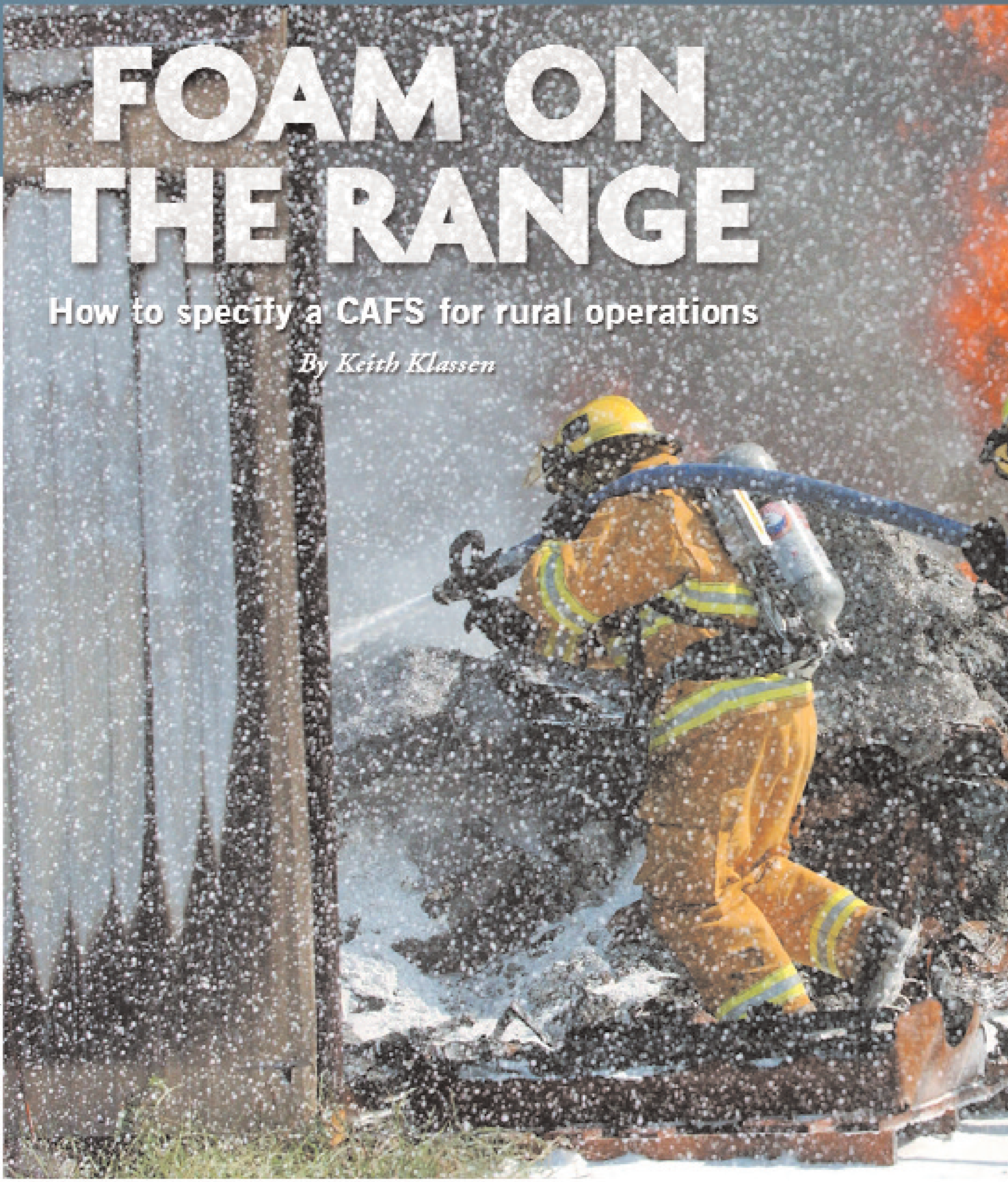
FOAM ON THE RANGE

How to specify a CAFS for rural operations

By Keith Klassen



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When resources are stretched thin, as they are in many rural areas, compressed air foam systems (CAFS) help firefighters accomplish more in the first few critical minutes of a fire incident. As such, CAFS are a tool that merits consideration for any rural department on every piece of firefighting apparatus. But how do you know which CAFS is right for your department and your apparatus?

Many CAFS are available in today's marketplace. Selecting the system that will work best for your application is an important part of obtaining the biggest bang for your buck. Of course, the mission of the apparatus determines which CAFS system is best. The rig may be used for a specific purpose, such as wildland firefighting or

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structure fire response. Or it may be required to respond to all fire alarms, a common scenario in smaller rural departments that don't have large numbers of personnel or multiple apparatus.

