May 7, 2024

To: All Interested Parties
From: Dennis R. Miller

Re: FireDos Foam/Water Proportioning System
Vs.
Conventional Balanced Pressure Pump Systems

Forward Note: This paper was written with the reader having some knowledge in water-based foam applications and the differences in the variety of foam proportioning equipment choices. We will touch on the hi-lights of advantages, but the reader should seek out opinions, knowledge, from reputable fire systems engineers for gray areas on specific sites that may need further consideration.

Having started my career in fire protection five decades ago, I have striven to identify improvements in my fire systems knowledge and passing this information on to my clients. The positive experiences that have presented themselves to me in the past, have always reflected in the projects that have been successfully completed. This is what I enjoyed about my career. To be versatile in researching and discovering other paths and finding solid alternate solutions for a particular risk. There are many factors in the decision process in order to identify all the peripheral factors that would have a cost impact or positive effect on the decision going forward. Some of my most successful projects involved presenting a decision tree to the customer and showing the pros and cons of the proposed engineered alternative that was different from the engineer's specification. I might point out that in some cases it may not have been at a lower cost than the base bid specification, but it saved in operational costs and was more user or environmentally friendly in the long run. The environmental impact presented by the required annual testing of foam systems is a major maintenance expense! NFPA does allow for alternative methods of testing so long as the goals are not diminished. Substitute foam liquids and water equivalency are gaining popularity but their spent liquids from testing still require hazardous disposal in some cases. Disposal means capturing the testing solutions and transporting them to a facility that may include incineration. it is not my nature to endorse a product or process, but I have to add my opinion on this novel product and process in foam liquid proportioning.

Balanced pressure proportioning utilizing bladder tanks are not addressed at this time. They may appear to be a cost-effective solution on the forefront, but they have a myriad of issues different from pump systems that I will address later. Foam concentrates proportioning utilizing pumps has been produced by a number of reputable manufacturers since the early 1980's. The choices of electric motor, diesel engine, or Pelton water wheel driven are available. Most of these mechanically driven systems, together with manufacturer specific foam liquid, are UL-Listed as a package. That is to say, every entity of the system, from the discharge device to the foam liquid is a specific listing to that manufacturer and cannot be mixed and matched to retain their specific UL-Listing. Essentially, the simplified explanation of operations for balance pressure proportioning involves the necessary foam pump pressure and balancing devices that

would provide a balance of foam liquid pressure with the incoming water pressure to the inlet of the foam-water ratio controller. The ratio controller is a venturi designed device and installed in the water path to the system of discharge devices. So long as there is a constant balanced pressure at that foam inlet, positive injection across the ratio controllers' specified flow ranges can be achieved. The nature of the ratio controller design varies from each manufacturer. Their systems are third party listed based on their flow range and the foam concentrate inlet orifice size that varies as well. Each orifice size will also vary based on the manufacturers' foam concentrate type due to its individual and unique viscosity. This is the reason that mixing different manufacturers is not allowed when maintaining UL-Listings on your system.

In the mid-1990's the design, controllers, and equipment selections had to comply with the same NFPA #20 standards as the fire water pumps. This requirement changed the whole basis of the design and substantially increased the base pricing of the foam pumped balanced pressure installations including the following considerations:

- Increased equipment footprint requiring more heated building space
- New electrical infrastructure of reliable power for electric pumps (NFPA #20)
- Emissions requirements and UL listings for diesel driven (EPA)
- Spill Containment for diesel fuel storage tanks
- Multiple monitoring points on diesel controllers (NFPA #20)
- Proportioning ratio controller and orifices need be specific to concentrate and manufacturer
- Foam liquid pumps, drivers, and controllers need UL listing similar to stationary fire pumps

We will not explore the requirements for water supplies in general as those are determined by the hazard being protected. The foam proportioning equipment is sized commensurate the flow requirements for the hazard. A water-based foam system can be added anywhere, a particular room, building addition, or hazardous area requires a water-foam additive. Most common applications can be a flammable liquid storage room, aircraft hangar, chemical warehouse, fuel terminal, or flammable liquids tank farm. These hazards are most often required to be protected with foam additives of varying application rates. There are pros and cons to choosing the proportioning system most suitable for your current and long-term needs. For now, let us consider the FireDos Technology versus standard diesel/electric/Pelton wheel driven pump systems.

FireDos utilizes the same calculation procedure in determining foam concentrate flow and concentrate liquid storge requirements. However, its unique injection design is predicated on volume displacement leading to mechanical direct injection rather than differential pressure

across a specific manufacturers custom orifice. This is of special interest for those requiring a foam concentrate change. After the previous concentrate is removed from the storage tank and the system is flushed clear with water, fill storage tank with replacement concentrate and conduct the self-contained testing procedure. No equipment changes are required.

