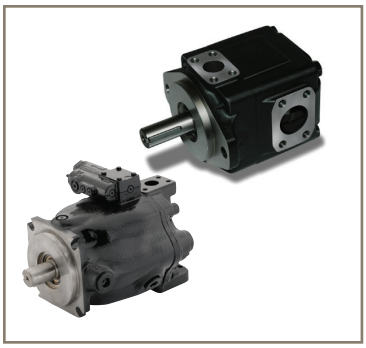
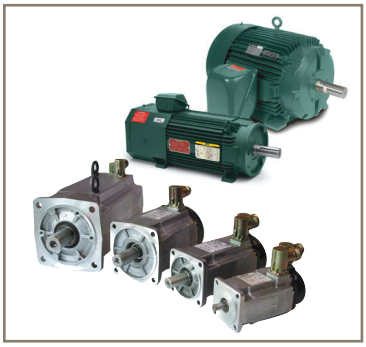
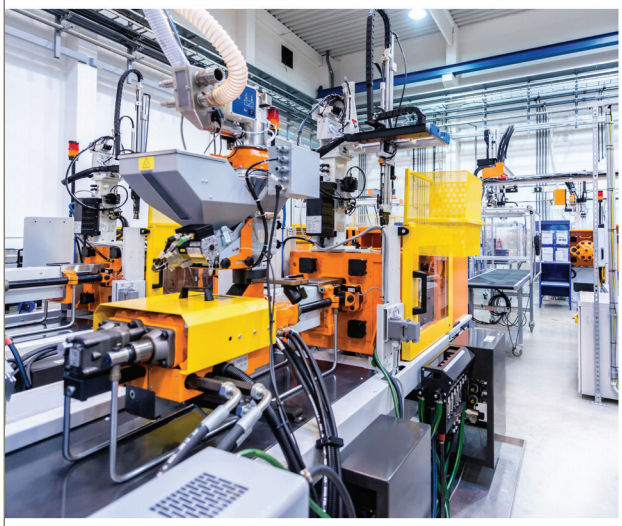
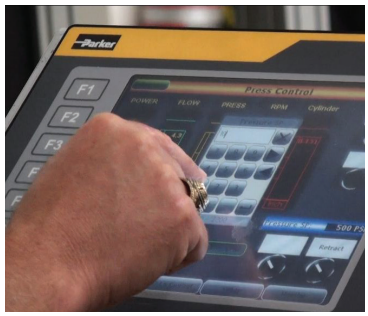






Drive Controlled Pumps

Energy Saving Solutions



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Parker Energy Saving Solution combines variable frequency drive and pump controlling algorithms

Hydraulic power has long been used in many industrial processes due to its inherent advantage to transmit a large amount of power via a relatively compact infrastructure of hoses or pipes. In many of these systems, the source of pressurized hydraulic fluid is the hydraulic power unit (HPU).

Traditionally in industrial machinery, the HPU's hydraulic pumps are driven by a fixed speed AC motor. In the majority of these systems the hydraulic flow and pressure exceeds the variable load demand. In order to match the supply to the variable load demand, flow and pressure regulating valves are used. These hydraulic devices regulate fluid power by dropping pressure across orifices, which results in energy losses in the form of heat. The heat is absorbed by the working hydraulic fluid, which needs to be removed in order to maintain acceptable system temperatures. By precisely matching an HPU's output, flow and pressure, to the variable load, these flow and regulating devices could be eliminated or simplified, resulting in the elimination of these energy losses. The end result is a simplified hydraulic system that will use smaller pumps, reservoir and heat exchangers.

With years of experience in hydraulics and motion control, Parker offers a solution that allows hydraulic powered machinery to operate more efficiently, quietly, and cooler. The key is to optimize the electric motor's operating speed and torque to produce only the pressure and flow required at any given point in the machine's operating cycle. This is accomplished by optimizing the hydraulic pump's mechanical and volumetric performance characteristics as it relates to speed and pressure to a programmable variable frequency drive (VFD). The combination VFD and pump controlling algorithms (or macros) is called a Drive Controlled Pump or DCP.

