

**Sugarbush Resort Biodiesel Pilot Project:  
Experiences in Using B20 Biodiesel in our  
2004-2005 Mt. Ellen Winter Operations**

**A Report to the Vermont Sustainable Jobs Fund  
March 2005**

**Submitted by:  
Sugarbush Resort**

## **Background**

Instituting a Biodiesel Pilot Project was an idea that was formulated through the work of Sugarbush Resort's Green Team. By and large the Green Team's mission is to find ways in which the resort can reduce its ecological footprint on the environment and look for areas where we can improve our resort operations through use of renewable resources. The ownership of the resort, Summit Ventures NE, LLC, was open to the idea of pioneering an effort towards implementing sustainable fuel use. As part of moving this idea towards realization, we employed a summer intern whose sole focus was researching the viability of using biodiesel for our winter grooming operations. The intern's research indicated favorable opportunities towards moving the project forward. With the execution of a Biodiesel Pilot Project, Sugarbush is further reducing its greenhouse gas emissions and implementing the use of a renewable fuel stock that has numerous environmental and social benefits. Sugarbush is also striving to become a pioneer in the use of biodiesel and become one of Vermont's environmental leaders in the recreation industry.

Prior to the 2004-2005 winter operating season, all of our snow grooming and snow removal equipment at the Mount Ellen and Lincoln Peak ski areas were run on petrodiesel. The machines include Pisten Bully and Bombardier groomers and a Caterpillar bucket loader. Our primary goal was to document performance of biodiesel in the challenging winter environment commonly experienced in Vermont and specifically the ski industry. The combination of the harsh winter environment and the number of hours our machines operate made a fuel switch to a B20 biodiesel blend an interesting experiment to initiate. Once we confirmed that using biodiesel would not void any equipment warranties, we decided to implement a pilot project with a B20 blend. During the summer of 2004, our Vehicle Maintenance department ran a small B20 test in our mountain mowing tractor and experienced positive results. We tested the fuel in this tractor because it travels the same terrain our snow groomers travel and it was a good opportunity to become familiar with the fuel and observe any potential performance issues.

Based on the positive test results and our intern research, we implemented the Biodiesel Pilot at Mount Ellen. More specifically, our biodiesel research focused on:

- Fuel integrity and performance
- Real environmental benefit
- Cost increase
- Vehicle performance, and
- Corporate warranty support from our equipment vendors.

We hoped that the Pilot would give us a positive introduction to biodiesel and provide insight into running biodiesel in other year-round operations at the Resort. In an effort to offset some of the cost increase we incurred, Sugarbush Resort applied for, and received, a Vermont Sustainable Jobs Fund (VSJF) grant.

This ski season at Mount Ellen, four groomers and one bucket loader were operated on B20 biodiesel. Through the Pilot program we were able to compare B20 biodiesel fuel performance at Mount Ellen versus petrodiesel fuel performance at Lincoln Peak. This

evaluation included observing whether one fuel would outperform the other and under what conditions, if any, performance was an issue. We also developed a comparison of quantifiable greenhouse gas emissions from both fuel stocks employed during the winter season.

### **Benefits of Using Biodiesel**

Initiating the Biodiesel Pilot awarded Sugarbush Resort the opportunity to address the environmental issue of over-reliance on conventional fossil fuels and the specter of global warming. Global warming poses a serious threat to Vermont ski areas. With its increased temperatures and changed weather patterns, global warming has the ability to significantly impact the entire ski industry. Taking our lead from the National Ski Area Association's slogan of "Keep Winter Cool," Sugarbush Resort approached this problem by evaluating the total quantity of petrodiesel we consume per year for winter operations and offsetting a predetermined amount with an alternative, domestically produced and renewable fuel.