This article describes several factors to consider when purchasing CAFS for rural operations, as well as tips for ensuring you get the right system for your needs.

Nozzle Knowledge

The right nozzle is key to maximizing CAFS operation

CAFS use proportioners to mix foam concentrate and water to create foam solution. They create finished foam by injecting air under pressure into the foam solution at the discharge. The air and foam solution agitate together and form bubbles as they travel through the hoseline. When the product reaches the end of the hoseline, millions of tiny, equal-size bubbles have been created and are ready to go to work fighting fire. The benefit of all of these bubbles is the dramatically increased amount of surface area when compared with water or even foam solution. More surface area equals more and quicker heat absorption.

Because the product is finished at the end of the hose, all that is needed is a valve to control the flow. Therefore, the nozzle of choice for compressed air foam (CAF) is smooth bore. The orifice size depends on the type of finished foam needed for the tactical objective. A large orifice, such as 1 3/8" on a 1 3/4" hoseline, will produce the driest foam for the settings at the pump panel, because it provides little disruption of the bubbles as they pass. The foam created is best for structure protection. A 15/16" orifice will squeeze the foam together as it passes. This causes bubbles to break, stripping out air and making the foam wetter for the same pump panel settings. This combination works well for fire attack.

The most versatile combination is a pistol-grip ball valve with a 1 3/8" waterway and a threaded 15/16" tip, allowing for quick change as tactics dictate. Valves with an insert or a mounted slug tip do not allow this versatility.

Note: Fog nozzles and CAF do not play well together. The purpose of a fog nozzle is to break a smooth-bore stream of water into small droplets. This is done mechanically as the water passes through the appliance. CAF will be subject to the same treatment when passing through the fog nozzle. The nozzle will destroy a large portion of the bubbles, returning them to foam solution. The destruction of bubbles dramatically decreases the surface area and thereby the heat-absorbing potential. I have seen this effect first-hand during both live-fire training and product testing. The foam difference between smooth-bore and fog nozzles may not appear to be much different when sprayed in the parking lot, but when used properly, the differences in both heat reduction and the interior environment are dramatic.

The bottom line: If you want to fight fire with foam solution, put on the fog nozzle and turn off the air. But if you spent a lot of money on a CAFS that creates the ultimate bubble for firefighting, don't destroy the bubbles and waste the effort with the wrong nozzle on the end of the hoseline.

The Summit Fire Department experienced such success with CAFS that all first-out engines are now CAFS-equipped. Right: Engine 364 is a Type 6 brush truck with a 70-gpm/35-cfm CAFS powered by a 23-hp engine. Far Right: Engine 33 is a 4 x 4 Type 3 CAFS engine with a cross-mount 500-gpm/140-cfm CAFS powered by a 4-cylinder diesel engine. Below: Engine 32 is a 4 x 4 Type 1 CAFS engine with 750-gpm PTO pump and a 200-cfm PTO compressor.

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PUMP & ROLL VS. STATIONARY PUMPING

The first question to ask: Will the responses for this apparatus require pump-and-roll operations? Pump-and-roll is primarily required for wildland and wildland/urban interface (WUI) operations. There are many ways to power the CAFS to provide this capability, but the most common are a transmission power take off (PTO) and an auxiliary power plant.

Using a transmission PTO allows the CAFS to be engaged and the apparatus to be in gear so you can pump while driving. Most transmissions feature PTO ports. This is a simple, straightforward way to power the system. On systems up to 500 gpm, one PTO port will drive the pump transmission, which simultaneously drives both the water pump and the air compressor. Systems with larger pumps will require the use of two PTOs, one for the pump and the other for the compressor.

The downside to this method for pump-and-roll: The pump pressure and compressor speed are tied to road speed. To maintain a specific pump pressure, you must also maintain a constant road speed—often not an easy task, particularly in wildland operations. If you choose a PTO-driven system, work closely with the truck manufacturer to select the proper gear ratios in both the final drive and PTO. This provides the best performance to fit your mission. If using a 4 x 4 chassis, consider the speeds in both high and low range.

A variation on this system is to use the PTO to power a hydraulic pump. The hydraulic pump powers a hydraulic motor, which can be used to run a pump or compressor. This may provide some benefit in maintaining CAFS pressures with changes in road speed; however, it requires an additional hydraulic system.

You can also use an auxiliary engine to power the CAFS. The advantage: It provides true pump-and-roll capability because the CAFS is completely independent of the truck powertrain, and is therefore unaffected by road speed. Most Type 6 engines or brush trucks use this type of pumping system, but it can also be applied to larger apparatus using a cross-mount CAFS. These systems are powered by a four- or six-cylinder diesel engine, with pumps ranging from 500–1,250 gpm and compressors up to 200 cfm. The disadvantages: additional weight, cost and space requirements.

