



USE OF AUTOMATION IN SPRINKLERS BASED FIRE HYDRANT SYSTEM

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Abstract: Electric generators are essential for the safety of homes, factories, shelters, schools, hospitals and other places. The power plant basically consists of water tanks (underground or above ground), pumps (primary fire pumps, supply stations). pump and D.G), Class C MS pipe rings, hydrant release valves, hose reels, hoses, nozzle studs, hose boxes and sprinklers around the building and at the building terminals. In the circular line, there is a hydrant valve in the hydrant column. The system can work in manual or automatic mode. In training mode, we have to start and stop the system every time, but in automatic mode, when the system starts, it will automatically control the water pressure.

Keywords: Hose reel, Short Branch, Hydrant Landing Valve, Sprinkler, Hose Box, and Jockey Pump etc.

Introduction:

A) Description of components used in sprinklers based fire hydrant system:

1. Water tank: Water is needed to extinguish a fire. For this system we required different capacity of water tank/reservoir as per NBC code. Concrete based tanks are available in some places and steel and plastic water tanks are available in some places. Fig.1 shows the water tank, the water tank can be designed in different capacity according to the client's requirements.



Fig.1 Water storage tank

2. Pump set:

Basically three types of pumps are used in this system.

a) **Main Fire Pump (end suction)** A fire pump is part of the water supply for fire fighting equipment and can be powered by electricity, diesel or steam. The pump suction is either connected to a public underground water pipe or to a static water source (e.g.

reservoir, reservoir, lake). The pump provides higher pressure water flow to the sprinkler system risers and hose rack pipes.



Fig. 2 Main fire pump

Fig 2. Showing the main fire pump, It also available in different RPM, LPM and Head capacity as per client requirement.

b)Jockey Pump:

The purpose of the booster pump is to maintain pressure in the fire piping system so that the larger fire pump does not have to run to compensate for minor leaks in the water circuit. A jockey pump package consists of a pump, a motor and a controller. There are two types of pumps available for riding pump applications. A preferred embodiment is a centrifugal pump. The second type is the positive displacement turbine pump. The turbine pump operates with very tight tolerances. If these tolerances wear down by several thousandths of an inch, the ability to generate sufficient pressure is lost. A centrifugal pump is not dependent on tight tolerances and will only swirl at the highest pressure point on the curve.

Whether a centrifugal or turbine-type regenerative pump is used, it should be sized for low flow and high enough head to achieve the maximum head of the fire pump. The flow must not exceed the flow capacity of a single sprinkler head, otherwise the pump will not be able to maintain pressure when the head opens to extinguish the fire. The goal is to overwhelm the jockey pump so that the pressure in the system continues to drop, resulting in the fire pump starting. The auxiliary pump should be able to generate the same pressure as the fire pump at no flow. It is best to avoid a jockey pump that can generate much more as it could flirt with the possibility of exceeding the system pressure rating. Jockey pumps play a very important role in the trouble-free operation of the fire protection system

Demand Drives:

- Residential and commercial complexes
- All core industries and others
- Industrial Ware Houses
- Hotels
- Railway station and airport complexes
- Ports