Sugarbush Resort used the following categories to evaluate the overall benefits and accomplishments of our Biodiesel Pilot program:

- *Environment* - Investing in biodiesel is investing in Sugarbush's future and the greater public good. Significant emission reductions compared to petrodiesel include smog/ozone, particulates, CO<sub>2</sub>, NO<sub>x</sub> and Carbon Monoxide. The National Biodiesel Board is currently working on an emissions calculator that will provide actual offset values from petrodiesel to B20 biodiesel. In the interim, we worked with World Energy to put together rough emission offset and fuel displacement data. Using 15,000 gallons of B20 biodiesel, approximately 3,000 gallons of petrodiesel are displaced by an American made, domestically produced, renewable product. Using CO<sub>2</sub> as a leading indicator of global warming potential, every pound of fossil fuel displaced will yield a savings of approximately 3 pounds of CO<sub>2</sub> equivalents (CO<sub>2</sub> not emitted into the atmosphere). By using B20 biodiesel we will be offsetting the emission of approximately 9,000 pounds per year of CO<sub>2</sub> equivalent. Estimated reductions in regulated and non-regulated emissions through the use of B20 biodiesel include: total unburned hydrocarbons (20% decrease), carbon monoxide (12% decrease), particulate matter (12% decrease), NO<sub>x</sub> (2% increase), CO<sub>2</sub> (16% decrease), Ozone formation (10% decrease).
- *Economic Benefits* - Oil is projected to become unaffordable between 2010-2025, while biodiesel is projected to become more affordable. Implementing the use of, and becoming familiar with, biodiesel puts Sugarbush one step ahead of an impending oil crisis. Our use of biodiesel also boosts a local economy by decreasing our dependence on foreign oil and investing in a domestic renewable fuel source.
- *Mechanical* – Biodiesel acts as a solvent and lubricant by cleaning out engines while lubricating with its higher viscosity, which increases engine efficiency and helps extend equipment life. The machinery we use is very costly to operate and maintain and any action we can take that will prolong engine life and decrease engine maintenance is beneficial. As with the economic considerations listed

above, staying ahead of the curve by testing an alternative fuel stock will better position Sugarbush for the future.

- *Public Relations Benefits* - Sugarbush Resort seized the opportunity to become a Vermont biodiesel pioneer and establish itself as one of the State's environmental leaders. No other ski areas in Vermont are known to be using biodiesel at this level. Our biodiesel program has been touted through internal and external marketing initiatives and various media. Media outlets that covered Sugarbush Resort's Biodiesel Pilot program include the VSJF Cornerstone Project newsletter, Sugarbush Resort Web Site, RSN - Sugarbush Live Television, The Times Argus, Sugarbush Resort Marketing, Snow Industry Letter and sharing our biodiesel initiative during Sustainable Slopes Day.

### **Challenges and Obstacles of Using Biodiesel**

There were some challenges and obstacles to overcome before implementing our Biodiesel Pilot program here at Sugarbush Resort. These challenges stem from the "unknowns" associated with using an emerging technology, concerns over equipment performance and absorbing the cost of implementing an environmentally progressive program. These issues are expanded upon below:

- *Cost* – The overall cost increase can be looked at in a few ways: 1) straight per gallon cost difference between petrodiesel and biodiesel was approximately a 30% increase; 2) the cost in transportation was increased by approximately 51%; and 3) the net overall cost increase (including transportation and the VSJF grant) of the B20 blend was approximately 25%. This resulted in an average \$1.91/gallon cost for the 15,000 gallons of B20 biodiesel blend compared to an average \$1.35/gallon cost of petrodiesel (see **Table 1** for B20 cost details). We used the VSJF grant funds to offset the per gallon fuel cost and fuel transportation cost increases.
- *Good Impression/Bad Impression* – Breaking down stereotypes, dispelling the myth that we are burning French fry oil, overcoming fear of unknown and unknown performance issues.
- *Internal Barriers* – Skepticism and fear of technology change during a critical operating period. We relied heavily on research of the product, testimonials on successful biodiesel projects and anecdotal evidence that biodiesel has proven itself as a viable fuel alternative under a variety of uses.
- *External Barriers/Availability* – No commercial availability in Vermont, meaning that all product must come from outside of Vermont. We had some initial problems establishing a supplier in Vermont and chose to work through our own diesel fuel distributor to procure the B20 blend. Our local distributor, Owner Services in Proctor, VT, worked with Alliance Energy in Holyoke, MA to procure the B100 which was used to make our B20 blend. The transportation cost increase of the biodiesel can be directly attributed to geography. One goal of the VSJF grant was to stimulate local business economy and we achieved that by using our local distributor and getting them involved in the pioneering effort of making biodiesel commercially available in Vermont. The B100 would have come from out of state regardless of which Vermont distributor we chose to work with.

