Getting an adequate water supply to the scene of a fire emergency is always of paramount importance, and when the fire scene is in a rural area without a site water supply, the problem can be really serious, putting lives and property in jeopardy. Additional issues are that, in many cases, insurance rates are based on the fire department's ability to supply an adequate water supply for the property, while there are numerous, sometimes onerous, requirements relating to the mechanics of delivery, training levels of responding firefighters and manpower levels, plus some legalities.

Oktibbeha County in Mississippi, USA, comprises about 500 square miles with a mostly rural population. While most of the county is forest and agricultural land, there is a population of about 21,000 permanent county residents, with an estimated additional 9,000 students at a local university. The student population is mostly contained in multi-storey apartments, with no fire codes and a limited water supply, so the responding fire departments must be capable of tackling everything from grass fires to fires in multi-storey occupancies.

There have been several large fires in these apartment complexes which have severely taxed the county and mutual aid fire departments.

Protection levels

The county is protected by seven volunteer fire departments operating out of 14 stations, which provide fire, rescue and first response to it and its visitors. There are pumpers (usually 1,000 g/m [3,785 l/m] pumps and 1,250 gallon [4,731 litre] tanks); tankers (up to 3,000 gallons [11,356 litres]); brush trucks (with small pumps and 200 gallon [757 litre] tanks); and rescue vehicles for vehicle wrecks (road traffic accidents). All these appliances come with equipment such as hydraulic rescue tools, smoke fans, air bags, small pumps, miscellaneous loose equipment, generators and tools.

While most of the departments' work these days is related to emergency medical services (EMS), making up about 80% of the calls, there is still the need to be ready for 'the big one'. Hence training becomes a real problem, as there is a limit to the number of hours a volunteer can expend on both fire and medical training and exercises.
Though residences, farms and businesses in the county are supplied with domestic water by rural water associations or private wells, the capacity for fire flow in rural areas just isn’t there. Baths and showers, sanitary water, and the laundry are pretty low in terms of flow demands. A five mile (8km), six inch (150mm) pipe, powered by a 10hp (7.46kW) pump is not much help, so the fire departments must rely on water they carry on the responding vehicles, energise a water shuttle operation, know where nearby and all year available bodies of water are, and be efficient in their operations.

Specialised hardware, such as portable pumps to get water up to a roadway from a pond, jet siphons for suction/drafting operations, and long hard suction hose setups are important. In addition, the organisation of, and manpower to, set up portable dams and drafting hardware, and get these functioning, can be a real problem, especially when time is of the essence. Route planning for available tankers is always a challenge, as various volunteers and responding units become active on a more or less random basis.

As well as the need for firefighting water, there is another consideration in that property insurance rates are based on the amount of water that may be delivered consistent with insurance company rules. These rules deal with how many vehicles may be utilised and how far they may travel, and rates are based on flow rates within a one hour duration. Additional rules deal with firefighter response and initiating fire streams on the fireground.

Locations and innovations

A GPS enabled map of the county, showing the locations of all overhead tanks, drafting sites (lakes, ponds, etc) and rural fire hydrants has been made. In addition to the GPS location of fire hydrants in the rural water system, a database of flow capacity, access, and supply duration is included. Simply put, some hydrants aren’t worth using in an emergency, but might be used at other times (such as filling a tank after a fire). Hence a responding tanker may skip the nearest...
hydrant for the next one, as it's the most efficient for fill operation.

Certainly the number, type and capacity of vehicles are in the control of the fire department and its sponsoring agency, but the various roads, bridges and travel may not be totally compatible with weight limits, road conditions and so on, so planning for response is important.

A novel system of overhead water storage tanks has been established throughout the county. These tanks were obtained as surplus, as underground petroleum tanks were replaced by fibreglass ones or were simply declared surplus to environmental requirements and business practices. These tanks are elevated, with increased foundation capacity as water weighs more than fuel, and they have capacities up to 20,000 gallons (75,708 litres), serving simply as static storage tanks.

While they are supplied by a rural water system, the supply is used only to refill the tank after use, and it may take hours to refill. The discharge spout has both an antiswirl fitting in the discharge elbow to keep the stream straight, and a flexible tube to prevent spray. Each tank is equipped with a heater, not used much in Mississippi, to prevent freezing. There is also a mechanical or electrical display to ensure passers-by that the tank is, indeed, full and ready for use.

A 3,500 gallon (13,248 litre) tanker can be refilled in 49 seconds, by a simple turn of a valve, requiring no hose connection or great effort by personnel. Further, pumpers and tanks have an oversized fill tower on top of the vehicles. This 24in x 24in (0.6m x 0.6m) tower has a spring loaded trap door that opens when hit with a water stream, but closes otherwise to prevent
water escaping when the vehicle is in motion. Each tank location has either signs or markers on the driveway to provide the vehicle driver with information on where to stop the vehicle’s fill tower directly under the spout.

Water shuttle exercise

A typical water shuttle exercise sees portable dams (tanks) employed with large ‘dump valves’ in the tankers to provide quick emptying, thus allowing the vehicles to rapidly return to water sources to bring more water.

Some tankers have multiple dump valves, on both the sides and rear, and can empty in a matter of seconds. In this operation, over 32,000 gallons (121,133 litres) of water were delivered in an hour, consistent with the Insurance Rating Bureau’s rules. The requirement for this area was to generate 500g/m (1,900 l/m) for an hour, with an additional 10% flow for spillage and leaks.

Obviously some 30,000 gallons (113,562 litres) of water on a typical fire would be a significant effort, but one always has to be ready for the ‘big one’, and an unusual situation. Of course, there are additional rules regarding what is done with the delivered water.

These rules involve the number of equipped firefighters on scene, their training levels, large stream devices, the type and capacity of on scene fire pumps, and allied firefighting equipment and tools. The results of all this will provide up to a two thirds reduction in fire insurance rates for property owners.

Such a saving is most important, from a property owner’s perspective and also from a political standpoint for the sponsoring agency or group. But the real result is better fire protection and life safety, as well as a safer environment for firefighters to work in with an adequate water supply

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