



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

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Project Title The Optimization of Industrial Scale Biodiesel Production	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals As the world's supply of fossil fuels such as petroleum is both rapidly diminishing and detrimental to our atmosphere, there is a clear need for a fuel that is less harmful to our planet. Biodiesel has gained recognition as a possible alternative fuel for its safer effect on the environment. In order to make biodiesel economically and environmentally viable, we needed to find an efficient production method that conserves resources and minimizes waste.</p> <p>Conclusions/Discussion While the laboratory production of biodiesel is adequate for educational purposes, it is too energy-intensive for economic feasibility at a commercial level. Additionally, the standard transesterification process that converts oils to biodiesel produces various waste products, such as crude glycerol and wastewater. In order to model an industrial-scale production, we designed a four-tank tabletop biodiesel reactor. Using our model, we attempted to optimize biodiesel production and minimize wastes. To do so, we constructed the reactor with reused materials--such as the tanks, pipes, and separatory funnels--and four tanks instead of two in order to maximize fuel output per energy input. We also used a sawdust dry wash to filter the impurities out of the biodiesel without using excess water. In addition to the tanks, separatory funnels were placed within our design to allow us to conveniently separate the glycerol from the biodiesel. Furthermore, we constructed additional add-ons, such as the reflux column and methanol extraction, to maximize the resource efficiency of the refinery. All of these add-ons allowed us to economically and ecologically model the industrial scale production of biodiesel.</p>	
Summary Statement We have designed/manufactured a reactor/refinery that can economically and ecologically produce biodiesel feasibly on an industrial scale.	
Help Received Used lab equipment at the University of California San Diego under the supervision of Dr. Pomeroy.	