FireDos units Available with FM Approved water flow rate FM Approved operating Pressure in 1% or 3% configurations

Q_{min} Q_{max} p_{min} p_{max}

FD1000/1-S 190 l/min 1000 l/min 5 bar 16 bar
50 gpm 264 gpm 74 psi 237 psi
FD1000/3-S 180 l/min 1000 l/min 5 bar 16 bar
48 gpm 264 gpm 74 psi 237 psi
FD2000/1-S 270 l/min 2000 l/min 5 bar 16 bar
71 gpm 528 gpm 74 psi 237 psi
FD2000/3-S 280 l/min 2000 l/min 5 bar 16 bar
74 gpm 528 gpm 74 psi 237 psi
FD3000/1-S 280 l/min 3000 l/min 5 bar 16 bar
74 gpm 793 gpm 74 psi 237 psi
FD3000/3-S 400 l/min 3000 l/min 5 bar 16 bar
106 gpm 793 gpm 74 psi 237 psi
FD4000/1-S 400 l/min 4000 l/min 5 bar 16 bar
106 gpm 1057 gpm 74 psi 237 psi
FD4000/3-S 440 l/min 4000 l/min 5 bar 16 bar
116 gpm 1057 gpm 74 psi 237 psi
FD6000/1-S 490 l/min 6000 l/min 5 bar 16 bar
129 gpm 1585 gpm 74 psi 237 psi
FD6000/3-S 550 l/min 6000 l/min 5 bar 16 bar
145 gpm 1585 gpm 74 psi 237 psi
FD8000/1-S 880 l/min 8000 l/min 5 bar 16 bar
232 gpm 2113 gpm 74 psi 237 psi
FD8000/3-S 520 l/min 8000 l/min 5 bar 16 bar
137 gpm 2113 gpm 74 psi 237 psi
FD10000/1-S 690 l/min 10000 l/min 5 bar 16 bar
182 gpm 2642 gpm 74 psi 237 psi
FD10000/3-S 1060 l/min 10000 l/min 5 bar 16 bar
280 gpm 2642 gpm 74 psi 237 psi
FD15000/1-S 1060 l/min 15000 l/min 5 bar 16 bar
280 gpm 3963 gpm 74 psi 237 psi
FD15000/3-S 1260 l/min 15000 l/min 5 bar 16 bar
333 gpm 3963 gpm 74 psi 237 psi

FD20000/1-S 1330 l/min 20000 l/min 5 bar 16 bar
351 gpm 5283 gpm 74 psi 237 psi
FD20000/3-S 1330 l/min 20000 l/min 5 bar 16 bar
351 gpm 5283 gpm 74 psi 237 psi

Low end flow requirements are especially important for single 50 gpm hose stream minimums per NFPA #11 or 4 sprinklers discharging minimum per Factory Mutual for closed sprinkler head systems

FIreDos Benefits:

- No exhaust system
- No fuel system and containment-no fuel
- No electrical controller or battery charging system
- Streamline design leads to less freight cost, less building space
- Less engineering requirements
- Less complicated testing-no disposal of testing liquids
- Less commissioning time
- Less annual cost for compliance testing
- Less intermittent testing-weekly and montly
- No consumables involved
- Greatly reduced alarm monitoring points

FireDos Operation:

The unit (FireDos) is ordered by the required system flow and the desired rate of injection (1% or 3%)

- Suggest including foam flow meter and pump shaft rotation counter (Optional)
- Unit is connected with the water supply and foam concentrate lines to the system and foam concentrate storage as indicated by design. Unit can be floor mounted or skid mounted (optional)
- A means of flowing water only through the unit should be installed to atmosphere or back to water storage tank
- The unit is pressurized and lines are flooded free from air and establishing their normal standby position.

With the foam injection valve closed (this is a manual valve Normally open) and the foam test bypass valve open (this valve is normally closed), open the water supply, system discharge, and water only test valves. Foam concentrate will flow based of the water demand it senses but

return to tank via the foam test bypass with a flow meter installed. The water flow will be measures with the pump shaft rotation counter. This rotation counter has an accompanying chart by FireDos the relates shaft revolutions per minute to gallons per minute passing through the unit.

By performing a simple division calculation, divide the foam flow meter reading by the determined pump shaft rotation flow and the result sum is the present of injection. For a 3% injection, acceptable range is from 3.0 to 3.99%

Upon the completion of the testing and commissioning, return the foam discharge to the system, the foam concentrate test bypass, and water only test valve back to their normal standby position. The system is ready for operation.

Ironically, this same FM approved means of testing is also the same procedure necessary for periodic testing:

- If the testing water is returned to the storage tank, this requires no water for the entire test procedure
- No foam concentrate usage

Intermittent testing requires only that the operator place a provided wrench on the shaft end of the foam pump and rotate a few times. That's all!

Please find attached supportive documents pertaining to the FireDos unit. This unit is very versatile as well. It can be trailer mounted for mobile applications.

If you require additional information, Feel free to contact myself:

Dennis R. Miller
Associated Fire Specialists, LLC
(317) 645-3007
denny@afirespecialists.com

Joe Stonecypher-Manager of North America ***
FireDos
(346) 262-9984
Joe.stonecypher@firedos.com

*** If you contact joe directly, Tell him Denny Miller sent you. You will be given the best service

Midwest Office: 12063 Florida Road | Fortville, Indiana 46040-9607
Phone/Fax: (317) 485-6198 | **Cell:** (317) 645-3007 | denny@afirespecialists.com