Installation, service and training

As well as delivering effective, efficient solutions adapted to customer specific needs, Parker ensures that the performance of our products continue to meet your expectations throughout their life.

Parker technical support provides a team of experienced application engineers providing comprehensive help and assistance with all aspects of maintaining the performance of your drive systems.

Parker also offers a whole host of on-site services and maintenance contracts, designed to ensure the maximum possible lifespan of an installation.

For maximum effectiveness, Parker can also train your teams to enable them to maintain and support customer installed products. Training programs and courses are run throughout the year at Parker training facilities and can be adapted to the specific requirements of your business or delivered on-site.

Local Support

Parker provides sales assistance and local technical support through a network of dedicated sales teams and authorized Hydraulics Technology Centers in North America. For contact information, please refer to the back cover of this document or visit www.parker.com and refer to the distributor locater.

Training unit simulates actual operating conditions and demonstrates DCP benefits

Reducing energy usage to save you money

Lower your energy consumption on hydraulics applications with Parker Drive Controlled Pump solutions

Centralized Hydraulic Power Units (HPU)

New and retrofit applications

An ideal DCP application, these pumps typically run in preset pressure setpoint for extended periods of time.

Fixed displacement pumps: DCP can lower pump flow when full flow is not needed to minimize excess flow over the relief valve, reducing noise, power usage and oil temperature.

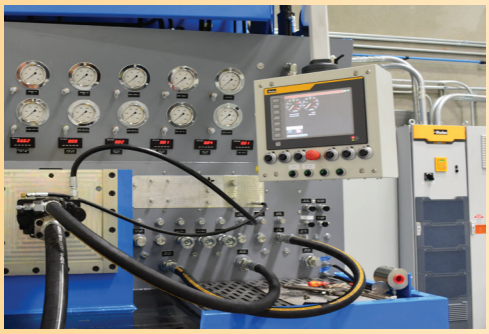
Variable displacement pumps: DCP can lower the pump speed during low flow and dead head periods to reduce noise, power consumption and oil temperature.

Many pumps use non-petroleum hydraulic fluids, which can make them prone to failure due to low lubrication and viscosity. DCP in conjunction with the right pump can extend life expectancy, reduce noise, and reduce maintenance and downtime costs associated with pump failures.

Hydraulic Pump Control

Utilizing the full speed range of pumps: Many Parker variable and fixed displacement pumps have speed ranges beyond the base speed of a typical 4 pole electric motor (1800 RPM). DCP technology can take advantage of these features and extend the electric motor's speed beyond 60 Hz (at reduced torque) to achieve extra flow at lower pressure when rapid moves are required. This feature allows for smaller pump sizes, and in some instances even the elimination of the low pressure pump of a Hi-Low HPU or the cylinder regen valve circuit. Simplifying a system in this fashion can add reliability since there are fewer moving parts.

Hydraulic Test Stands



Hydraulic repair centers are constantly challenged with the high energy costs associated with testing hydraulic pumps, cylinders, valves and motors at full pressure. The component test operation requires testing at full load to confirm the product performance to specifications. The full load test is accomplished by simulating full load and this is achieved by relieving flow over flow reducing orifices. Instead of using a conventional proportional relief valve, pumps and hydraulic motors can be loaded down with a fixed displacement pump/motor DCP. The DCP system operates the electric motor in a generator mode to capture the load down energy in form of direct current, which is directed to the prime mover DCP drive for reuse. In some tests up to 85% of the supplied energy is recovered, noise is lowered and oil is not sheared or heated.

Case Studies

Die Casting Machine

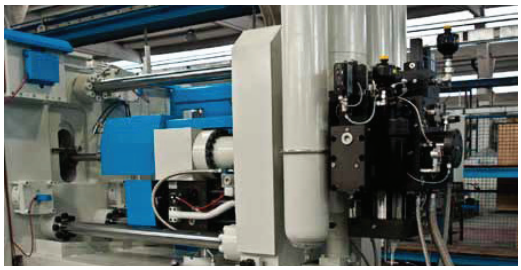
Flow and pressure requirements vary widely on the closing and injection stages of the cycle. A DCP offers a substantial gain in efficiency. The injection stage saves energy in large piston accumulators that are pre-loaded with gas cylinders and reloaded throughout the entire cycle at a pressure of around 160 bar. In contrast, the closing stage requires large volume flow for movement but at low pressure. High pressures are only required for locking or for auxiliary movements such as for ejectors and core pullers.

