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Fire Pump Maintenance Program

Fire and booster pumps are costly items, but the cost of a pump *not* operating during a fire could be financially devastating. A pump may sit for years and never be needed, but how well the pump is maintained over these years may make all the difference in the world. If a testing and maintenance program has been instituted and followed religiously, then the chances are that the pump will operate properly on that fateful day when a fire breaks out.

If, however, the pump has not been kept in top running condition, it may simply not work. In many cases, when the pump doesn't operate it is like having no fire protection at all. A fire pump may be the most important piece of equipment at a facility – if the pump doesn't work when and how it is supposed to, the facility may be reduced to ashes.

Constant care and maintenance of fire and booster pumps are required to keep them in proper working condition. A regular maintenance schedule should be established and followed by plant personnel. Although the specific schedule should be tailored to the individual plant, below is a list of essential items that should be included in all programs.

Testing of the following items should be done at least ***once per week:***

- Automatically start the fire pump or booster pump in the same manner in which it would start in a fire situation. That is, simulate the call for pump operations as if a fire had really started. In most cases the pump starts on a reduction in system pressure. When a sprinkler head operates, the pressure in the fire system is reduced and the pump is called upon to operate. To test this type of automatic start, a test line is opened to reduce the system pressure. This is probably the most important test as it gets right down to the bottom line – will the pump work when it is called on to do the job?

- Testing the drivers:

  a) With internal combustion engine-driven pumps, weekly run the engine at rated speed for at least 30 minutes with the pump discharging water through the circulation relief valve to an open drain. It takes at least 20 minutes to fully warm up the engine. The running time allows the engine to be lubricated and also allows problems to surface. A quick two-minute test might hide a problem in the pump or engine's condition.

  b) With electric-motor drive, operation of the starting devices should be checked, and the pump should be run monthly for at least 5 to 10 minutes.

- Verify that pressure relief valves, if present, are operating properly. In most cases that means there is no water being discharged through them. These valves are installed on the system to prevent pressure from exceeding that which the system is capable of withstanding. With the relief valve set at pump shutoff pressure plus suction pressure, the valve would operate only if the pump exceeded its shutoff pressure. In some cases the relief valve is set below the pump shutoff plus suction pressures because this sum exceeds the pressure capabilities of the system.

- Verify waterflow to packing in the stuffing box (a slight leakage of water usually indicates that lubrication provided by water is adequate) and check the pump temperature. Feel the pump casing and bearings for overheating and signs of excess friction.

- Check water supplies. Suction tanks should be overflowed or checked visually. In cold weather, heat to the supply lines and suction source should be assured. For open bodies of water, check the suction intake for possible obstructions. Verify that drought or dry conditions have not significantly reduced the water supply. On public supply booster pumps, all valves on the suction line should be checked as part of the weekly valve inspection.

- Check pump room temperature. It should be a minimum of 40ºF (4ºC). For internal combustion engines the recommended minimum temperature is 70ºF (21ºC). (If the room temperature is maintained between 40ºF and 70ºF, then an engine jacket water heater should be provided for internal combustion engines.)

- For diesel engines, make sure the engine is clean and dry and check:

  a) Fuel tank levels. Maintain them at least three-quarters full.

  b) The quality and quantity of the crankcase oil, and renew it if it has become fouled or has lost viscosity.

  c) That the battery charger and batteries are in good condition and operating properly.

  d) Cleanliness of the strainer in the water cooling system. Clean it when necessary. Note temperature of the cooling system.

  e) Proper operation of engine instruments (rpm, oil pressure, temperature amps).

  f) Test the operation of the speed governor.

On a ***monthly*** basis:

- Check the specific gravity of the battery electrolyte.

On a ***semi-annual*** schedule:

- Examine the oil filter and insert a new filter cartridge if necessary.

On an annual basis, a water flow test should be conducted and should include:

- All tests listed above in the weekly, monthly and semi-annual tests.

- Water flow measurements and suction and discharge pressure readings should be recorded for several different flow volumes. These data can be plotted on a rating chart and the pump performance can be evaluated and followed over the years. The performance of any given test can be compared with the pump acceptance test, other yearly tests, and the pump manufacturer's characteristic pump curve. Deterioration in pump performance can be readily identified, and problems can be corrected before the pump becomes incapacitated.

Normally, there will be no more than a slight difference between pump tests. A reduction in capacity of up to ten percent over the life of the pump due to normal wear is tolerable.

Flow and pressure readings should be taken for at least three well-spaced points on the pump curve (at churn or no-flow, near the pump rating, and at 150 percent flow point). If required flows cannot be met, or if there is more than a slightly noticeable change in performance, the problem should be ascertained and remedied without delay.

Water should be flowed through a hydrant or hose header, or through a Factory Mutual Research Corporation Approved flow meter discharging to a drain or impounded water supply.

- Check the rate at which water is discharged from the heat exchanger and exhaust manifold. Compare the cooling water discharge rate with previous observations and the recommended rate. Usually all that is needed for this test is a bucket and a watch with a second hand.

Fire/Booster Pump Churn Tests

Pump manufacturer	Year installed
Manufacturer's model No.	GPM/PSI rating

	Correct Settings						
Date tested							
By whom							
Motor running time (min.)							
Suction pressure							
Discharge pressure							
Engine instrument readings:							
RPM							
Oil pressure							
Temperature							
Amps							
Condition of water supplies							
Pump room temperature							
Fuel tank level							
Condition of crankcase oil							
Condition of battery charger							
Cooling system temperature							
Cooling system strainer condition							
Operation of speed governor							
Temperature and tightness of stuffing box glands							
Comments:							