



# 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**

**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

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## Researchers

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**Technology ID**

2022-163

## Category

Engineering & Physical Sciences/Design Specifications  
Engineering & Physical Sciences/Instrumentation, Sensors & Controls  
Engineering & Physical Sciences/Robotics

## Learn more



## References

1. Wadsley, Luke(2011) , Optimal system solutions enabled by digital pumps, The 52nd National Conference on Fluid Power
2. 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