its performance competitor to WD-40.*

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Pre-Lab Preparation

1. Show students a slide or provide a small demonstration of friction in action without identifying it.
2. Hold a class discussion. Ask students to identify the force used in your picture or demonstration.
3. Ask for additional examples and applications of friction in action. When is friction a helpful thing and when is it a detriment?
4. Discuss the role of a lubricant in reducing friction.
5. Ask students what they knew about bio-lubricants. What expectations do they have about bio-lubricants in regards to its sources, aromas, and viscosity?

Lab Procedures

1. Students will rotate through 3 stations that will familiarize them with two lubricants: Nutek's Simply Soy or LubFix (bio-lubricant) and WD-40 (synthetic product).
2. Prior to students arrival, spray some Simple Soy into several clear plastic cups marked with an "A" and WD-40 into several clear plastic cups marked with a "B" for Station 1.

Station 1

1. Aroma Test: Have students perform a waft test on the liquids in cups A and B. Students should record a description of each smell and which smell they prefer.
2. Appearance Test: With the same cups have students record a description of each liquids appearance. Students should then record which liquid they would prefer to use.
3. Price Test: Have student compare the price per ounce of each liquid. Have students record why they think one liquid is more expensive than the other.

Station 2

1. Students will be given a sheet of material and two of the same matchbox cars. Students should lubricate the wheels and axels of one car by dipping them in containers with WD-40 and the other with Simply Soy/LubFix. Students will then test the effectiveness of each lubricant by using the sheet as a ramp. Students should record their results and observations.
2. Students will be given two pieces of metal gutter and two metal washers. Students should lubricate one piece of gutter with WD-40 and the other with Simply Soy/LubFix. Students will then test the effectiveness of each lubricant by sliding the metal washers down the metal gutters. Students should record their results and observations.

Station 3

1. Consider the input resource: Using the MSDS sheets students will distinguish the two types of resource inputs used to create each lubricant. Students should record their findings and which lubricant they would choose.
2. Environment: Based on documentation from the MSDS sheets and bottle claims, students will describe and document the difference of each of the following between the lubricants: propellant, Volatile Organic Compounds (VOC's), and biodegradability. Students will also record which product they would choose.

3. Location: Using the cans, students will determine where each lubricant was manufactured. Students will record their findings and which lubricant they would choose.

Post-Lab Discussion/Questions

1. Have the students record their answers to the following questions:
    a. Which lubricant had the more attractive physical characteristics?
    b. Which lubricant performed better?
    c. Which lubricant was more environmentally friendly?
    d. Which lubricant would you choose? Why?
2. Hold a class discussion on the above questions.

Expansion Ideas

- Develop marketing strategies for using soy lubricants.
- Explore the lubrication market. Do a cost comparison of soy lubricants to other types of lubricants.
- Test and rate product claims for reliability and performance.
- Test different lubricants.

Evaluation of Learning

- Have students turn in a description of the product they would choose along with the reasons why.

Resources

- Videos
    - WD-40 – What Can't it Do? from YouTube by WD-40
    - Ohio FFA Camp Sales Finalist 1 from YouTube by Ohio BioProducts Innovation Center
    - Ohio FFA Camp Sales Finalist 2 from YouTube by Ohio BioProducs Innovation Center
    - Cathy Horton, Founder of Nutek, "Go for the Brass Ring" from YouTube
    - Cathy Horton, Founder of Nutek, "Get Dirty" from YouTube
    - Cathy Horton, Founder of Nutek, "Solve that Point of Pain" from YouTube
    - Cathy Horton, Founder of Nutek, "Move Fast to the Market" from YouTube

- Websites and Articles
    - Biodegradable/Biobased Lubricants and Greases by Lou Honary, Machinery Lubrication
    - Bio Food Grade Gear Oils from United Bio Lube
    - Northwest Ohio Green Products Center
    - Introduction to BioPreferred from United States Department of Agriculture
    - Ohio Manufacturers to Gain from Broader "BioPreferred" Labels from Dayton Business Journal

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Contacts

- Nutek, Chagrin Falls, OH: http://www.nutekformulations.com/
- Ohio Soybean Council, Columbus, OH: http://www.soyohio.org
- Renewable Lubricants, Hartville, OH: http://renewablelube.com/

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