## **Experiences in Using Biodiesel at a Vermont Ski Area**

Our overall experience with biodiesel has been extremely positive. In fact, we have no real mechanical or operational problems to report. The biggest problems we encountered were establishing our supply and breaking down the internal barriers to using this fuel stock. Our experiences are generally summarized below with some testimonials from the departments here at Sugarbush most directly involved with this program.

- *VSJF Grant Opportunity* – Established new contacts and gained new exposure for Sugarbush Resort. We were able to cross-promote our initiatives and achieve some cost offset with use of the VSJF grant. We also gained a valuable new partner organization and a venue for sharing our experiences.
- *Dollar Expenditure* – Other than the cost of the fuel, we have not incurred any additional cost increase. There were no operational problems as a result of employing the B20 biodiesel. We did not make alterations to any machinery or our fuel storage facilities. Fuel filters on all of our machines will likely be replaced at season's end but that is a matter of general maintenance practice. Filter costs are somewhat negligible, less than \$500 for the five machines in the Pilot. Our Vehicle Maintenance staff will note any issues that are found during post-season equipment maintenance.
- *Performances on Par* – No performance issues have been reported and B20 biodiesel performance appears to be on par with petrodiesel. We also tested the B20 biodiesel blend in our summer mowing tractor and no performance issues were noted. Visible emission reductions were noted and the exhaust had a less noxious odor compared to petrodiesel exhaust.
- *Manufactures' Warranty Integrity* – We verified warranty integrity and the National Biodiesel Board website provides corporate information links on the use of biodiesel in individual machine types. For our Biodiesel Pilot, we used Bombardier and Pisten Bully snow grooming machines and our parking lot snow-removal machine is a Caterpillar loader. All three companies have approved use of biodiesel in their machines with specific fuel qualifications.
- *Outside Interest* – We have received various inquiries about our experience with the biodiesel use; see Public Relations Benefits and guest interest on Sustainable Slopes Day.
- *Employee Interest* – Sugarbush staff has gained valuable experience testing an emerging renewable fuel technology. Numerous employees have expressed interest in using biodiesel in resort vehicles and machines. Employee interest has been solid with some phone calls on how we can expand our program or otherwise get involved in our environmental initiatives.
- *Sustainable Slopes Day* – Sustainable Slopes Day, celebrated this year on February 26, 2005, is a program sponsored by the National Ski Areas Association (NSAA) and is celebrated annually at ski resorts around the nation. Generally speaking, participating resorts take this opportunity to showcase their commitment to, and stewardship of, the environment. It provides a great forum to share our environmental initiatives with our guests and get valuable feedback on what environmental issues are important to them. Sustainable Slopes Day also allows us to invite some of our partner environmental organizations out to the slopes to help spread our message. Organizations that joined us this year included

the 10% Challenge-Action for Climate Change, the U.S. Forest Service and Efficiency Vermont. We showcased our Biodiesel Pilot with a grooming machine onsite and sparked much interest from our guests on all of the possibilities it can bring us.

