

Electro-Hydraulic Hybrid System KAWASAKI ECO SERVO



Commentary
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A Tiny System with the Power to Drive Industrial Machines

Hydraulic equipment is popularly used for driving various industrial machines, as it provides intense power using a small driving force, thus delivering "high output density". Previously, however, precise control on a par with electrically-driven equipment was impossible. To resolve this drawback and achieve a system that offers both the ease of control of electrically-powered equipment and the power of hydraulic products, Kawasaki developed an electro-hydraulic hybrid system, the KAWASAKI ECO SERVO.

Unlike a conventional hydraulic pump, which is driven by a conventional motor and discharges a fixed amount of oil, ECO SERVO controls the variable-speed motor for the hydraulic pump in a precise manner and optimizes the volume of oil discharged according to the type of operation the industrial machine is performing.

By better controlling the motor and employing a simplified hydraulic circuit, ECO SERVO achieves a 60 to 80% energy savings. A reduction in the number of control valves on the circuit also makes the configuration much simpler, resulting in reduced heating value and a more compact oil tank. The resulting ease of maintenance is an additional benefit of the system. In some cases, needed installation space was

reduced by two-thirds, and the volume of hydraulic oil used to one-twentieth that of conventional systems.

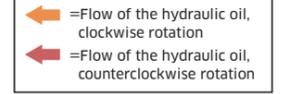
ECO SERVO made its debut in 1999. Because the concept that motors could be controlled was totally new at that time, ECO SERVO was a revolutionary invention. Since then, the system has evolved and Kawasaki now offers a wide range of models, including a high-pressure, large-displacement type that achieves a continuous rated pressure of 32 MPa and a maximum pump displacement of 500 cm³.

ECO SERVO is being utilized with a diverse range of industrial equipment, such as large press machines and injection molding machines. Not only that, but it is also being used in applications closer to our everyday lives, such as adjustment systems for variable pitch blades of ventilators installed in highway tunnels and for laundry dewatering presses.

Variable displacement pump

Displacement produced by the pump is switchable (large/small). By reducing the displacement during the high-pressure state, the torque can be lowered, which allows the capacity of the motor to be minimized.

This pump is a K3VL (closed-circuit) type.

