Michigan Technological University
Mechanical Engineering-
Engineering Mechanics

John and Cathi Drake Endowed Chair in Mechanical Engineering 2024 Annual Report Summary

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Introduction

Thank you for creating and funding the John and Cathi Drake Endowed Professor in Mechanical Engineering. Every day, I'm fortunate to see your impact on our students. It's had a profound effect on my career, and for that, I'm grateful. Having the Drake name next to mine has made many things possible that would not have been possible without it.

Research

The research mix is the same as last year: Marine Renewables, Diesel Engine Aftertreatment, and Naval Technologies. Below is a detailed look at some of the results.

Naval Technologies

We continue to be funded by Advanced Research and Technology Corporation in two areas, supporting their U.S. Navy customer for (1) machinery vibration isolation and (2) condition-based maintenance for ship-deployed, 3D printing. The vibration isolation work is wrapping up while the condition-based maintenance area is growing. Funds from the John and Cathi Drake Endowed Professorship were used to bridge gaps caused by funding delays, significantly reducing student stress.

Marine Renewable Energy

The John and Cathi Drake Endowed Chair funds continue to support this area through promotion, safety, and research. The website we released last year connects us with external collaborators in ways we would never have otherwise. Safety is an area we constantly re-examine in terms of processes and equipment. This year, we added some new items, including a rescue board. Our goal is to have practices with zero injuries and never touch our specialized safety equipment; however, we must be prepared. In addition to supporting the website and safety equipment, most of this year's funds advanced MTU Wave research, including student support, upgrades to instrumentation, and high-performance computing. The Low-Friction WEC testbed, shown in Figure 1, is one instrumentation example that allows us to investigate the nonlinear response of large-motion wave energy converters.

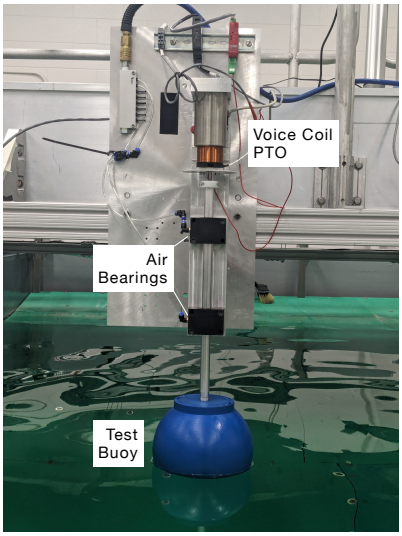

Figure 1. The Low-Friction WEC (LFW) testbed.

Diesel Engine Aftertreatment

The project aims to reduce the precious metal washcoat needed to remove NOx, CO, and particulate matter (PM) from off-highway diesel engine equipment. Our focus is the Diesel Oxidation Catalyzed Filter (DOCF), where exhaust enters the DOCF via its inlet channels and is forced through the porous walls, where it reacts with the catalyzed washcoat, eventually exiting through outlet channels. Drake Chair funds were used to purchase a high-performance computer, allowing us to calibrate the model to experimental data.