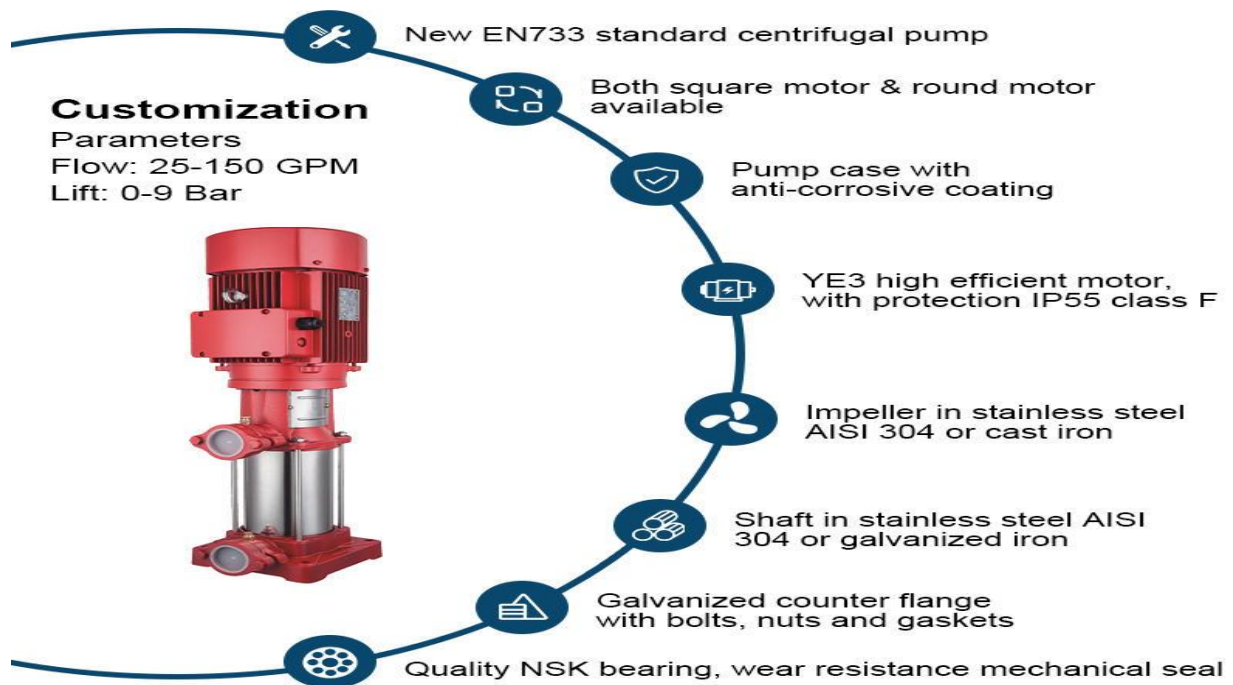


Fig. 3 jockey pump

Fig. 3 showing the jockey pump, the capacity of this pump depends upon the capacity of main fire pump.

c). Diesel generator pump: Diesel fire pumps, also known as booster pumps, are used to increase water pressure from sources that do not provide sufficient water pressure for sprinklers to operate to specification. The fire pump can be connected to a municipal water supply, reservoir or tank/pond used for firefighting. Diesel engine fire hydrant pumps work just like other diesel engines. The DG SET, which starts with UPS power and uses diesel to run the main pump, has a large storage fuel tank as backup.



Fig. 4 Diesel Generator pump

The main diesel pumps are designed to start automatically when the fire water pipeline pressure drops to a certain level. The pumps will be stopped manually only. Fig. 4 showing the Diesel generator pumps.

3.M.S Pipe: M.S stands for milled steel. M.S pipe available in three classes i) Class-A ii) Class-B iii) Class-C. Basically in fire hydrant system Class-C M.S pipe is used because thickness of Class-C is higher than Class-a and B. So the weight of a length(Six meter) of Class-C is higher than Class –A and B. Class-C M.S pipe is expensive than class –A & B.



Fig. 5 M.S class-C pipe

4. Hydrant Landing Valve: The landing valve is considered an essential part of the hose system, acting as a manual shut-off valve that gives you full control of your firefighting system. To activate the flow of water to the extinguishing system, simply turn the landing valve handle counter-clockwise. Water pressure is important for tall buildings. These landing valves are reducing type designed to provide a range of outlet pressure (4 bar -12 bar). Landing valves are classified as high pressure and are suitable for use at a nominal inlet pressure of up to 20 bar. Landing valves are something used for firefighting and are located on risers in buildings. These are usually located in stairwells, allowing easy access for firefighters



Fig.6 fire Hydrant landing Valve

5. Hose Reel: A fire hose reel is part of a firefighter's first attack equipment, which means it can be an extremely important tool to prevent a fire from getting out of control. The fire hose reel is designed to be used as a quick response method by anyone from the general public to fight fires in their early stages. Fire hose reels are suitable for Class A fires which include paper, textiles, wood, most plastics and rubber. don't use a fire hose reel on electrical fires - remember water conducts electricity so use a fire hose reel on an electrical fire. could lead to electrocution! Fire Hose Reels are easy to use and provide a virtually unlimited supply of water, as they are connected to the mains water supply. The hose reel typically extends for approximately 30 meters and is made from specific non-kinking material which ensures simple operation.



