



What are the benefits to using a Variable Frequency Drive?



A Variable Frequency Drive (VFD)

controls the speed of the motor by converting the sine wave (60 Hz) signal input to a modifiable pulse waveform to be sent to the motor. The modified wave is sent at different frequencies along the range of 0-60 Hz depending upon the system demand, and the motor interprets the modified waveform as a sine wave at the given frequency. The result is a change in motor speed based upon the output frequency of the drive. Think of it as cruise control that adjusts speed based upon feedback from the speedometer. In the case of variable speed pumping the speedometer is the system pressure or flow sensor.

Energy Savings

A typical pump and motor are sized for a rating point (flow vs head) at 60 Hz (full speed). In a constant speed pumping system the changes in system demand changes the rating point at which the pump operates on its curve. Movement to the right of the curve increases the power draw (HP) of the pump. Movement to the left of the curve decrease efficiency. Both have a negative impact on pump and motor performance. Given feedback from system sensors and utilizing the pump affinity laws the VFD varies the speed of the pump and motor to meet demand. At operation below 60 Hz (full speed) the HP draw of a centrifugal pump is reduced significantly. The chart below shows that a 16% reduction in speed results in a 42% reduction in horsepower! This reduced power draw equates to reduced operating costs for your customer's equipment.

		Multipliers for Flow, Head, HP		
Hertz	RPM	Flow	Head	Power
60	3450	1	1	1
50	2875	0.83	0.69	0.58
40	2300	0.67	0.44	0.30
30	1725	0.50	0.25	0.125

System and Motor Protections Increase Uptime and Product Life

The VFD is better equipped than across the line starters to help protect your pump, motor, and system components from both electrical and hydraulic extremes. This protection prolongs the life of equipment and increases uptime for the end user. By measuring the electrical input

to the VFD and controlling the electrical output to the motor a VFD can also monitor and react to upset electrical conditions such as surges and low voltage conditions. This allows for protection from:

- Overcurrent
- Short circuit
- Pump or motor binding
- Ground fault
- Motor overtemp

Pressure or flow feedback is also coming from the system into the drive which extends your protections to the pump and system. This allows extended protection from:

- Low suction pressure
- Dry pump operation
- Overpressure of system
- System shutdown for broken pipes
- Empty supply tank / over filling discharge tank

Integrated Diagnostics Allow Easy Troubleshooting

On-board diagnostics help a user understand when there is an issue with the system. Either through flashing LED error codes or through fault text on the keypad the VFD helps protect the system by alarming and controlling your pump during an upset condition such as low water or a broken pipe. A basic drive generally uses a series of red flashes from an integral LED to alert user to a specific system or electrical fault. More advanced controllers use on screen text to describe the fault. Relays on the VFD can be programmed to turn on a light or alarm when the VFD is in a fault condition for remote monitoring of the system. In all cases it is important to review your IOM to determine possible causes of the fault, and follow instructions on how to remedy. These faults are generally as a result of the VFD protecting the pump, motor or the VFD.

AQUAVAR® IPC



Designed to provide variable frequency pumping control of speed, pressure, flow and level over a wide range of submersible and above ground applications. IPC contains intelligence to make it CentriPro's most versatile VFD.

Electrical Supply and HP range

- 1Ø Input 208-230 volt 1.5 - 30 HP
- 3Ø Input 208-230 volt 1.5 - 60 HP
- 3Ø Input 380-460 volt 1.5 - 125 HP
- 3Ø Input 575 volt 1.5 - 125 HP

Wall mounted with fan cooling indoor and outdoor enclosures

Enclosure ratings meet IP20 Open, UL TYPE 1, UL TYPE12 UL TYPE 3R and UL TYPE 4X. Native outdoor enclosures offer a more compact drive enclosure that does not have to be mounted into a separate large panel outdoor enclosure. Use reactors or filters as accessories for submersible applications. Keypad interface gives full text view of parameters and system status.

Duplex variable speed pumping control with auto lead/lag and alternate

IPC has built in Duplex, synchronous pumping capability. No need for a separate controller to stage lag pump, or alternate between lead and lag. Use the CentriPro Start-Up Genie to easily program for Duplex, single pump.

