



High Efficiency Variable Displacement Pump Motor (20130212, Dr. Perry Li)

Technology No. 20130212

IP Status: Issued US Patent; **Application #:** 15/368,643

Axial Positon of Rotary Valve

A new discrete piston pump/motor yields an unprecedented combination of simplicity, efficiency and versatility. This new pump/motor, which can be used as a pump, motor, or combination of a pump and motor, varies displacement by changing the axial position of a single novel rotary valve. It improves efficiency by discrete piston displacement that applies high pressure to pistons for only a portion of their stroke and saves energy by using hydro-mechanical valves instead of the more typical electric valves or complex variable cam systems. Instead of varying the stroke length, individual pistons can be enabled and disabled by using two- or three-way valves.

Licensing Terms

MN-IP Try and Buy

Center for Compact and Efficient Fluid Power (CCEFP) Try and Buy - Available to [CCEFP member companies](#)

Try

- Trial period is up to 12 months
- Trial fee is \$0; In place of Try fee, a business plan for the Try period is required
- No US patent fees during Try period¹

Buy

- In place of a conversion fee, a post-Try period business plan is required²
- First \$1M cumulative sales are royalty-free
- Sublicense freely
- Royalty rate: 2% of Net Sales
- Patent(s) expenses paid by licensee
- Qualified startups: 5% of equity of startup is allocated to University at formation³
- Transfer fee for transferring license to a third party - \$25,000

Please contact us for detailed term sheet for a Try & Buy agreement as well as guidelines for Try¹ and post-Try period² business plans as well as qualified startups³

Discrete Piston Displacement

In general, variable displacement pump/motors are highly efficient. However, their efficiency decreases substantially at displacements below 50% due to friction and leakage losses that remain constant despite a reduction in displacement. Discrete piston displacement control minimizes these losses, but at a cost of increased energy/electricity. This new design improves the overall efficiency of a variable displacement pump/motor, especially at low displacements, by changing the way the displacement is varied.

BENEFITS AND FEATURES OF HIGH EFFICIENCY VARIABLE DISPLACEMENT PUMP MOTOR:

- Can be used as a pump, motor, or combination pump/motor
- Simple, fast and repeatable on/off control
- Only one control input needed
- Bidirectional and capable of freewheeling
- Robust—no electronic control required
- Reduces power consumption and enables energy recovery; continuous spinning valve needs no acceleration
- Potentially more compact and cost-effective
- Applications may include hydraulic pumps and hydraulic motors

Phase of Development Proof of concept

Researchers

Perry Y. Li, PhD

Professor, Department of Mechanical Engineering, Deputy Director, Center for Compact and Efficient Fluid Power

[External Link](http://www.me.umn.edu) (www.me.umn.edu)

Thomas Chase, PhD

Professor, Department of Mechanical Engineering

[External Link](http://www.me.umn.edu) (www.me.umn.edu)

<https://license.umn.edu/product/high-efficiency-variable-displacement-pump-motor>