

EXECUTIVE SUMMARY

Today there is much talk about different sources for biofuel to replace the decreasing supply of fossil fuels. Algae seem very promising with its abundance across the globe and relatively simple growing conditions. Lipids can be extracted from this organism which is then converted to biofuel. Although biofuel production from algae is not economically viable at this stage, researchers are suggesting using the by-products of algae for supplemental and healthcare use. If true, this could justify the economics of obtaining fuel from algae by creating more markets from various algae products.

Cal Poly State University's Food Science and Nutrition Department has requested that a new and improved system used for producing algae called a Photo Bio Reactor (PBR) be built by the end of Spring 2013. A grant was offered to create a system that allows better monitoring capabilities, reduced safety hazards, increased volume throughput per square area, improved portability, and ultimately decreased operating costs.

Throughout the project, concepts and methodologies from Systems Engineering, Human Factors, Project management, and Process Improvement courses were utilized to design, build, and test the final product. Tools used throughout this 9-month-long project included creating an A3 Diagram and Ishikawa Diagrams for conducting root-cause analysis and incorporating Human Factors concepts throughout the design aspect of the PBR. Statistical Analysis was used to verify the effectiveness of different assembly methods of components. Time studies were utilized at the very end to verify setup costs were decreased yielding an overall savings in operation costs. Project Management was used throughout the way to schedule deadlines.

After much analysis of the system, The System decreased setup times from 12.0 hours per week to 2.0 hours per week. This yielded an overall labor cost reduction of \$4800.00 per year assuming a labor cost of \$10.00 per hour and 48 weeks in an academic year. A payback period of approximately 1.5 years for the new PBR was calculated. Volume throughput increased from 33.33 Liters per square meter to 184.0 Liters per square meter. Ergonomic traits such as safety risks, portability and measuring capabilities were also improved.