Advantages with vanes

The machines are equipped with a combination of various pumps. As the commonly used water glycol vaporizes quicker than mineral oil, robust fixed displacement pumps are preferably employed as double pumps. To minimize hydraulic losses in the fluid, vane pumps are best suited in this regard.

Flow on demand

Pumps for loading accumulators and supplying auxiliary movements with high pressure should supply the exact flow required. In this case, multiple small vane pumps are ideally applied. Pumps with a high flow rate for the supply of the closing motion must be able to circulate to the tank with minimal no-load losses. Pumps are each combined so that the smallest electric motor possible can be selected as a drive for sequential usage.



Benefits at a glance

- Optimum adjustment to various requirements
- Multiple pumps and pump combinations possible
- Smaller motor size

Presses

For presses, the focus is frequently on minimizing cycle times. The power density of the hydraulic drive can be increased significantly with a DCP. An example: For inserting and removing the workpiece, presses require a no-load stroke that should be as quick as possible. With a DCP, one can over-speed the motor with the AC drive's extended frequency, to the pump's permitted limit and therefore supply considerably more flow with the same sized pump. As the no-load stroke is generally driven with small to medium pressure, no increased torque is necessary despite the higher speed, so a larger motor is not required.

Reduce energy consumption

Another option for presses is a DCP with a combination of a large vane pump and a small variable axial piston pump. With this version, the high flow rate for the no-load stroke is generated by both pumps with the high press pressure generated exclusively by the piston pump. During pressing, the vane pump feeds with low idling capacity to the tank, either directly or via the cooler. The axial piston pump lowers displacement during the pressing process based on requirements to maintain pressure and thus reduces energy consumption.

Benefits at a glance

- Numerous application possibilities
- More efficient use of the available drive
- Use of pump combinations possible

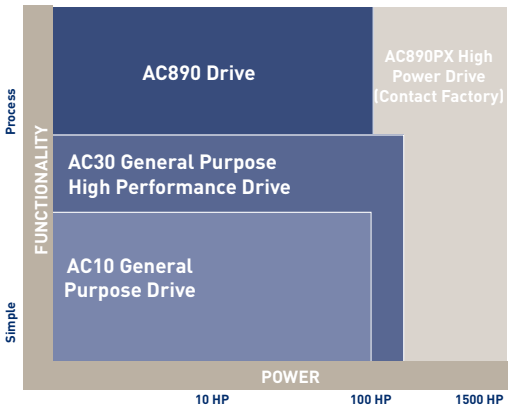
Drive Controlled Pump Solutions

Drives for Induction and PMAC Motors

The **AC10** series of drives is easy to set up and operate for less complex applications, but still provides a high level of performance and reliability. AC10 is available with an IP66/NEMA 4X indoor enclosure for the ultimate resistance to moisture and dust.

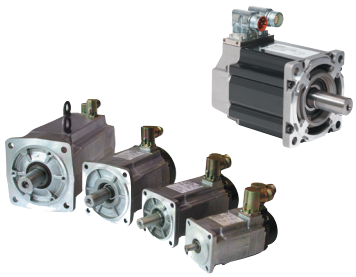
The **AC30** range of variable speed drives provide simple speed control of three phase AC induction or PMAC motors through 300HP (75kW). Thanks to sensorless flux vector technology, the AC30 provides exceptional control at low speeds, accurate speed regulation of variable loads, and high starting torque. With a range of pre-programmed macros, the AC30 is quick to setup and easy to operate. Standard conformal coating provides environmental protection. Optional encoder feedback provides enhanced speed accuracy.

