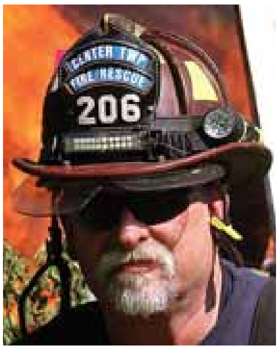

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Task Force Tips

Choosing the Right Firefighting Nozzle

With hundreds of models of handheld firefighting nozzles from which to choose, the choice can be confusing and the decision making process often frustrating.

Before investigating which nozzle may be an ideal choice for initial attack fire flow operations, one basic factor must be considered before all others: Determining the agency's target fire flow will be critical to the overall success of the nozzle choice. To assist in this determination, several questions about departmental operations need to be answered. How many litres a minute are required to absorb the heat being generated by the fire during initial attack? What are the most predicable fires, their contents, and size (based upon department historical experience and what flows have been successful in the past)? What is the experience level of the firefighters expected to participate in initial attack operations?

Ideally, after some review, and taking accepted fire flow formulas into account, a target fire flow will be determined. This minimum flow to be provided to the nozzle team will be used to determine pump discharge pressure after taking into consideration hose size, length, and nozzle operating pressure. Once the determination of pressures, losses, and minimum flows are taken into account, operational guidelines can be established to consistently and repeatably provide the nozzle operator with critical flow performance.

Now, the next step: choosing the best nozzle to meet the agency's operational needs. From a features and benefits standpoint, we will review key performance criteria and offer benefits and drawbacks for each characteristic. Generally, choice of nozzle pressure regulation, type of shut off valve, fog tooth design, and pattern shaper configuration are the most critical elements examined during the primary evaluation.

Nozzle Pressure Regulation

- **Fixed Litreage.** This nozzle style is designed to provide optimal straight stream and fog pattern performance at its rated pressure and flow. Over pressurisation of the nozzle creates unacceptable nozzle reaction for the operator, and under pressurisation produces an ineffective stream.
- **Selectable Litreage.** Optimal stream performance is achieved at the selected flow at the rated pressure. To maintain maximum stream

performance when litreage selection changes are made during operations, corresponding changes must take place in the pump discharge pressure. Much like the fixed litreage design, over pressurisation of the nozzle at a given selection creates unacceptable nozzle reaction for the operator, while under pressurisation produces an ineffective stream.

- **Automatic.** Using a unique design that incorporates an internal spring and hydraulic balance, these nozzles provide optimal straight stream and fog pattern performance over the entire rated flow range at the rated pressure. These nozzles are commonly referred to as constant pressure/variable litreage nozzles and standards require that the nozzle's rated flow range and pressure be indicated on the labelling of the nozzle. The automatic nozzle's pressure regulation provides the nozzle operator consistent reach and penetration (even while gating of the nozzle) without changes in pump discharge pressure.
- **Automatic with Flow Limiting.** In addition to offering the same stream performance characteristics across a broad range of flows as the standard automatic nozzle, these nozzles incorporate a user-defined flow limiting selection restricting maximum flow. Some models also offer a fixed high flow setting at a reduced operational pressure.

In summary, there are many choices of flow and pressure regulation currently available. While the fixed and selectable litreage styles initially appear simplistic in nature, they rely heavily on predetermined and proper hydraulic and pumping operations to achieve and maintain the target flow during operations. Automatic, constant pressure/variable litreage nozzles can provide a level of simplicity and flexibility in rapidly changing fireground conditions thanks to their self-regulating design.

Rated nozzle pressures can also vary from 7bar to 5bar and even lower in many designs. While lower pressure (lower exit velocity) can reduce nozzle reaction somewhat for the nozzle operator, the reduced velocity of the stream will also provide less reach and penetration. When working with foam, lower operating pressure nozzles can often produce a higher expansion and longer lasting finished foam.

Shut Off Valve Style

- **Ball Style Shut Off.** The most commonly used style of shut off, the ball valve design and all of its variations, is typically used in the fully open or fully closed position. Any gating of the valve to reduce flow or nozzle reaction during operation creates unwanted turbulence in the waterway resulting in a poorly performing straight stream and degraded fog pattern.
- **Slide Style Shut Off.** The slide valve style of shut off (similar in design to a needle and seat valve) allows the nozzle operator to vary the position of the valve without creating unwanted turbulence in the waterway. The nozzle valve can be gated to restrict flow, yet will maintain optimal stream performance in all positions.

Final choice of either the ball or slide type of valve should be accompanied with training and operational guidelines to support the creation and maintenance of optimum stream performance for the initial attack crew. With the ball style of valve being most common, hose handling techniques and pump pressure choices should be practiced to avoid the nozzle operator gating the ball valve and degrading the stream. When using a slide style of valve, nozzle training should stress that the nozzle operator has full control of flow, using a little when necessary, or opening the nozzle fully to achieve the targeted fire flow. In either case, choosing valve designs that incorporate time tested materials such as stainless steel has been proven to result in reduced maintenance costs and ensures your equipment's long term durability.

