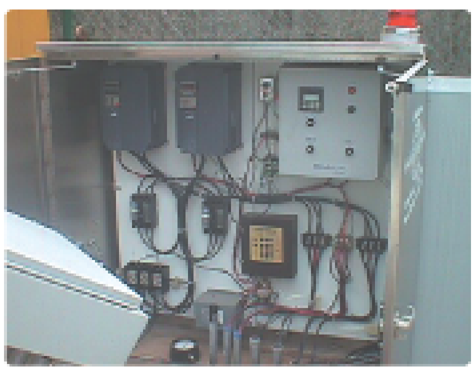
Products in Action

Pumps

Using Variable Frequency Drives for Sewage Lift Stations

High in the Pocono Mountains of Eastern Pennsylvania, the small town of Tobyhanna was in need of a high head, small flow sewage lift pump. Actual design conditions were 263 gpm at 191 ft. of TDH. These conditions are not uncommon for mountainous areas with high static lift, or for stations with very long force mains and high dynamic head losses.



Panels at Tobyhanna lift station.

Most sewage pumps are designed to pass 3-in. solids and have difficulty meeting such conditions without either grossly over-sizing the motors or risking motor overload on a closely selected motor.

Site Specific Design, a pump station and low-pressure sewer system equipment specialist (the local EBARA International Corporation Standard Pump Division's representative) designed a unique solution to the hydraulic dilemma. The proposed design for the lift station included a set of 40 hp (EBARA model 100DLFU6302) submersible cast iron sewage pumps and a Bihlertech duplex "Auto-Trim" level controller with torque vector controlled variable frequency drive (VFD). Using the VFD's Torque Vector control feature, the pumps are driven at speeds where the maximum torque, hence the horsepower, can be "fixed," and the motor can never operate beyond its power limit.

The continuous pressure sensing Auto-Trim level controller is capable of sensing not just the level in the wet-well, but also the change in level. Additionally, and through some clever programming, the Auto-Trim varies the speed to keep up with the inflow to the pump station, while operating the pump at the minimum power requirement and retaining full flow capability when necessary for peak flows.

Because the primary design criteria were motor size and prevention of overload, the full operating energy savings available at the higher-than-design flow were offset against the cost of larger motors and electrical equipment.

The key advantages to the programmable Bihlertech Torque Vector drive package include:

- Energy savings by operating the pump at its most efficient design condition, even with variable conditions;
- Prevention of motor overload;
- Energy cost and utility demand charge savings by eliminating the current surge at pump start for contactor started pumps;
- Operation of the pump closest to its BEP, where bearing loads and shaft deflection are minimized, leading to longer seal and bearing life;
- Operation of the pump at reduced speeds, which also contributes to overall pump life;
- Capability of operating less expensive and more reliable three phase motors, using single phase incoming power;
- Automatic reverse start to ensure clog free initial starting, particularly useful on grinder type pumps;
- Full motor torque capability, even at low speeds, to ensure clog free pumping, again especially useful for driving the cutting mechanism on grinder pumps;
- Prevention of "cross-talk" between the drives, which do emit local EMFs, and electronic level sensing devices;
- Ethernet communication capabilities, for remote alarms as well as for troubleshooting;
- Updated AT2K (Auto-Trim 2000) system connects level controller to drives through RS435 ports, greatly simplifying wiring of the internal panel;
- Updated AT2K system features touch screen, with icon driven programming and operation.

For additional information, contact EBARA International Corp. at 803-327-5005 or write in 1185 on this issue's Reader Service Card.