



Engine Driven Generators

Refer to generator manufacturers recommendations and locked rotor amps listed on page 13 (single-phase) and pages 16-17 (three-phase).

Refer to Page 33

Use of Check Valves

It is recommended that one or more check valves always be used in submersible pump installations. If the pump does not have a built in check valve, a line check valve should be installed in the discharge line within 7.5 metres of the pump and below the draw down level of the water supply. For deeper settings it is recommended that line check valves be installed per the manufacturer's recommendations.

Swing type check valves are not acceptable and should never be used with submersible motors/pumps. Swing type check valves have a slower reaction time which can cause water hammer (see below). Internal pump check valves or spring loaded check valves close quickly and help eliminate water hammer.

Check valves are used to hold pressure in the system when the pump stops. They also prevent backspin, water hammer and upthrust. Any of these can lead to early pump or motor failure.

NOTE: Only positive sealing check valves should be used in submersible installations. Although drilling the check valves or using drain-back check valves may prevent back spinning, they create upthrust and water hammer problems.

A. **Backspin** - With no check valve or failed check valve, the water in the drop pipe and the water in the system can flow down the discharge pipe when the motor stops. This can cause the pump to rotate in

a reverse direction. If the pump is started while this is happening, a heavy strain may be placed across the pump motor assembly. It can also cause excessive thrust bearing wear because the motor is not turning fast enough to ensure an adequate film of water between the thrust bearing and the thrust shoes.

- B. **Upthrust** - With no check valve, or with a leaking check valve, the unit starts under a zero head condition. This causes an uplifting or upthrust on the impeller-shaft assembly in the pump. This movement carries across the pump-motor coupling and creates an upthrust condition in the motor. Repeated upthrust can cause premature failure of both the pump and the motor.
- C. **Water Hammer** - If the lowest check valve is more than 9.0 metres above the standing water level, or a lower check valve leaks and the check valve above holds, a partial vacuum is created in the discharge piping. On the next pump start, water moving at very high velocity fills the void and strikes the closed check valve and the stationary water in the pipe above it, causing a hydraulic shock.

This shock can split pipes, break joints and damage the pump and/or motor. Water hammer is an easily detected noise. When discovered, the system should be shut down and the pump installer contacted to correct the problem.