The **AC890** and **AC890PX** range of drives takes control of AC induction or PMAC servo motors through 1500 HP to the next level. Offering three modes of operation, V/F, open loop vector, and closed loop vector, the AC890 provides flexibility for multiple applications. AC890 offers I/O comparable to a PLC, with function block programmability and pre-programmed macros to boot.



AC Drives Product Range Overview

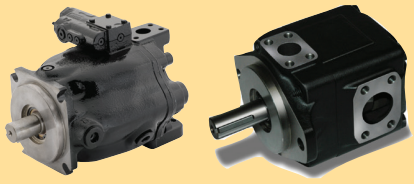
The above drives can be paired with our line of **energy efficient AC induction motors**. Styles include laminated steel frame for high performance and cast iron frame for extreme environments. Also available are **Parker MPP and NX series PMAC** servo motors, compact and powerful, and more efficient than induction motors of similar power rating. For hazardous environments, specify the EX series.



Hydraulic Pumps

Fixed Displacement Pumps
Parker is proud to introduce the T7 Vane series ePump, a selection of vane pumps dedicated to DCP technology applications. The unique technology of these hydraulic pumps allows a wide range of operating speeds and pressures to take the maximum advantage of modern power transmissions. When combined with asynchronous or synchronous electric motors and driven with Parker Drives, they operate in the most efficient and reliable ways, allowing maximum energy savings and quiet operation. In addition Parker offers the F-11 and F-12 bent axis radial piston pumps, which are very quiet and efficient. They make an excellent choice for open and closed loop pumping applications, due to their wide speed range and ability to work in all four pressure and flow quadrants of operation.

Variable Displacement Pumps
Parker manufactures a range of variable displacement pumps which are also compatible with DCP Technology. The PD series, an axial piston pump, is quiet and efficient, but can benefit from DCP Technology when the application requires long deadhead period. In addition, adding electronic displacement and pressure control to the PD series pumps results in the maximum performance to produce hydraulic power at peak efficiency.



Drive Controlled Pump Solutions

DCP for Fixed Displacement Hydraulic Pumps

Fixed displacement pumps are simple, inexpensive and very efficient, when operated at fixed speed however, any mismatch between supply and demand drastically reduces their overall efficiency. Hydraulic power unit efficiency approaches 0% during the pressure holding or deadhead periods of the machine cycle. By varying the speed of these pumps in proportion to flow and pressure demand, system efficiency can be optimized to match or surpass variable speed pumps operating at fixed speed. External and internal gear pumps as well as bent axis and vane pumps are the most suited to operate with DCP controls. Among which vane and bent axis pumps are most efficient with a wide speed range. DCP control modes for fixed displacement pumps include:

Application	Description
Q (flow) Control	This macro controls the flow of pump as the demand changes, and can eliminate use of flow control valves and proportional valves in many applications.
P (pressure) Control	This macro controls the pump's pressure, mimicking the variable displacement pump's compensated pressure and flow characteristics. Electronic power limiting and load sense can be added to this macro.
PQ Control	This macro operates the pump in Q mode with P-Limit mimicking a variable displacement pump with electronic swash plate control. This mode is suited for position, speed, and force control.
ACU - Accumulator Control	This macro is an addition to other macros, allowing for hydraulic accumulator charging control. This macro shuts down the hydraulic pump/motor of the HPU for further energy reduction when accumulator is fully charged. This eliminates the need for a pump unloading circuit.
EXS - Extended Speed Control	This macro takes advantage of the AC induction motor's tapered torque range (constant power operation), when the electric motor operates beyond its base speed. This macro will allow the system to generate additional flow at reduced pressure, enhancing the pump's High/Low function.

