



FLOATING CUP

the new generation of hydrostatic pumps and motors



INNAS, an engineering and innovation company in the Netherlands, has successfully developed a completely new principle for hydrostatic machines: the floating cup. The arrival of the floating cup pumps and motors will not only solve the problems of current markets but will also create new markets and economic growth for the hydraulic industry.

The technology has been evaluated and tested by the industry and independent research institutes. Now that also the durability and robustness have been proven, the design is ready to be offered to the market for licensing. The solid patent position offers the opportunity for exclusivity.

WHAT THE MARKET IS WAITING FOR

Whereas everything in hydraulic systems seems to be fluidic and flexible, the hydraulic components and systems have not changed for decades. They have the same inefficiency, the same costs, and the same noise and pulsation levels as 20 or 30 years ago. But the world has changed and the market eagerly awaits any new development that will improve their machines. A first step is the introduction of new pumps and motors. Current pumps (including their control valves) create high losses, especially at reduced displacements and lower operating speeds and loads. The losses not only increase the fuel consumption, but also increase the cooler size and reduce the performance of drive trains and systems. Pump noise and pulsations are spread through the entire hydraulic system. Hydraulic motors need to be increased in size to overcome friction and torque variations at start-up and low operating speeds. In order to solve these issues, a new design principle is needed.



DIRECT CONVERSION

In the floating cup principle, the pistons are press fitted into a rotor. The pressure forces acting on the pistons are directly transferred to the rotor, without any linkage or moving joint. The result is a very efficient principle.



MULTI PISTON

Floating cup pumps and motors typically have 24 pistons, about three times as much as other axial piston machines. The high number of pistons fundamentally reduces noise, pulsations and torque variations.



BALANCED FORCES

Hydrostatic forces can result in high bearing loads. In the floating cup design, the bearing load is minimized by the mirrored design having two rings of pistons. In the axial direction each ring is hydrostatically balanced by the other.

EFFICIENT AND ROBUST HYDRAULIC MACHINES

The new floating cup design is not just based on one single invention. It combines several improvements and innovations and is the result of over 10 years of development. The well protected patent position offers a competitive advantage for suppliers and its clients. The technology has been thoroughly tested by independent research institutes and industries. Floating cup pumps and motors have an extremely high efficiency. The low friction of floating cup machines strongly enhances the dynamic control performance and improves the productivity of excavators, cranes and other machines. The robustness, durability and reliability have been proven in thousands of hours continuous testing. Cost analysis and application studies have been made, not only in existing markets, but also in new markets such as the automotive industry. Lower noise levels, a smooth shaft torque, and a strong reduction of the losses will open market opportunities for the hydraulic industry, that have not existed before.



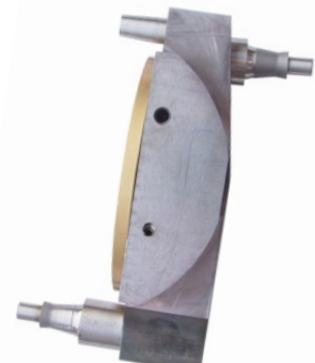
NEW HYDROSTATIC BEARING

A new hydrostatic bearing has been developed and patented. The new bearing strongly reduces friction and wear between the rotating barrels and the stationary port plates.



NEW CONTROL

A new design has been developed for damping the swash plate oscillation and control of the displacement. The new control strongly reduces the losses of pump and motor controls.










TWO ACTUATORS PER SWASH PLATE

By applying two actuator or control pistons, the deformation of the swash plate is reduced to a minimum. It also results in a strong reduction of the load on the swash plate bearings.



FLOATING CUP KEY FACTS

-  Floating cup pumps and motors are very efficient. The overall efficiency can be as high as to 97%. Due to the new pump control, the efficiency is also high at part load operating conditions. At start-up and break away the torque efficiency can be higher than 98%.
-  The large number of pistons reduces noise levels, and pressure and flow pulsations. It also results in an extremely smooth shaft torque. The large number of pistons also increases the number of barrel ports. The resulting increased flow area reduces the risk for cavitation and increases the operating speed at self priming conditions.
-  The floating cup can be applied for constant and variable displacement pumps and motors. The current designs allow heavy duty operation up to 500 bar.
-  Floating cup pumps and motors have a through drive, allowing in-line combinations of multiple machines.
-  Floating cup pumps and motors have a high power density. Many of the components have been designed for low cost automotive production technologies.
-  The durability, reliability and robustness have been proven.
-  The technology is protected by patents in the US, Europe and Asia.



INNAS is an independent, privately owned engineering and consultancy company, dedicated to innovation and creating new solutions for the industry. More information about Innas and the floating cup technology can be found at www.innas.com



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