Fig:7 Fire Hose Reel

Fire Hose Reels are permanently connected to a water supply and consist of a main turn on/off valve, a hose guide, and a control nozzle. The control nozzle attached to the end of the hose enables the operator to control the direction and flow of water to the fire.

6. Hose Pipe: A fire hose (or firehouse) is a high-pressure hose that delivers water or another flame retardant (such as foam) to a fire to extinguish it. Outside, it connects to either a fire hydrant, fire hydrant or portable fire pump. Internally, it can permanently connect to the riser pipe or building water system.



Fig:8 Fire Hose Pipe.

Fig :8 showing fire hose pie . Normally fire hose pipe available in 15 MTR and 30 MTR length.

7.Short Branch Pipe nozzles: Short branch nozzles are the main fire extinguishing equipment when it comes to extinguishing fire by spraying water, foam or chemical streams. Nozzles are made of various metals that are usually connected to a hose at one end..



Fig:9 Short Branch pipe Nozzles

Fig: 9 showing the short branch with nozzles. The main function of short branch pipe is increase the velocity and pressure of water to extinguish the fire.

8. Hose Box: Hose boxes are used to store firefighting equipment such as fire hoses, fire extinguishers, fire hose reels and branch pipes, etc. These cabinets provide the best protection against environmental damage to fire equipment. Hose box available in two sizes a) single door hose box b) double door hose box. The hose pipe and branch are stored inside the hose box. In the single-door hose box,

one short branch pipe and one hose pipe are placed inside. In the two-door hose box, one short branch and two hose pipes are placed



inside..

Single Door Hose Box

Double door hose box

Fig. 10 Hose Boxes

9. Sprinkler: Sprinklers are connected by a network of pipes, usually hidden behind walls and ceilings. A high initial fire temperature (135° to 165°F) will cause the sprinkler to activate. Only this high heat will trigger the sprinkler to flow water (a fire sprinkler cannot activate a smoke or smoke alarm). And only the sprinkler closest to the fire will work, which runs water directly on the flames in the area of the fire. This swift action controls or extinguishes the flames



Fig. 11 Sprinkler

B).Working of Sprinkler based Hydrant system. In his system, M.S class C pipes are laid throughout the building so that with the help of additional fire equipment, there should be water in every place of the building. This M.S pipe is also connected to the pump

station. In the Pump room there is a main fire pump, a Jockey pump and a D.G available with a fire panel. A water supply tank is also available near the pump station. The water tank is connected to the main fire pump. Initially the main fire pump was charged by M.S. Pipe at 6kg/cm².

The whole Fire Fighting System work on the Following Logic-

maintain pressure in the fire water line while the fire is being extinguished. Generally, sprinklers in a certain area are interrupted at a distance of three meters from each other. When the fire temperature reaches 135° to 165°F, the glass sprinkler table, which is normally filled with mercury, will crack. Then water is discharged from the M.S pipe and the sprinkler deflector up to a diameter of 1.5 meters. The water flows until the fire goes out or nobody stops.

A sprinkler system may not activate (ie, one or more sprinkler heads in operation) during a fire for one of the following reasons:

- 1.the heat released by the fire was not sufficient to activate the sprinkler system (regardless of whether a sprinkler system was present in the area of origin), or
- 2.the fire was large enough to activate the sprinkler system, but a partial sprinkler system was installed and was not present in the area of fire origin, or
3. the fire was large enough to activate the sprinkler system and one or more sprinklers were present but not functioning. In the event of a fire, other fire safety equipment such as a hose reel, a hose pipe, a short branch are also used to flow water under pressure to another part of the building.

C) Conclusion: Sometime it happens no man power is available to operate the pump room so pump room is operated in automatic and manual mode. In automatic mode, pressure switch send the signal to fire panel that pressure of water goes below the threshold level than fire panel automatically start the jockey pump to maintain the proper water pressure in M.S line. Once the pressure is maintained Jockey pump automatically stop. In case of power failure, Diesel engine automatically starts and maintains the pressure in M.S pipe line. In case of fire ,suppose sprinkler hydrant , hose reel are used to extinguish the fire in this case main fire pump is used to maintain the pressure in M.S pipe line.

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