TASK FORCE TIPS®
FIRE FIGHTING EQUIPMENT

DETERMINING FLOW WITH AUTOMATIC NOZZLES ON PRE-PIPED MONITORS

As more pumpers are equipped with pre-piped master stream devices, whether permanent or removable, a reliable method for determining the flow to these devices should be established. This is especially true when fire ground operations require pre-established flows for specific hazards and also to promote safe operation by limiting excessive flow rates. With conventional nozzles, fixed or selectable GPM, the built-in gauge on the monitor can give a good indication of nozzle pressure and therefore a corresponding flow for that particular nozzle. This is because fixed and selectable GPM nozzles will deliver only **one flow** at a specific pressure. Because TFT Master Stream nozzles maintain the Task Force Tips automatic operating nozzle pressure **at any given flow within each nozzles flow range**, the gauge on the monitor will read 100 psi. Another method must be utilized to determine actual flow.

A flow meter is the easiest way to determine the flow with individual or multiple fire streams. But not every department is equipped with flow meters.

A simple procedure that can be used to determine flow with automatic nozzles is: (1) flow a known amount of water through the monitor with a smooth bore nozzle, (2) determine the friction loss for that flow, and then, (3) add the loss for that flow to the required 100 psi nozzle pressure for automatic nozzles. The difference between the pump pressure and the nozzle pressure, when flowing any amount, is the friction loss in piping, valving, and monitor for that flow. This can be expressed as:

FL=PP-NP

where: FL = friction loss
PP = pump pressure
NP = nozzle pressure

By adding the friction loss for a given flow to the 100 psi nozzle pressure for automatics, the same amount of water can be delivered. This procedure is similar to using a friction loss chart for various size hose lines. The difference is that a friction loss chart is based on **average values** for losses, where the following procedure determines the **actual value** for your particular apparatus and monitor. This is accomplished by using smooth bore nozzles of various sizes, a pitot gauge, and a standard nozzle flow chart.

For example: A pumper with a pre-piped monitor and a 1-1/2" smooth bore tip is connected to a suitable (1000 GPM+) water supply. The pump pressure is brought up until a pitot gauge reading at the 1-1/2" tip indicates a nozzle pressure of 80 psi. Referring to flow chart for a tip of this size, this is a flow of approximately 600 GPM. Assuming the pump pressure during the testing is 110 psi, the nozzle pressure is then subtracted from the pump pressure leaving 30 psi, which is the total friction loss in the system when flowing 600 GPM.

FL=PP-NP
30=110-80

If the smooth bore nozzle is replaced with an automatic nozzle, and the pump pressure is brought up to 130 psi, (100 psi for nozzle pressure and 30 psi for the pre-determined friction loss) the automatic nozzle will be flowing the same 600 GPM.

Using a larger smooth bore tip for a higher flow we can determine the losses produced when moving more water. A 2" smooth bore tip with a pitot gauge reading of 70 psi will deliver about 1000 GPM. If the pump pressure is 120 psi, a total friction loss of 50 psi is produced when moving 1000 GPM through the pre-piped monitor.

To move the same 1000 GPM through this monitor with an automatic nozzle, the required pump pressure would be 150 psi; 100 psi for the nozzle pressure and 50 psi for the pre-determined friction loss when flowing 1000 GPM through that system.
Larger capacity monitors using large flow master stream nozzles can be calculated in the same manner, using larger smooth bore tips.

The advantage to using this procedure is that it will give you accurate friction loss calculations based on your particular system. Different monitors and piping configurations will produce different losses. Using this method, all valves, piping and elbows are accounted for in determining the total friction loss data. It then becomes a custom figure for that apparatus.

This method is also especially useful in determining the tank to pump capacity when operating from the engine's booster tank. Many fire departments use the pre-piped deck gun for initial attack with the water carried in the booster tank. By pre-determining the maximum flow and corresponding operating pressure for the automatic master stream device, pump cavitation will be avoided and possible damage reduced. Additionally, when the tank to pump capacity is known, the pump operator will be able to maintain flow rates for handlines and/or master streams within the capacity of the apparatus tank delivery system.

Once the friction loss figures are determined for various flows (500, 750, 1000, 1250 or 1500 GPM for example), the master pump discharge gauge can be marked at the appropriate pressure for that flow and then used as a "flowmeter" for that apparatus when using the pre-piped monitor with an automatic master stream nozzle.

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