

ENERGY ALTERNATIVES: THE COOL FUEL ROADTRIP

Biodiesel and Vegetable Oil

Teacher's Guide



Grade Level: 6–12 **Curriculum Focus:** Science **Running Time:** 25 minutes

Program Description

Shaun Murphy and his Cool Fuel Crew put a whole new spin on the phrase "oil change." Join them as they travel through Oregon and Washington on biodiesel fuel derived from vegetable oils and animal fats. And this energy source doesn't just come direct from the farm. In the Lone Star State, Shaun gives restaurant owners a helping hand by turning their used vegetable cooking oil into a cool fuel.

Learning Objectives

After viewing the program and participating in discussion, students will be able to:

- Explain how biodiesel is made and identify its components;
 - Describe the chemical properties of biodiesel and vegetable oil and their effects on diesel engines;
 - Identify the economic benefits of alternative fuel production;
 - Note the environmental advantages of using biodiesel and vegetable oil;
 - Utilize energy-saving techniques in their everyday lives.
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Classroom Connections

What is biodiesel made of? List the steps in biodiesel production.

Why must a car have two fuel systems (one petroleum or biodiesel-based, the other for alternative fuels) in order to use peanut or vegetable oil? How does the viscosity of vegetable oil affect a vehicle's performance?

Visit ThinkQuest.org (<http://library.thinkquest.org/C006011/english/sites/diesel.php3?v=2>) to view an animated illustration of a diesel engine. How do diesel engines convert fuel into energy? How does this relate to vegetable oil's viscosity?

In addition to using biodiesel, what other steps did Shaun, his team, and the featured drivers take in order to reduce their reliance on fossil fuels?

Why would biodiesel use help the American economy as well as the environment? Why is vegetable oil a cost-efficient choice for drivers and restaurant owners?

Classroom Activities

Set up an experiment to investigate the principles of combustion. For example, have students place a test tube attached to a funnel over a live water plant. Remove the test tube and place a glowing splint at the opening of the tube. What two things need to be present in order for the splint to reignite? Why does burning a match produce water vapor? How does a fuel's flash point affect its use in engines?

Have students research biodiesel producers and distributors in your area (<http://www.biodiesel.org/buyingbiodiesel/distributors/>). Break the class into two groups; one group will call three distributors for pricing information on a gallon of biodiesel, and the other group will compare the price per gallon for gasoline at three local gas stations. For local residents, is it cheaper to use gas or biodiesel? Is biodiesel an efficient alternative to gasoline? Make a list of the pros and cons of biodiesel use.

Ask students to keep a record of each time they use a car for a week (not including public transportation). How many trips did they make? Could they have used another method to reach their destinations? In addition to limiting the use of gasoline, what other actions can the public take to reduce America's dependence on fossil fuels and decrease the amount of carbon emissions released into the environment?

Target Vocabulary*

biodiesel - a fuel that is similar to diesel fuel and is derived from usually vegetable sources (as soybean oil)

combustion - an act or instance of burning

diesel engine - an internal combustion engine in which air is compressed to a temperature sufficiently high to ignite fuel injected into the cylinder where the combustion and expansion actuate a piston

soybean - a hairy annual Asian legume (*Glycine max*) widely grown for its oil-rich proteinaceous seeds and for forage and soil improvement

viscosity - the property of resistance to flow in a fluid or semifluid

Academic Standards

National Academy of Sciences

The National Academy of Sciences provides guidelines for teaching science in grades K-12 to promote scientific literacy. To view the standards, visit this Web site:
<http://books.nap.edu/html/nses/html/overview.html#content>.

This guide addresses the following standards:

- Physical Science: Chemical reactions
- Physical Science: Transfer of energy
- Science in Personal and Social Perspectives: Natural resources
- Science in Personal and Social Perspectives: Science and technology in local, national, and global challenges

AAAS Benchmarks

Benchmarks for science literacy, developed by the American Association for the Advancement of Science (AAAS), state what all students should know and be able to do in science, mathematics, and technology by the end of grades 2, 5, 8, and 12.