Multiple inputs and outputs for system control

- 2 voltage or current analog inputs can be used for pressure and level sensors, or flow meters. IPC has the ability to subtract signals for differential between two sensors
- 6 digital inputs (2 can be digital outputs) allow for start/stop control, dual setpoint selection and pump protections using exterior pressure or float switches.
- 1 programmable analog output and 2 programmable relay outputs allow for system and VFD information to be transmitted to external control center, alarm lights/horns, or accessory equipment (including full speed lag pumps)
- Communicate via Modbus® RTU and BacNET MSTP protocols included in standard drive - Options for 6 other protocols to cover a wide range of control systems



The proprietary CentriPro Start-Up Genie guides you through quick and easy commissioning. Take advantage of the complete Genie with 10 sections to configure applications with pump protections, I/O options, and Duplex operation, or for the more straightforward applications just set your motor information, operation mode and "Autoset" the rest of the parameters.

AQUAVAR SPD™

SPD boasts a quick, simple start-up procedure designed to be mounted and running in 30 minutes.

Programming is completed using dip switches and push buttons for constant pressure applications, so there are no parameter menus to scroll through.

Electrical Supply and HP range

- 1Ø Input 208-230 volt 2 - 15 HP
- 3Ø Input 208-230 volt 5 - 30 HP
- 3Ø Input 460 volt 5 - 30 HP



Dual Phase Input for 208-230V

The same drive can be used for either three phase or single phase input by de-rating the drive. This allows for consolidation of inventory. Regardless of single phase or three phase input the output to motor will be three phase.

Wall mounted with fan cooling and outdoor enclosure

NEMA 3R Outdoor rated enclosure with an operating temperature range of -22° F to 122° F. 3R rating eliminates the need for a separate cover panel Required by drives with NEMA 1 standard enclosures.

For Surface motor and Submersible motor applications

SPD is available with and without output filter depending upon your application.

- **With Filter** for Submersible applications with long wire runs. **Filter Pack** available with output filter rated to 1000 feet of motor lead.

Remote Monitoring External monitors may be connected to the drive for monitoring pump running speed (4-20 mA output based on speed), pump on, and system fault. Utilizing the analog output and two relays.

Full Diagnostics Full range of pump protection features such as bound pump or motor shut down, low water or loss of prime shut down.

AQUAVAR® CPC



Specifically designed for single or multipump systems in any submersible or above ground application. CPC start up Wizard set the bar for VFD start up assistance for water boosting applications.

Electrical Supply and HP range

1Ø Input 208-230 volt 1 - 50 HP

3Ø Input 208-230 volt 1 - 100 HP

3Ø Input 380-460 volt 3 - 550 HP

3Ø Input 575 volt 2 - 150 HP

Wall mounted with fan cooling indoor enclosure

NEMA 1 standard design (indoor), with NEMA 12 enclosure available. CPC provides two different indoor enclosures depending upon the mounting location (control room vs local to the pump). Keypad interface gives full text view of parameters and system status.

Control of complex pumping systems - Easy Start-Up

experience levels. Multi-Pump control for up to 4 pumps is achieved without the expense of additional PLC's or controls. Multi -Pump control uses automatic lead-lag with alternation with a simple serial connection through the RS-485 bus.

Multiple inputs and outputs for system control

- 2 voltage or current analog inputs can be used for pressure sensors
- 6 digital inputs allow for start/stop control, dual setpoint selection, and pump protections using exterior pressure or float switches.
- 1 programmable analog output & 3 programmable relay outputs allow for system and VFD information to be transmitted to external control center, alarm lights/ horns, or accessory equipment (including full speed lag pumps)
- Communicate via Modbus® RTU protocol included in standard drive

HYDROVAR®



Designed for centrifugal pump systems requiring constant pressure, flow control or differential pressure in commercial and municipal applications. Hydrovar is a compact, simple solution with a broad range of pump control.

Electrical Supply and HP range

1Ø Input 208/230 volt 2 - 5 HP

3Ø Input 208/230 volt 2 - 15 HP

3Ø Input 460 volt 2 - 30 HP

Motor Mounted with Indoor Enclosure (NEMA 4)

Motor - 3 phase, TEFC, 208 - 230V or 460V, 0- 60 HZ, Class F insulation, NEMA design A or B. Hydrovar easily attaches to a TEFC motor with mounting clips, and uses the airflow from the TEFC motor fan for cooling.

Control of complex pumping systems - Plug and Play Start-Up

Hydrovar can be mounted either vertically or horizontally. Motor mounted Hydrovar allows for a smaller pump/ motor/drive footprint in both single pump applications and booster pump skids of up to 8 pumps!



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For technical information on
CentriPro Drives and Controls please visit:
<http://goulds.com/pump-controllers/>