UNIVERSITY OF MINNESOTA
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High efficiency pump & motor utilizing partial stroke piston pressurization

Novel hydraulic valving system featuring high efficiency variable displacement hydraulic pumps, which can be combined with a variety of existing mechanical piston pumping and/or motoring systems, including radial piston pumps, axial piston pumps, and slider-crank pumps

Technology No. 2022-163

IP Status: Provisional Patent Application Filed

Applications

- Off-road equipment
- Water pumps
- Aerospace control valves
- Medical devices
- Soft robotics
- Industrial presses

Technology Overview

Hydraulic applications require varying the speed, torque or force of rotary and linear hydraulic actuators. Current available methods for achieving this are inefficiently, and often generate heat in the process. Thus, there is a critical need for alternative methods to improve the efficiency of variable displacement pumps. To address this issue, researchers at the University of Minnesota developed a method to produce very high efficiency variable displacement hydraulic pumps that are also simpler and more robust than current available designs. The novel design features pumps that are simple, fast, and repeatable, requiring only one control input, i.e., ON/OFF. In addition, this technology replaces the commonly used electronic controller with a simple hydro-mechanical controller, which reduces the cost and improves the reliability of the system.

Phase of Development

TRL: 3-4
A proof of concept prototype is available.

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- **Thomas Chase, PhD** Professor, Mechanical Engineering Department
- **Perry Li, PhD** Professor, Mechanical Engineering Department

References

Wadsley, Luke(2011), Optimal system solutions enabled by digital pumps, The 52nd National Conference on Fluid Power

Rannow, Michael B., Perry Y. Li, and Thomas R. Chase(2016), Discrete piston pump/motor using a mechanical rotary valve control mechanism, Proc. 8th Workshop Digit. Fluid Power