Fog Tooth Design

- **Spinning Tooth.** Designed to provide a very wide protective fog pattern, the spinning tooth design is one of the most common designs used worldwide. With the water being directed to the outer portion of the pattern to gain the wide angle, a central hollow core typically exists with this style of design. This hollow central core can often draw heat, flame and smoke back towards the nozzle operator. The protective nature of the fog pattern can also be easily degraded if the teeth are prohibited from spinning due to debris, or if the teeth are bent, broken, or missing (making regular inspections imperative). Often stainless steel spinning tooth construction is preferred over plastic for durability, long term reliability, and crew protection.
- **Moulded Rubber Tooth.** With a fixed tooth style, often the teeth are an integral part of the front bumper of the nozzle and are bonded to a metal shaper underneath to provide maximum durability. This style of tooth, which does not provide as wide a pattern as the spinning tooth design, directs water towards the central core of the fog pattern creating a fully filled fog pattern. This style of pattern tends to push heat, flame, and smoke ahead of the nozzle operator as the hose line is advanced on the fire.

- **Fixed Cut Metal Tooth.** This tooth configuration is a variation of the two previous designs and offers not only a fully filled pattern at a given selection, but when rotated further, will expand to a wide flat style of pattern more commonly recognized as a spinning tooth design. Cut from metal on the front of the nozzle bumper, this style of pattern is very rugged even in the harshest firefighting conditions.

Often pattern selection, just as using a nozzle with a pistol grip, is determined as much by past practices and the existing equipment in use as it is on the actual performance differences among the fog tooth designs and pattern styles. No matter which selection is made, safety of the nozzle team should be the number one consideration. The front of any nozzle is capable of seeing very harsh conditions and rugged use during firefighting operations. Regular inspection and repair of nozzles, specifically the components that provide the protective fog pattern is essential.

Pattern Shaper Detent

- **Fixed Tactile Indicator.** These indicators, an integral component of the pattern shaping bumper, provide a visual and tactile indication of the stream pattern selection of the nozzle. When fixed, these indicators are typically set to the top of the nozzle when it is in the straight stream position.
- **Tactile Indicator with Pattern Detent.** This style of indicator incorporates an integrated detent ball within the pattern shaper and allows a set pattern selection to have a tactile and audible feel. This style allows a detent to be integrated at a given pattern selection, such as a partial fog position, which can be noted by the nozzle operator as the pattern shaper is rotated in dark or smoky conditions.
- **Tactile Indicator with Lock Out.** This style of indicator incorporates a lock setting that must be manually overridden by the nozzle operator to access other stream settings. An example of this would be to restrict the ability of the nozzle to go to straight stream to prevent plunging the stream into flammable liquids or, to prevent the nozzle operator from selecting a fog pattern position when entering an unventilated room and contents fire. The pattern can be easily overridden to choose other pattern selections.
- **Locked Tactile Indicator.** If no other pattern selection is desirable, the indicator can be locked into a predetermined pattern selection. This style will allow no other pattern selections by the operator. An example of this lock out choice is for nozzles designated for use on fires where energized electrical components may be present. A modified fog pattern may be the sole choice of the agency having authority.

Tactile indicators are an ideal choice for departments trying to meet individual operational performance criteria. Often international standards may dictate certain lock out configurations, and in other situations, just having the nozzle operator know, with the feel of a detent, that a pattern selection has been achieved is a critical operational consideration.

Possibly not as essential as the previously noted nozzle design elements, there are also other characteristics that should be considered when making a decision. Two-piece nozzles, ball shut off combined with a nozzle tip, can offer some additional tactical performance if the need to remove the tip and add additional hose line is required. This configuration is often found in departments who have specially designed hose bundles for high rise firefighting operations, or in areas where wildland fire operations are common. Equally important are international standards for nozzles that through either self-certification or third party testing can provide a level of performance and materials verification not easily accomplished at the fire department level.

In summary, the choice of the proper nozzle for the initial attack operations is not an easy process. But, with proper investigation, determining the agency's target fire flows, and identifying key performance criteria that are essential to the operations, the decision can be based more on facts, and less on just purchasing what the next latest, greatest and extensively marketed product may be. From a safety standpoint, choosing a rugged, time tested and factory supported product is essential. For additional information on nozzles, operational guidelines, or the newest in designs, the worldwide web offers countless opportunities. But, as a final suggestion; always use the nozzle you are considering in both demonstration and field evaluation. Only then can you be assured you are getting the best value for your investment. IFF

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