DCP for Variable Displacement Hydraulic Pumps

Variable displacement pumps are complex and they are typically controlled by a variety of hydraulically operated pilot controls. They are very efficient at their rated flow and pressure range, however during low flow and deadhead conditions they significantly lose their ability to operate efficiently. DCP control modes for variable displacement pumps include:

Application	Description
ESV - Energy Saver Control	For variable displacement pumps. By simply lowering the hydraulically controlled pump's rotational speed during deadhead periods, the pump's efficiency can be improved. This macro senses when the pump is deadheading and it reduces the pump's speed to its most efficient range. The result is energy savings and reduced heat generation. The macro can also detect changes in flow demand and increases the pump speed to meet the application's variable load demands.
PQV Control	PQ control in conjunction with hydraulic pump's electronic pressure and displacement control. This macro is considered to be the best combination of variable displacement pump and electric motor speed control to produce hydraulic power at peak efficiency.
2QE Control	A two quadrant pump is any variable displacement hydraulic pump that can operate in over the center conditions. This energy recovery macro allows for energy recovery in the form of electric energy when the two quadrant pump operates over the center. When the pump goes over center, power flow reverses the direction and the DCP can capture that energy in the form of electric power., which can go back into the building's electric mains or it can be shared with other operating electric motors.

DCP for Closed Loop Transmissions

DCP adds additional dimensions to closed loop hydrostatic transmissions. DCP regulates operation of fixed displacement pump/motors by using the fixed displacement macros in all four quadrants. DCP Q Control macro can be used to improve and extend the flow regulation of some variable displacement hydrostatic pumps.

Packaged Solutions and Systems

The Systems Approach...

While the Parker Drives are known for being user friendly and intuitive, some customers prefer the convenience of more support in the design and implementation of their systems. For this reason, Parker and its network of authorized distributors offer a complete in-house design and build service, enabling users to focus on their core competencies.

Custom hydraulic power unit systems are available at Parker Hydraulic Technology Centers (HTCs), or through Parker's Industrial Systems Business Unit. Both options offer customized hydraulic solutions including custom hydraulic power units, custom valve manifolds, servo hydraulic actuators and complete turnkey motion control packages from controller to actuator to meet customer needs. They can assist with fabricating, equipment design, prototyping, system modeling and the integration of electronic and hydraulic systems.

Custom hydraulic power unit options:

- Custom reservoirs – optional materials, JIC, L-shaped, stacked, and vertical
- Heating, cooling, kidney loops, return and pressure filtration
- Portable HPUs
- AC, DC, and diesel powered
- Variable frequency drive control of hydraulic systems (DCP Technology)
- Custom panels
- Surface finish and coating options with certifications compliance capabilities to meet the most demanding requirements

System installation and commissioning:

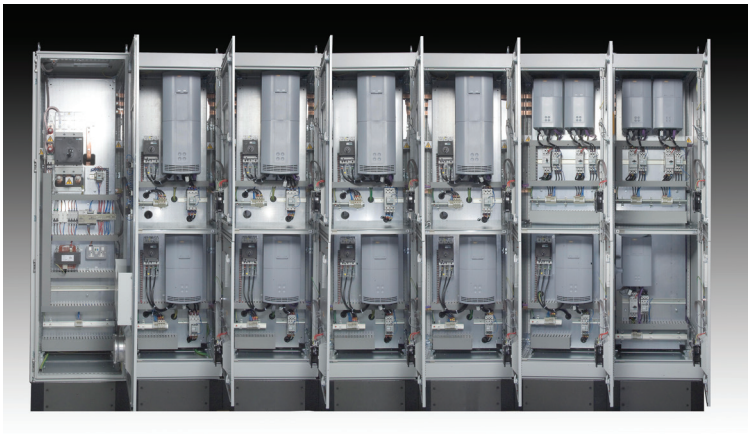
- On site HPU installation
- Start up
- System flushing

Packaged Drives

Sometimes an application calls for more than just a catalog product. For example, some peripheral components may be required to complete the installation, like a contactor, a set of fuses, or an industrial grade enclosure with operator devices. In cases like this, to keep in-house costs and labor to a minimum, a "packaged drive" may be the best choice.

Engineered Systems

For more complex applications where multiple motors are to be controlled in a coordinated manner, an engineered system may be appropriate. Systems options can include PLC's, operator interface, and programming for a sequence of operations. Advanced communications and data acquisition capabilities can also be integrated. Parker offers commissioning, startup, and training services with all systems to insure a trouble-free installation and peak performance thereafter.



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