



# 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

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- Trial period is up to 12 months
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## **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**

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