Get to Know Your Eductor

Simple tips for using your foam eductor—portable or plumbed

Story & Photos
by Keith Klassen

When asked if our apparatus has foam capability, most fire departments will respond in the affirmative. For many departments, saying "yes" means that they have a foam eductor. Eductors may be portable or plumbed into the apparatus. If they're portable, they're usually relegated to the back of the engineer's cabinet where they're covered in a layer of dust. If they're plumbed, they're often plugged with dried foam concentrate. Both situations are a good indication of how infrequently we use them. This lack of use is often due in large part to a lack of training and practice with the system. This month, we'll shed some light on the mysteries of eductors.

HOW IT WORKS

Foam eductors operate using the Venturi Principal. The eductor's inlet has a large diameter as compared to the small diameter in the center or Venturi area of the unit. The outlet of the eductor returns to the original inlet diameter. The result is that all the water entering the eductor is forced through the small center opening. In order for this to occur, the velocity of the water must increase in small diameter. The increase in velocity reduces pressure in the Venturi area, which allows the foam concentrate to enter the water stream as atmospheric pressure pushes on the concentrate in the foam bucket or tank. This is the same principal by which carburetors provide fuel to engines and airplane wings create lift.

A firefighter operates a foam eductor. *Remember:* Eductors can be great tools, but they must be set up and operated properly to be effective.

EDUCTOR PLACEMENT

Eductors come in various sizes, ranging typically from 60 gpm to 250 gpm, and can be attached directly to the apparatus discharge. They may also be placed between two hose sections in the discharge line. Moving the eductor down the hoseline may be required if a long line is being pumped, as there are restrictions on how much hose can extend past the eductor. These restrictions range from 150 to 300 feet depending on the eductor.

The eductor may also need to be moved away from the discharge if the discharge plumbing is creating turbulence entering the eductor. Such turbulence can disrupt the operation of the Venturi.

PUMP PRESSURES & PERCENTAGES

Eductors are typically pumped with a 200-psi inlet pressure. This is due to the high friction loss, roughly 30 percent, through the small Venturi area. The pickup tube can be placed in a foam bucket or attached to a foam tank supply.

For Class B operations, a large supply of concentrate will be needed due to the high percentages required. The percentage can be adjusted to 0.5, 1.0, 3.0 or 6.0 percent; some models have a 0.25 percent setting. Each setting is simply a specific orifice size that allows the correct amount of concentrate to enter the water stream.

DURING & AFTER THE OPERATION

Flows during the operation must remain constant at the rated gallons per minute. This fact makes the use of an eductor problematic for Class A foam firefighting where lines are constantly being opened and closed. Eductors work much better in Class B operations where foam is being flowed constantly on a fire or a spill for a longer period of time.

When the operation is complete, the eductor must be flushed. This is best done by removing the ▶

pick-up tube from the concentrate source and placing it in a bucket of water. The hoseline can then be flowed until clear water is exiting the nozzle. *Important:* Do not leave foam concentrate in the eductor as it will dry, attract dirt and plug the small orifices. It may also cause the internal check ball to stick. If the check ball is stuck open, this could result in water flowing back into the concentrate supply. If the check ball is stuck shut, it could result in no foam entering the eductor.

A selectable gallonage nozzle must be adjusted to match the eductor flow rating.

THINGS TO REMEMBER

When using foam eductors, remember that they're situation-sensitive. They must be operated in precisely the correct parameters to operate effectively. For example, the flow through the eductor must match its rating. Drastic variations and/or incorrect flow will affect the pressure drop through the Venturi and, therefore, prevent its operation. The eductor must also be matched to the correctly adjusted nozzle, which must discharge at a constant rate.

There are several other factors that will disrupt the eductor's operation. These factors have one thing in common: They all create 5 psi or greater of back pressure downstream of the eductor. One factor, elevating the nozzle more than 10 feet, creates head pressure. Another factor, excessive hose beyond the educator, increases friction loss. Other factors, such as an incorrect or partially opened nozzle and kinks in the hoseline, restrict flow, creating back pressure.

FINAL THOUGHTS

Eductors can be great tools, but they must be set up and operated properly to be effective. As with everything that we do in the fire service, training is the key. Regular practice with your equipment will ensure that the steps for proper operation are second nature when the call comes in at 0 dark 30.

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