The methods used for pump-and-roll will also work for stationary pumping. One of the most common methods to power the compressor for strictly stationary pumping is to use a transmission PTO. PTO compressor systems range from 80–200 cfm. The 80-cfm systems are sufficient for two 1 ¾" or one 2 ½" handlines and are becoming popular due to their lower price. Some manufacturers have also added a second line of lower-cost PTO systems. Although these provide less in terms of warranty, support and training, they may be a better fit with your department's budget.

A final method: Power the compressor off the midship pump. In this case, the compressor is mounted on top of the pump and is driven by a clutch and drive belt off the pump transmission.

SYSTEM SIZE

The next question: What size system do you need? CAFS are typically sized with a pump capacity (gpm) two times the size of the compressor capacity (cfm). In the larger systems, however, with compressors about 200 cfm, it's common to see pumps of 1,500 gpm or higher. The smallest systems use a 70-gpm pump and a 35-cfm compressor. These systems are capable of flowing one 1 ½" line or two 1" lines. Other small systems, typically skid units, use pumps ranging up to 200 gpm with appropriate size compressors. These units work well for WUI operations.

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Engine 32's bumper turret in action. The turret is often used for firefighting and pretreatment in this rural area.

If your CAFS will be used for structure fire attack, you'll need a fire-rated pump of a minimum 250 gpm. A 250-gpm/120-cfm system can easily handle two 1 ¾" lines or one 2 ½" line. Such pumps can also be paired with smaller compressors (80–100 cfm) to be more cost effective.

The first CAFS that my fire department purchased was a 250/120 system. We intended it for WUI operations but its effectiveness on structure fires was immediately obvious. It quickly became the first unit to respond to all fires, including structures. Since then our CAFS fleet has increased to 10 systems of various sizes.

Larger systems can support more lines, higher flows and master streams. But don't oversize the system; bigger is not always better. CAFS allows you to do more with less. Purchase both the apparatus and the CAFS to fit your actual needs. The truck may end up being smaller, more maneuverable and more cost effective.

PROPORTIONERS

CAFS use automatic proportioners. This means they constantly adjust for changes in water pressure and flow without the need for operator attention. Some systems even adjust for variations in water and foam concentrate quality. Most of the proportioners currently used for CAFS are electronic direct-injection systems.

Proportioners are sized by their concentrate flow capacity. To determine the proper proportioner size, consider the percentage requirements of the concentrate you are using and the size of the water pump. Undersizing the system will limit the number of foam lines that can be flowed simultaneously; oversizing will be expensive.

INTAKES & DISCHARGES

It's best to operate CAFS using booster tank water, because with high inlet pressure, the pump will provide the needed pressure at lower rpms. This also causes the air compressor to run slower, thereby limiting its volume of air output. Tank operations work well in the rural setting, as the apparatus is often the only water source. Consider specifying a direct-tank fill or upgrading to an auto-tank fill device that will automatically maintain the booster tank level.

The number and size of discharges that

can be plumbed for CAFS is directly related to the air compressor's capacity. If a large number of discharges are plumbed, you might not be able to operate them all at once. It's best to plumb CAFS to various size discharges to allow for a variety of foam tactics.

ADDITIONAL EQUIPMENT

Bumper turrets and portable monitors work well with CAFS and make good tools for rural operations, in which manpower may be limited. During pump-and-roll operations, you may need a mixing chamber to maximize the performance of the CAFS with short hoselines.

CHOOSE WISELY

After you have answered the above questions and determined your needs, CAFS manufactures can assist you in selecting the system that best fits your requirements.

The addition of CAFS in the rural setting will allow you to modify your responses to fire incidents. I work for a rural fire district that covers 62 square miles with three stations. We are a combination department with two- and three-person career crews and volunteers. We have few hydrants and even fewer with good pressure. Consequently, we've long relied on tenders for structure fire response. On a structure fire, all three first-out engines will respond. Before we obtained CAFS, the water tender always responded with the first engine, even if it meant splitting a two-man crew to take both apparatus to the scene. Now that all of our first-out engines feature CAFS and 500- or 600-gallon tanks, we have scaled back the water tender response to a volunteer or recall response. I can't recall a recent structure fire where we used tender water to fight the fire. The water tender has become a taxi, or is used to refill the engines before they leave the scene.

One last thought: When purchasing a CAFS, be certain to inquire about the training included with the system. CAFS is a tool that firefighters must understand how and when to use. Effective training is the only way to achieve the maximum benefit from your purchase.

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