



COLD WEATHER OPERATIONS

EXTEND THE LIFE OF YOUR PUMP WITH TIPS FROM THE PROS.

Cold Weather Operations

If you are looking at this article, we can only assume you are one of the many individuals who are seeking information on whether they should run a "dry" or a "wet" pump during cold weather operations.

This article covers the Waterous recommendation along with several other "pros" and "cons" related to running the pump "dry" or "wet" in cold weather environments.

The Waterous' recommendation for cold weather operation of Waterous Fire Pumps is simple: "If the pump is exposed to freezing temperatures, drain all water from pump, lines and accessories". Is it really that simple? Read on...

LET'S BEGIN WITH DRY PUMP OPERATIONS:

If the fire department elects to run a "dry" pump during cold weather conditions, it is necessary to drain the pump completely. To properly drain the main cavity of the fire pump, the tank to pump and tank fill valves need to be closed and the main pump drain opened and remain opened until the water is drained out.

If the tank to pump and/or tank fill valve(s) are leaking, the pump will not remain drained. Leaving the drain valve open while the apparatus is parked will keep the pump dry, but will also allow the booster tank to drain down, requiring someone to periodically monitor the water level in the booster tank between uses. In addition, leaving the drain valve in the open position while it is subjected to freezing conditions may cause it to freeze in the open position, which could render the pump inoperable.

DRY PUMP MISCONCEPTIONS:

A "dry pump" is not necessarily dry. Discharge and intake (compound) gauges, gauge lines, individual drain lines, pressure lines and other components with small orifices will have a tendency to retain water. Unless they are disconnected and allowed to drain, they may retain water, resulting in freezing and subsequent damage to the components. Since disconnecting and draining of the lines is labor intensive, this practice is seldom if ever done. This promotes the need for pump house heaters and under body pump house enclosures when operating in climates where freezing conditions are a concern.

DRY PUMP "PROS" and "CONS"

PROS:

- Minimal chance the pump is going to freeze.
- Opportunity to ensure that the tank to pump and tank fill valves are sealing properly.
- Ideal for situations where extended response distances to and from the incident and/or increased speeds (highways, freeways, etc.) are obtained. With no water in the main cavity of the fire pump and its accessories little if any damage will occur.

CONS:

- Requires periodic opening of the main pump drain to ensure the main pump cavity isn't partially full of water. A partially full pump will freeze rapidly and will initially cause damage to the impeller shrouds and vanes. This damage is unable to be seen until the fire pump requires disassembly. Other signs of damage may be vibrations and/or metallic sounds coming from the pump, water externally leaking from the main fire pump body and/or body halves, water leaking from components attached to the fire pump or a failed annual pump service test.
- If the main pump drain is left open and the tank to pump and/or tank fill valve(s) are leaking, the apparatus booster tank may be low or empty. This condition requires constant monitoring and filling of the booster tank. Also, an open drain can freeze in the open position.
- If the pump is left "dry" for extended durations without the fire pump being operated, an excessive buildup of calcium and/or rust deposits will accumulate inside the main fire pump cavity. The amount of buildup is further compounded by the water quality for the department. Once the fire pump is engaged and water is circulated the excessive build up is broken loose and may create problems with the discharge relief valve system (plugged strainer screen), scoring to the discharge valve seats, damage to the individual discharge valve drains, damage and scoring to the priming valve and other accessories that utilize O-rings and/or seals on mating surfaces. It is important to operate the fire pump periodically to minimize the chances of this condition occurring.
- Priming of the fire pump may be required.

WET PUMP OPERATIONS:

Since moving water doesn't freeze the fire pump should be engaged and water circulated during cold weather conditions.

If circulating water through the apparatus booster tank, the tank to pump valve should be fully open and the tank fill valve partially (approximately 1/8 to 1/4 from closed) open to allow adequate circulation. The apparatus operator should continually monitor the pump temperature by feeling the intake fitting with their bare hand to ensure the pump isn't overheating. If the pump is equipped with the Waterous "Overheat Protection Manager" (OPM) the apparatus operator should monitor the OPM warning light on the pump operator's panel. If the warning light is illuminated the water temperature within the fire pump and apparatus booster tank is overheating and the pump must be disengaged or fresh water must be introduced into the pump through an intake to avoid severe damage to the fire pump and its components.

If operating from an outside water source, the apparatus operator should ensure that some water is being circulated through a discharge or tank fill valve to minimize chances of the pump overheating.

WET PUMP "PROS" AND "CONS"

PROS:

- Priming the fire pump before use may not be necessary.
- The mechanical seals or packing remain in water keeping them pliable and minimize the chances of calcium build up since they are not subjected to atmospheric conditions.
- There is a reduced chance of dry run conditions on the mechanical seals and/or packing mating surfaces during initial pump start up.

CONS:

- The chances of damage to the fire pump and its components increase if the pump is not engaged and water isn't properly circulated when exposed to freezing conditions.
- The chances of the fire pump and its components freezing increases with excessive response distances and increased road speeds. Not to forget that the colder it is, the faster things will freeze!
- The potential for repair costs increases when running a "wet" pump due to the potential for damage to the fire pump and its accessories as a result of freeze up.

HOW FAST WILL A MIDSHIP FIRE PUMP FREEZE WHEN KEPT "WET"?