- Sugarbush Resort Testimonials
  - *Vehicle Maintenance* – “No operator complaints for lack of power, lower fuel economy and gelling. The exhaust smell was not as strong as regular diesel and we used less diesel fuel anti-gel additive. We also noted less smoke/soot and we didn’t have any fuel plugging issues.” – Ian Blackmer, Manager of Vehicle Maintenance
  - *Purchasing* – “If fuel costs keep up the current trend I would not be surprised if the cost of doing a B20 mix would be comparable to using straight off road diesel.” – Jim Westhelle, Purchasing Manager
  - *Planning & Development* – “This Pilot has provided the Resort with great educational opportunities internally and proof of our environmental commitment with our regulatory partners. I hope this is just the beginning of our use of biodiesel and renewable fuel sources at the Resort.” – Jason Lisai, VP Planning and Development
  - *Marketing* - "In an industry that is so dependent on climate and conscious of the implications of global warming, Sugarbush's decision to use a cleaner-burning fuel like biodiesel was seen as a necessary measure in preserving our environment." – JJ Tolland, Communications Manager
  - *Mountain Administration* – “Biodiesel works and it is the right thing to do. In the Colorado ski industry where I have also worked, biodiesel use is far more common than it is here on the East Coast. This difference in usage is related in part to transportation and distribution infrastructure. I am proud that we are Vermont's first . . . but it is my hope that other Vermont ski areas will soon follow our lead. As biodiesel use becomes more common in our region, the transportation and distribution costs associated with biodiesel will become less prohibitive, and bio will be the right thing to do financially as well as environmentally.” - Hardy Merrill, Mt. Ellen General Manager
  - *Grooming* – “We saw no difference using B20 compared to regular diesel. If we hadn’t told operators and mechanics we were using it they would have never known.” – Dave Mosher, VP of Mt. Operations and Head of Grooming
  - *Mountain Ownership* – “Sugarbush Resort was pleased with the opportunity to run a successful biodiesel pilot program and participate in the VSJF grant process. We strive to run our business operations as efficiently as possible while remaining environmentally conscious. The Mt. Ellen Biodiesel Pilot project has met these objectives.” – Win Smith, President of Sugarbush Resort Operations

### **Concluding Remarks**

Our overall experience with the Mt. Ellen Biodiesel Pilot Project was extremely positive. Starting with our initial research into this technology, through our full season implementation, we have learned that biodiesel is a viable technology in our industry. Our Pilot project team worked together seamlessly to break down internal and external

barriers to using biodiesel, prove that this fuel can perform at least on par with petrodiesel and overcome availability and cost increase issues. In addition, Sugarbush Resort hopes its biodiesel experience can set a new standard for ski area operations throughout Vermont and New England.