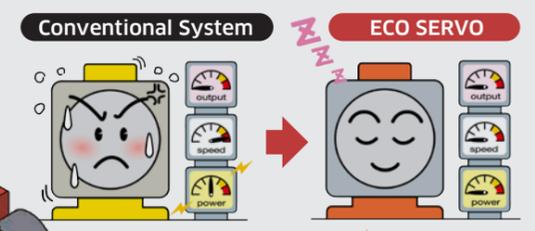


Suction valve plate

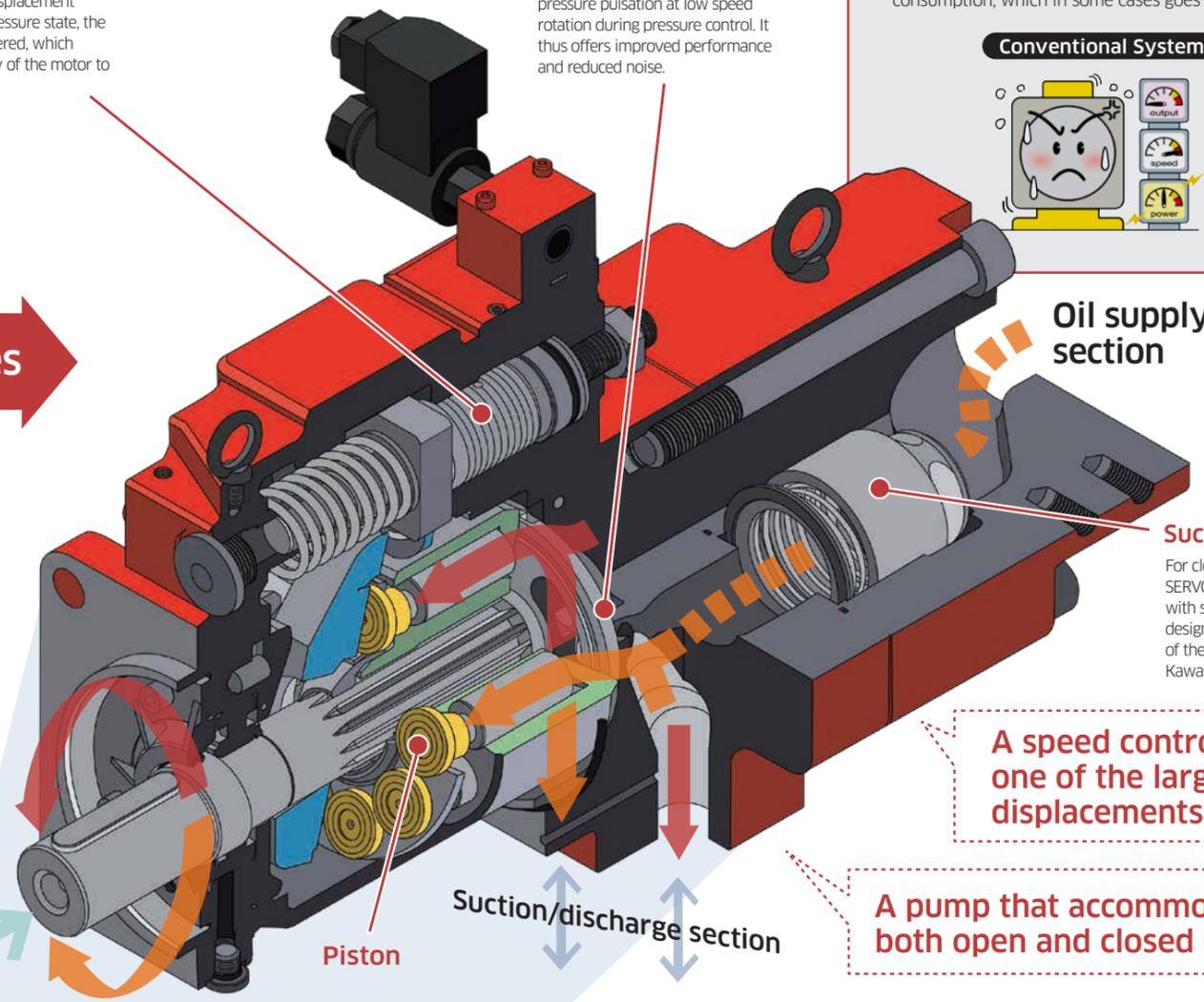
A highly-efficient suction valve plate that accommodates both clockwise and counterclockwise rotations significantly improves pressure pulsation at low speed rotation during pressure control. It thus offers improved performance and reduced noise.

Combining the best of hydraulic and electrical systems

ECO SERVO is a hydraulic hybrid system that renders high-density power along with the precise controllability of an electrically-driven system. In a conventional hydraulic system, the motor is constantly running and consuming power even when the machine is not in operation. ECO SERVO, on the other hand, controls the motor speed and drives the pumps only when they are needed, achieving a dramatic reduction in power consumption, which in some cases goes as high as 80%.



Power consumption reduced 60%~80%



Oil supply section

Suction valve
For closed-circuit configurations, ECO SERVO is equipped with a suction valve with superior self-priming capability, designed to compensate for the shortage of the flow. This function is unique to Kawasaki's system.