The following is a sad (but true) story!

An apparatus with a "wet" pump is kept in a station at seventy (70) degrees Fahrenheit. The apparatus has all of the cold weather accessories (pump house heater, under body pump house enclosure, etc.) on it.

The apparatus responds to an early morning medical incident one (1) mile away, traveling at an average speed of thirty (30) miles per hour with a temperature of two (2) degrees Fahrenheit. Upon arrival at the incident the apparatus operator forgets to engage the fire pump and the apparatus sits at an idle for fifty-five (55) minutes. After returning to the apparatus the apparatus operator realizes his error and returns the apparatus to the station where it is allowed to thaw out.

After one hour of (1) hour of thawing in the fire station and a subsequent shift change, the new crew responds to another medical incident meeting the same response distance and elements as the first incident.

Upon arrival at the incident scene the apparatus operator attempts to engage the fire pump and the apparatus engine stalls. After further examination he finds that the water in the main pump cavity was frozen solid. This condition resulted in the impellers being frozen in position.

This apparatus was immediately pulled out of service and a NFPA service test performed to determine if there was damage to the fire pump and its accessories.

THE STATEMENT "MORE WATER IN THE PUMP BODY WILL TAKE MORE TIME TO FREEZE"

We hear comments from both sides on how long water takes to freeze and that a small amount of water will freeze solid faster than a large amount of water does at the same temperature.

On one hand a small amount of water that has frozen solid will create a small amount of damage. On the other hand, a large amount of water that has frozen solid will create a large amount of damage (it just takes a little longer).

The fact remains that damage can occur throughout the freezing process and is magnified by the amount contained within the pump and its components!

WHAT ABOUT THE HEATING SYSTEM WITHIN THE FIRE STATION?

Another sad but true story!

What happens to a "wet" pump when the heating system in the fire station fails?

A department in Minnesota experienced this condition when a two way radio was keyed in a squad car that was leaving the apron of a fire station. The radio frequency caused a north facing apparatus bay door to open. Since the squad car left the facility, the overhead door remained opened for approximately two hours with a temperature of minus twenty (-20) degrees Fahrenheit and a north wind gusting over twenty (20) miles per hour.

The wind gusts were enough to blow out the pilot lights on the heating system in the apparatus bay. A firefighter happened to stop in the station on his way to work and encountered water flowing from several broken sprinkler pipes and heads in the apparatus bay. There was water flowing from a restroom just off the apparatus bay in which the toilets and their tanks froze and burst, adding to the situation.

The four fire apparatus within the station experienced the most damage. The fire pumps were frozen solid. It took a propane heater pointed towards the intake fittings on both sides of the apparatus for

several hours to thaw the fire pumps. The flanges and mounting brackets on virtually every discharge valve were cracked and/or broken off. Several of the discharge valves required complete replacement. All of the priming valves, master drain valves and independent discharge valves on all four apparatus required complete replacement. The discharge and intake relief valves and the pilot valves required complete replacement also. The lone aerial apparatus in the station required a new hydraulic cooler since it was flooded with water at the time the incident occurred. Three of the four apparatus required new impeller shaft assemblies due to the distortion of the impellers and wear rings.

DRAINING OF THE INDIVIDUAL DISCHARGE VALVE DRAINS:

The individual discharge valve drains (provided by the apparatus builder) on the Waterous discharge valves are located after or downstream from the discharge valve ball and seal. It is recommended that after each use each individual discharge valve drain is opened and remain opened until the water has drained out completely. Individual discharge valve drains will freeze early on since they are down stream of the discharge valve and not exposed to water circulation that occurs within the main fire pump when it is in operation.

NEVER open a main pump drain or discharge valve drain when under pressure. Damage to the O-rings and/or seals may occur resulting in a leaking drain valve.

PUMP HOUSE HEATERS:

The pump house is defined as the enclosed area surrounding the fire pump and its accessories.

Pump house heaters are an auxiliary component consisting of a heater core(s) and fan(s). The heaters are usually written into the apparatus specifications and are commonly found on apparatus in cold weather climates.

The main purpose of the pump house heater is to provide limited freeze protection to the gauges, gauge lines and other small components that are located in the upper area of the pump house (the area above the fire pump). Pump house heaters do little to protect the fire pump or components that are located beneath the fire pump.

UNDER BODY PUMP HOUSE ENCLOSURES:

Under body pump house enclosures (belly pans, heat shields, etc.) are made of metal. The purpose of the enclosure is to close off the underside of the fire pump and pump house. For the enclosure to be effective, the apparatus exhaust system (usually the muffler) runs through the enclosure.

When properly installed, the enclosure traps heat from the apparatus exhaust system in the pump house, providing increased protection to the fire pump and its accessories when exposed to freezing conditions.

Since heat rises, the lower and upper areas of the pump house see protection. The harder the apparatus engine is working the more heat is generated.

OTHER COLD WEATHER SCENE SAFETY TIPS:

Measures should be taken to ensure that slippery conditions that result from water that is discharged around the apparatus and around the incident scene be treated with sand and/or salt for better footing.

When performing drafting operations, the access routes to and from the incident scene to the fill site should also be treated with sand and/or salt for safer driving conditions.