

## PRECISION VFD CONTROLLER

Mercer Controls, Inc. of Edna, Texas has refined the use of a process controller for maintaining constant pressure or flow within water and sewage pumping systems. A “PID” controller module is mated with a Variable Frequency Drive (VFD) unit to provide fine control of the pumping function.

Normal VFD units supplied by Mercer Controls are the Altivar 61 and 71 modules as manufactured by Square D. The Altivar 71 is the constant-torque unit, and as such has much greater reserve capacity than the Altivar 61. Both these drive families are fully rated to high ambient temperatures, so long as there is adequate air exchange supplying the drive unit. For example, the Altivar 61 rated at 100-horsepower will deliver full output of 160 amperes while in service at an ambient temperature of 50 degrees Celsius, and 80 per cent of full output at an ambient temperature of 60 degrees Celsius.

Although these VFD units incorporate their own PID controller, we find that a separate controller provides much better control in the water and wastewater industry. Most VFD units are so limited in the span of their PID protocols as to make them less than useful. An outboard PID unit such as the Red Lion PCU family is much more versatile, and it can be modified without disabling the VFD. We sometimes use a small PLC, but with the PLC, the flexibility of field changes is lost without a laptop in the hands of a skilled programmer. In addition, in the future, if the VFD requires replacement, only general programming of the VFD is required in order to replace the full functionality of the control scheme if a separate PID controller is used. The operating protocols are all safely stored in the PID unit.

If the source of the process variable is a pressure signal, we prefer to use a field-configurable unit such as the Foxboro IGP10 rather than a “throw-away” device which usually has no ability for repositioning its zero setting. The standard Foxboro unit does not require a HART programming device, and therefore it can be reconfigured in the field as needed without specialized equipment.

The Red Lion PCU controller is just as capable if the process variable is a flow rate. Some past installations required the delivery of fixed, limited amounts of water from a water system into a storage vessel.

The “Precision VFD Controller” is normally provided with a single screwdriver adjustment for setting target pressure or flow. The operating personnel therefore do not need to know the sequence of pressing buttons on a control panel in order to make adjustments.

For exterior installations outside of a cooled room, we can mount the VFD and PID controller with the remaining switchgear in an enclosure with fans. We are always prepared to provide the necessary amount of filtered air exchange required for outside operation. Alternatively, an enclosure air conditioner can be provided. An enclosure air conditioner assures that the life of the VFD will not be shortened by operation at elevated temperatures. But failure of the air conditioner will prevent the VFD from operating. The BTU/hr requirement of the VFD will exceed what can be provided by an enclosure air conditioner if the VFD exceeds 75 horsepower,

based on the limited size of enclosure air conditioners available.

On all installations furnished by Mercer Controls, there is a greater than normal provision for lightning and surge protection. We add some specialized protection of our own. We utilize an isolation contactor between the circuit breaker and the input of the VFD unit.

There is also a lower amount of harmonic energy throwback from the Square D units than with many other brands. We have the harmonic calculation software from Square D which allows us to verify whether IEEE Standard 519 will be challenged in any single application. Some units will require an input reactor or a power factor capacitor in order to minimize harmonic energy throwback.

Output cabling must be reviewed with any VFD installation. Briefly, with any cable installation beyond 100 feet, protection against high amounts of reflective surge energy must be blocked. There are several ways to accomplish the protection. In rare occasions, there is a need to totally prevent radiated energy from leaving the wires delivering power from the VFD to the motor. Shielded cable may be used, but it may not be any more effective than the use of a metallic conduit, and in either case, an output filter is much more effective than shielded cable. The use of shielded cable is very much a problem with small horsepower VFD units below 50 horsepower. Units may be easily damaged with the presence of output capacitance.

Mercer Controls has been in the business of renting and selling VFD units for many years. Rental VFD units are in stock as well as rental Precision VFD Controllers. We have many satisfied clients, and references can be provided.

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