

# **ORANGE PEEL**

*November 26, 2004*

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## **SMOOTH BORE NOZZLE BASICS**

While smoothbore nozzles have undergone minimal change during the past 25 years the combination nozzle has continued to evolve with new technology. The fog nozzles used during the 1960's were designed to break the water up into very tiny droplets discharged at a very high pressure. Cities such as Chicago and Oakland used pumpers with up to six stages that could pump through booster lines at up to 800 psi.

The theories presented by Lloyd Laymen were in full force in many cities across the U.S. The idea was low G.P.M. (40 to 80) at high pressures delivered into the super-heated upper atmosphere and converted to steam to cool and suffocate the fire. The fog stream was very effective in pushing fire away from the hose team as they advanced into a ventilated room and contents fire. Self contained breathing apparatus was left on the engine for the next generation of firefighters.

Gradually, the flow rates for combination nozzles were increased in connection with the acceptance of the adjustable gallonage combination nozzle. The industry standard nozzle pressure was 100 PSI and droplet size was increased to allow for greater reach and penetration. Based on the research by Keith Royer and Bill Nelson of Iowa State University's fire training institute, rate of flow and water distribution were identified as the two most important factors affecting fire extinguishments. Provided critical rate of flow was met and the stream penetrated the area of involvement, their tactics favored violent movement of a combination nozzle applied through the window set on a medium wide fog. Most of their principles found their way into the mainstream of firefighting teachings. Automatic nozzles were introduced next and this lasted until just recently as fire departments started realizing that the cost far outweighed the lack of benefit.

The latest generation of combination nozzles introduced to the fire service by nozzle manufacturers is the fixed gallonage, low pressure version. These nozzles offer many outstanding features that make them a favorite of many fire departments. Because fixed gallonage nozzles have fewer moving parts than automatic or adjustable gallonage models, they have a lower repair frequency and cost. The most popular flow rate chosen by today's fire service is considerably higher, ranging from 150 to 250 GPM for handlines. These were achieved by redesigning combination nozzles to flow at pressures from 50 to 75 PSI instead of 100 PSI.

The demand for higher flows, to combat larger and hotter burning fuel loads in residential fires, could only be accomplished by reducing the nozzle reaction created by the increased GPM. Lastly, water droplet size was drastically increased to produce better reach and penetration, more effectively cooling the burning material below its ignition temperature.

So here we are, 2003, with the most advanced combination nozzle money can buy. High flow, low pressure, larger droplets, low maintenance and reduced cost. Funny, but if I didn't know better I would say it sounds like the description of a smooth-bore nozzle.

Every recent change by manufacturers has been to emulate the performance of a smooth-bore. In fact the latest nozzle to hit the market is a combination nozzle that shoots a fog pattern and solid stream simultaneously. I'm not here to continue the great debate, but facts are facts. The greatest amount of opposition that I have heard concerning smooth-bores has come strictly from those who have never used a solid stream in a working fire and had a chance to experience its capabilities. Two firefighters in Sacramento were recently heard at two different fires saying that they would have liked to have had the opportunity to see what difference a smooth-bore would have made during their aggressive interior attacks. High heat and heavy fire rendered their streams ineffective from the combination nozzles they were using. Use the 7/8" smooth-bore tip (160 GPM @ 50 PSI) in training and practice breaking the stream into large droplets off the ceiling and walls. Practice sweeping the floor and moving in with the nozzle out in front working in circles. Then take it inside a working fire, learn what it can do and get good at using it. As retired New York firefighter Bob Pressler once said, "You can't make this #@% up!"

As smoothbore nozzles work their way back on to hoselines all across the country at an increasing rate, many of the born-and-bred combination nozzle men are finding themselves with a new tool in their hands. To most, this has become the vogue. A good portion of these firefighters have failed to realize that with a change from fog patterns and combination nozzles comes a new challenge: to properly apply the solid stream safely and effectively from the smoothbores. This unfamiliarity has left them unconvinced, partially burned or just plain confused and unsuccessful.

With the popularity of smooth-bores expanding, the theories surrounding the use of solid streams have been well documented. This raises an interesting question. Have we changed the way we apply water to compensate for this "new nozzle"? Are we using the stream correctly and taking advantage of a solid stream's true capabilities? I think not. In order to maximize its potential and truly reap the benefits, certain basic skills must be modified and perfected when fighting interior fires using handlines equipped with smooth-bore nozzles. As basic as they may seem, these four simple steps will insure a successful transition.

## **1 CHASE THE KINKS**

Lower nozzle pressures mean more kinks. It is important that we remove the kinks to maintain proper flows and nozzle pressures. This starts with making a good stretch from the hose bed and flaking the hose properly before charging. A few extra seconds here leads to minutes saved as the line is advanced. Place the nozzle down a short distance from the point of entry after stretching the line (off the porch, allowing for easier forced entry). The nozzle and the coupling (50 feet back) are side by side with a bend pulled straight back away from the entry point. This method allows the line to be advanced through the door with less effort because we are not putting needless bends in the line, and a straight hose can be advanced inside without binding on the door jam.

## **2 SOLID STREAMS OFFER REACH**

Use this to your advantage. While it is imperative that the nozzle make the doorway quickly, once in position, use the stream's reach to cover the entire room. Break up the fire burning overhead, cool down the contents, then sweep the floor and move in. Hit all six sides when necessary.

## **3 POSITION THE NOZZLE OUT FRONT AND MOVE THE STREAM AROUND, A LOT!**

I feel that this is the skill that is being overlooked and ignored the most by the newly converted fog generation. In order to take advantage of the cooling capabilities of water, it must be applied to the burning material to cool it below its ignition temperature. This requires the nozzle men to aggressively work the stream over the entire burning area. Too many times the nozzle is held too close to the body and directed into the fire area with little or no movement. Do your department a favor, remove those pistol grips. With the tip held approximately two feet in front of the body, the nozzle is easily directed in all directions quickly with less effort and maximum cooling efficiency. Break up the stream into large droplets off the ceiling and walls. Fog patterns give us the false security of quick extinguishment simply because of the large amount of steam generated. It appears to be darkening down the fire when in reality the steam is merely hiding the seat. Precious time passes before the fire is exposed again and the process starts over, delaying search.

## 4 DARKEN DOWN, SHUT DOWN

While the solid or straight stream doesn't usually offer the appearance of instant extinguishment, it does extinguish more quickly with less disruption of thermal balance. Still, too much of a good thing can be bad, and this holds true with water. Remember, hit the seat hard with sufficient GPM quickly, then shut down the nozzle, wait a second, and move in, observing the conditions, then completing extinguishment.

The fact is that most fires can be extinguished no matter how we apply the water. The true test remains with whether lives are saved. I am convinced smoothbore nozzles used to extinguish interior fires always save lives if used properly. We have to approach each fire situation with the idea that we will need to save a life. If the structure turns out to be unoccupied, then we are that much more prepared for the next fire when it truly matters and lives are at stake, including our own. If you want your engine companies using straight streams inside, give them a smoothbore and take the guess work and temptation out of the mix.

*A solidstream is the best straight-stream.*

This article is dedicated to the memory of Firefighter Andrew Fredericks, who was killed in the line of duty at the World Trade Center in New York on September 11. His vision, knowledge, and desire to perfect the art of stretching lines and applying water have been, and will always be, a great inspiration to my career. — *Tim Adams*