A speed control pump with one of the largest displacements in the world

A pump that accommodates both open and closed circuits

Motor

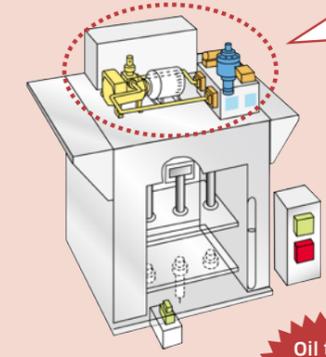
Piston

Suction/discharge section

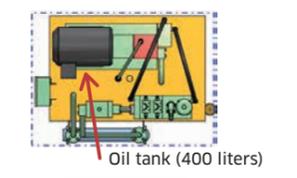
Accommodates CW/CCW rotations

Versatile enough that it is applicable even to existing systems

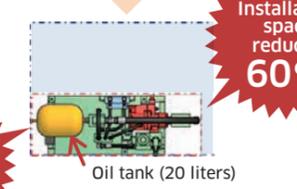
One of the most prominent features of ECO SERVO is its versatility, allowing customers to configure systems in a way that best suits their operational requirements. For example, an open-circuit configuration could be created, whereby the oil is deposited in the reservoir tank, once used, or a closed-circuit configuration, whereby the oil is returned to the hydraulic pump. Also, the system could employ a servo drive, which offers a high degree of controllability, or a cost-effective inverter drive. Kawasaki is ready to create tailor-made proposals that achieve optimal performance, by combining the best hydraulic circuit, sophisticated control technology, and compact unit construction.



Kawasaki Technology



Far more compact than conventional systems



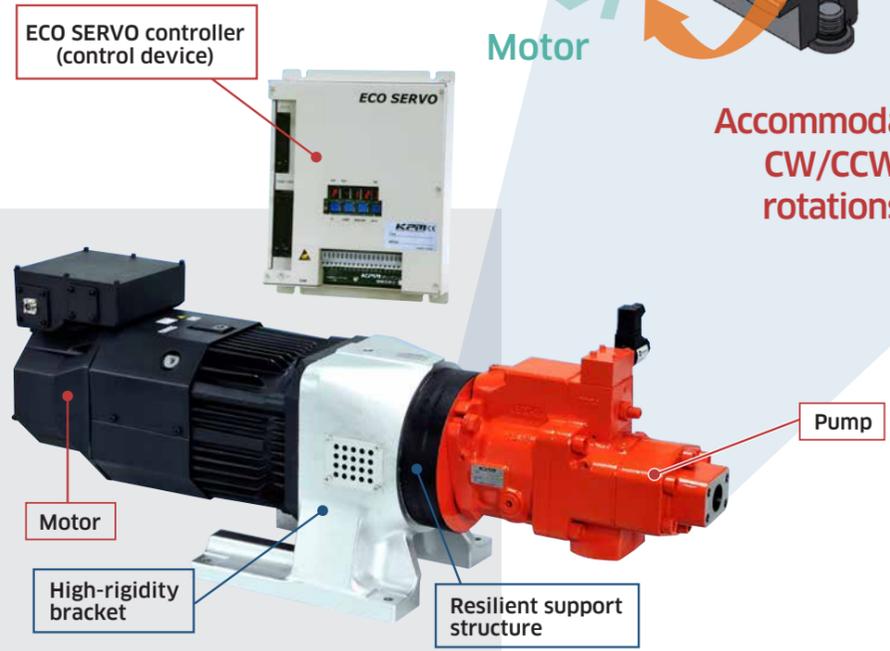
Oil tank capacity reduced 95%

Installation space reduced 60%

System

Pump + motor + control device Proprietary mechanism achieves a minimal-noise operation

This system is comprised of a pump, a motor, and a control device. The control device, with the help of sensors, offers highly precise, energy efficient, highly reactive, and significantly quieter operation. In addition to combining a hydraulic pump with electrical equipment, the system uses a high-rigidity bracket and a resilient support structure for the pump, which reduces vibrations transmitted from the pump. The low operational noise is attributable to the controlled motor speed, which may be kept as low as possible.



Motor

High-rigidity bracket

Resilient support structure

Pump