**Objective and Significance:** To produce a master design, inclusive of PID diagrams, costing, manufacturing, and shipping to build and install a wastewater treatment system designed from past research and commercial demonstration projects. Its importance lies in its commercial scale modular-based designed. The system fits niche opportunities where concentrated wastewater streams need to be treated on-site prior to discharge to pre-existing wastewater lines. The modular nature allows non-concrete permanent installations that can be tailored to specific wastewater flows and concentration of pollutants.

**Background:** Over a number of years, an up-flow anaerobic packed bed reactor was developed. Packed with biochar in various formulations, these reactors were verified at lab and demonstration scale to treat high and low strength wastewaters efficiently. These exercises served to verify lab generated results upon scale up to commercial size and to provide crucial insights for design revision, as well as experience for discussion with manufacturers as well as equipment selection.

From this work, PID diagrams have been constructed that have considered targeted organic loading rates and hydraulic retention times. These designs are accounting for modular fabrication of reactor units, dimensions of reactors and pipes, piping size, recycle lines, details of how to install and connect modules, utilities and electrical, materials of construction, sources of manufacturing, packing materials, shipping and installation issues, among others. Finally, cost estimates for fabrication, shipping, and installation were estimated and three-dimensional renderings were generated.

**Project Status/Results:** This project has produced a number of works that can be found on the following page. The PI is seeking industrial partners to apply the system. The PI is also extending the modeling efforts to execute a cost-benefit analyses comparing WWTPs producing potable water versus reusable non-potable water. Key metrics of success are both energy use and GHG emission per unit volume water produced. Outcomes will help determine the relative choice of producing non-potable versus potable water.

*Funding Source:* Office of Naval Research

*Contact:* Michael Cooney, mcooney@hawaii.edu

*Last Updated:* November 2020
**ADDITIONAL PROJECT RELATED LINKS**

**TECHNICAL REPORTS:**

**PAPERS AND PROCEEDINGS:**

**PRESENTATIONS:**
1. 2014, M.J. Cooney, *Low Energy High Rate Anaerobic – Aerobic Digestion (HRAAD) and Applications*, Presented at the ECS MA2014-02 Meeting, Cancun, Mexico, October 5-9, Abstract 2288.