



CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

Name(s) Remy S. Campbell	Project Number J0203
Project Title Gasification: The Future of Renewable Energy	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals With increasing concerns about clean energy sources, clean water supplies and degraded farmland soils, recycling biomass waste products through the process of gasification may be a perfect solution to all of these environmental concerns.</p> <p>Inspired by my family's search for a clean and economical way to dispose of the wood waste from their manufacturing business, my first science fair project in 2015 compared combustion temperatures in varying density hardwoods and softwoods. In 2016 my project compared the British Thermal Units released by different types of wood waste at a conventional biomass power plant. This year I explored gasification, which is a carbon-neutral process that creates syngas (synthesis gas) and biochar (carbon byproduct) from biomass waste products. Syngas can be converted into energy and biochar has many uses such as water filtration and soil amendment. I tested different types of biomass to compare the amount of biochar output from each product.</p> <p>Methods/Materials I worked with Greg Stangl, the owner of Phoenix Energy, a gasification plant in Merced, to test different biomass waste products to determine which produced the most biochar in weight per hour. I utilized 4 different types of biomass - peach pits, oak chips, soft wood waste (pallet stock), and walnut shells.</p> <p>Results After running my tests, I found that peach pits produced a larger amount of biochar than the other biomass materials. This was consistent with my hypothesis that the denser material would yield more biochar.</p> <p>Conclusions/Discussion Based on my research and experiment, I found the use of gasification to produce energy and valuable byproducts while recycling biomass waste products from agriculture and wood manufacturing industries may be a solution to many environmental concerns.</p>	
Summary Statement I tested different types of biomass materials at a .5 megawatt gasification plant to determine which material produced the most biochar by weight.	
Help Received I was assisted by Greg Stangl, owner, Todd Machado, plant supervisor and Milan Alex, engineer, of Phoenix Energy. I was also helped by my parents, Travis and Patti Campbell.	