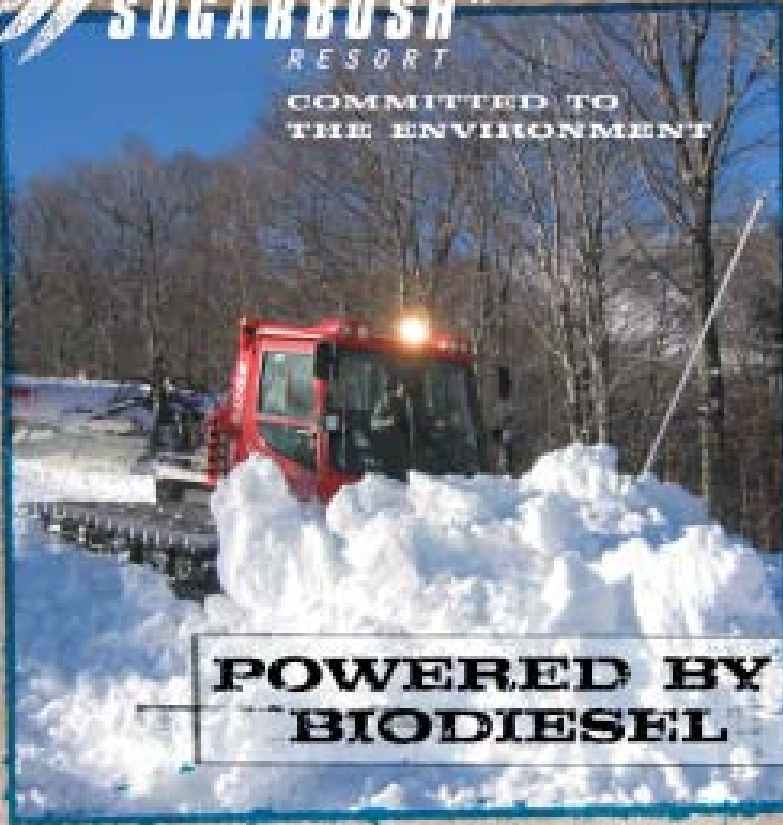
In cooperation with our new partner organization, the Vermont Sustainable Jobs Fund, we hope to help grow biodiesel potential through our example and our partnership with outside organizations. Sugarbush is intent on sharing its experiences to dispel the myths of implementing an alternative fuel technology during essential winter operations. We are also excited about the future use of biodiesel and possibly making it a more permanent fixture in our year-round mountain operations. Although there was a cost increase to implement our Biodiesel Pilot, we believe the benefits established a positive return on our investment. Furthermore, with the great energy and interest we've generated with the Pilot, Sugarbush Resort hopes to expand its biodiesel use and explore opportunities to supplement local biodiesel manufacturing operations with the waste grease we generate through our food and beverage operations.

**Table 1. Mount Ellen Off Road Diesel Consumption and Cost 2004/2005**

Date	Product	Gallons	PPG	Delivery Charge	Total Cost	Cost per gallon
1st Delivery 12/06/04	Off Road DSL	5250	1.22	806.93	7185.68	
	Bio DSL	1500	2.74	1317.7	5423.95	
	Red Kerosene	750	1.97	Included	1575.70	
<b>Totals</b>		<b>7500</b>			<b>14185.33</b>	<b>1.89</b>
2nd del 1/19/05	Off Road DSL	4500	1.22	691	6158.50	
	Bio DSL	1506	2.78	1317.7	5500.62	
	Red Kerosene	1500	1.84	Included	2929.40	
<b>Totals</b>		<b>7506</b>			<b>14588.52</b>	<b>1.94</b>
<b>Total Gallons Used</b>		<b>15,006</b>				
<b>Costs of BIO DSL</b>	<b>\$28,773.85</b>			<b>B20 Pilot Cost Increase</b>	<b>\$8,425.71</b>	
<b>Cost if Straight DSL was used</b>	<b>\$20,348.14</b>			<b>VSJF Grant</b>	<b>(\$2,500.00)</b>	
<b>Cost of Biodiesel Pilot Program</b>	<b>\$8,425.71</b>			<b>Actual Cost to Implement</b>	<b>\$5,925.71</b>	

# SUGARBUSH<sup>VT</sup> RESORT

COMMITTED TO  
THE ENVIRONMENT



## POWERED BY BIODIESEL

THE SUGARBUSH GREEN TEAM CONTINUOUSLY LOOKS FOR WAYS TO IMPROVE OPERATIONS THROUGH THE USE OF RENEWABLE RESOURCES.

Mt. Ellen at Sugarbush is the **ONLY** Vermont ski area to operate all snow groomers and base equipment on a biodiesel blend.

This environmentally-progressive program was funded in part by a grant from the Vermont Sustainable Jobs Fund.



VISIT [SUGARBUSH.COM](http://SUGARBUSH.COM) FOR MORE INFO ON OUR COMMITMENT TO THE ENVIRONMENT.

VISIT [SUGARBUSH.COM](http://SUGARBUSH.COM) TO LEARN MORE ABOUT THE BENEFITS OF THESE RESOURCES.



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