Taking Top Honors at the Science Fair with Minitab

The Pennsylvania Junior Academy of Science (PJAS) sponsors a state-wide science fair each year for high school students, and seventh grader Jonathan Riska relied on Minitab Statistical Software to analyze the data for his award-winning project.

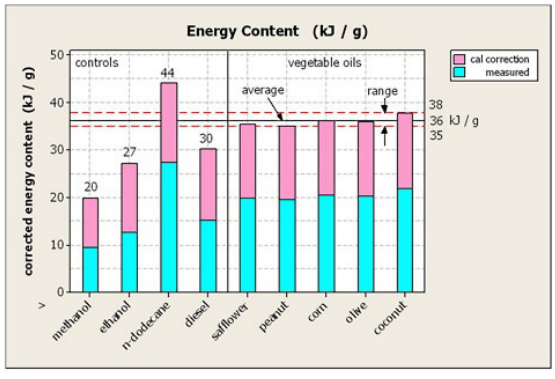
Riska's interest in sustainable energy, along with his love for cars and engines, prompted him to use his science project to compare the amount of energy contained in different vegetable oils to that in petroleum diesel fuel. "I wanted to confirm whether vegetable oils can be considered reasonable replacements for petroleum diesel," he says.

Jonathan Riska, a seventh grader from Macungie, Pa., used Minitab to help him analyze energy data for his award-winning PJAS science fair project.

To test safflower, peanut, corn, olive, and coconut oils, Riska built a simple calorimeter, which measures the energy per gram in a fuel by determining how much of it must be burned to raise the temperature of water. For each fuel, Riska filled a burner and recorded its initial mass. He then lit the fuel and began recording the water temperature. When it rose to about 80 degrees C, he extinguished the burner and reweighed the sample. Together, these measurements gave Riska the information to calculate the amount of energy per gram in each fuel.

But Riska took it a step further. He also tested petroleum diesel, methanol, and n-dodecane, which all have known energy contents. He then used these measurements to calibrate his simple calorimeter, making his data more accurate.

Now it came time to analyze the data. Riska's Dad uses Minitab Statistical Software at work and suggested Jonathan try it. "Within forty minutes I was making my first graphs in Minitab," Riska says. "I was able to produce cool plots of my data that really made the results clear."



Riska's final presentation included a Minitab-generated histogram detailing each of his measurements, a plot that explained how he calibrated the calorimeter to ensure the accuracy of his data, and a bar chart (pictured above) that plainly shows the energy contents of each vegetable oil.

And Riska observed that analyzing his data with Minitab was one of the easier tasks of the entire project. "The most difficult part was keeping the burner lit," he says.

Minitab not only makes it easy to analyze data and improve quality in the business world, but the software makes it simple for students likes Riska to learn statistics and then apply those skills for real-world data analysis.

Riska produced Minitab graphs that helped him to quickly examine his data and form conclusions. All his measurements were clearly displayed on a Minitab-generated histogram and a bar chart that plainly showed the energy contents of each vegetable oil. "I really liked Minitab's ability to make 'right click' changes to every feature of a graph," he says.

As the graphs he created in Minitab made clear, Riska's data suggested that vegetable oils may well provide viable fuels for the future. "I found that most vegetable oils have about the same energy as petroleum diesel fuel—actually, about 15 percent less, but close enough to work well," he says. "Also, the vegetable oils burned much cleaner than petroleum diesel, which was very smelly and gave off a lot of soot."

Riska's final presentation included the Minitab graphs he used to analyze his data, as well as a Minitab plot that explained how he calibrated the calorimeter to ensure the accuracy of his data. The judges were impressed, and his project took a 1st place award at the science fair. "I believe I got the award because I was able to show very practical and meaningful results from such a simple homemade instrument," Riska says. "And I was able to present the results clearly, thanks to Minitab."

We can't guarantee that all students who use Minitab will win awards for their science projects—or solve the world's energy problems. But understanding statistics is easier when you use Minitab Statistical Software to make the concepts interesting and easy to apply.