



away rapidly, which cannot be recovered by increasing impeller speed. The fix is to reduce suction lift, clear suction blockages or reduce pump speed in some circumstances.

Overestimating pump capacity

“When talking about pumping capacity from deep lift there is a tendency to overestimate the depth the pump can lift from. A general rule of thumb is to take the figure for the vacuum that the pump will hold in a blank cap (suction and vacuum performance) test, eg 0.7 Bar, and multiply this value by ten. This will give the maximum lift capability for the pump in metres, in this instance 7 metres.”

When using dry riser systems in tall buildings there must be a full appreciation of the pump pressure required to ensure satisfactory flow at elevation. There must also be an awareness of the correct equipment being used with the pump to

Top tips for fire pump operators

Fire pumps need to fulfil a long list of requirements as well as complying with ever more stringent emissions regulations. Is this a case of fire buyer beware? F&R gives the lowdown on pumps.

A single stage centrifugal pump used by the majority of portable fire pump manufacturers. 3D drawing by Mike Simpkins.

Most fire pump operators understand the equipment they are using and achieve the maximum performance available from it. However, there are some misconceptions such as a general lack of understanding of the effect of delivery hose size and length on the pressure and flow rate available at the nozzle. These need to be considered to ensure the pump output is as expected, says Hale Products Europe’s (vehicle/trailer mounted fire pumps manufacturer) Marketing Manager David Burton.

“On multi-pressure vehicle mounted pumps there is a tendency to leave the high pressure stage engaged when only low pressure is needed. This causes an unnecessary power draw on the vehicle engine, consuming more fuel and creating more pollution through engine emissions.”

Burton finds that on both vehicle mounted and portable pumps there is insufficient attention paid to the vacuum gauge. Suction conditions have the greatest effect on pump performance, and the vacuum gauge can indicate the current level of pump suction performance. High vacuums will cause cavitations, where pump performance falls

handle the pressures generated by the pump when high rise pumping.

Burton strongly recommends a regular review of all equipment used with the pump to ensure compatibility with the pressures and flows required, eg hoses, suction tubes, and collecting breachings etc. “We recently launched the all-new Godiva Prima vehicle mounted pump and this is a significant advancement on the previous World Series range incorporates many new features – it’s more compact and with a modular design it’s easier to install in the appliance. There are more options for the suction tube – three tank to pump connection points and a 25° droop for example,” he explains.

The priming pipe and round-the-pump foam system pipework that was previously external to the main pump is now internalised passageway. The material specification has been upgraded to improve corrosion resistance – there is now an all-stainless steel high pressure stage and a tougher aluminium alloy all round the bodywork.

The priming system incorporates many new features to make it more robust and efficient. It handles less water and is therefore exposed to less load and abrasives. An electromagnetic clutch for

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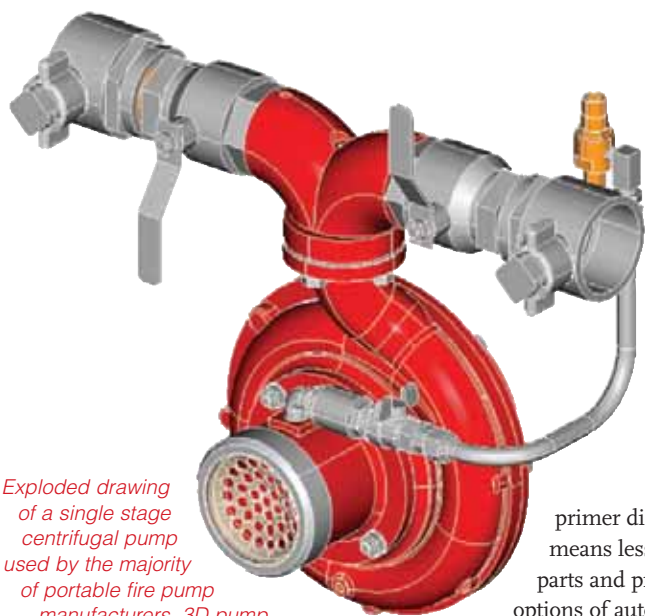
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Exploded drawing of a single stage centrifugal pump used by the majority of portable fire pump manufacturers. 3D pump diagram by Mike Simpkins

primer disengagement means less moving parts and provides the options of automatic or manual priming - and the pump

does not have to be run at high speeds to disengage.

There is improved efficiency for the high pressure stage too. It requires less power draw from the engine, resulting in less fuel consumption and engine emissions. And with no increase in noise levels the Godiva Prima is one of the quietest vehicle pumps available, says Burton.

As regards portable pumps, Hale Products Europe is also constantly improving design. "The latest lightweight portables, the Powerflow 8/5, is one of the lightest pumps in its classification. It provides a rated output of 800 lpm at 5 bar and is capable of 14,00 lpm at 3 bar. This compact and robust pump is available as a single or twin discharge model."

In addition to the design of conventional fire pumps delivering just water, Hale Products Europe is a leading supplier of Compressed Air Foam Systems (CAFS). The use of CAFS as a firefighting media benefits the frontline firefighter.

The water/foam/air solution of CAFS provides a quicker fire knockdown, uses less water, reduces water damage and is easier for use in action. The

water/foam/air solution can be adjusted to provide different qualities – a wet foam is used for direct suppressing of the fire at source, while a dry foam will be used to provide a protective layer on adjacent structures to a fire.

Kidde Angus – findings

David Mills from Kidde Angus finds that there are increasingly stringent emission standards being imposed across Europe for both large and small petrol and diesel engines, but emission standards for small portable or mobile diesel units are yet to be implemented.

According to Mills there are exemptions in many countries for machinery used for emergency applications, however most fire authorities want to know that the engines they use meet local standards. As they don't want to be seen to be spending tax payers money on equipment that pollutes

"At Angus Fire we have decided to use engines in our small pumps that meet both the European emission standard (97/68/EC) but also the stringent CARB (Californian Air Research Board) standard which is considered to be the toughest in the world. This allows us to sell our pumps anywhere knowing they will meet the local standards," he explains.

Some portable fire pumps still use two-stroke engines. Making two-stroke engines comply with current emission regulations is a tough challenge, he says. Therefore some countries have banned two-stroke engines completely – no matter how good their emission performance.

The European standard that governs emissions for petrol and diesel engines is 97/68/EC, amended 2002/88/EC. This covers not only cars, trucks and marine applications but also non road power unit. It is divided into classes according to the kW output of the engine.

All petrol engines must comply (with some exemptions) but small diesel engines under 19kW (25.6 hp) are currently exempt.

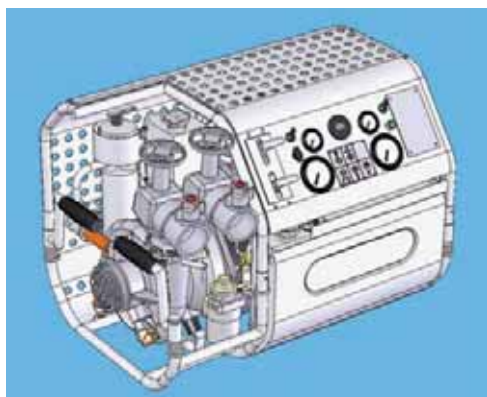
Mills agrees with Burton on the challenges faced when choosing pumps. "The main difficulty faced by users when choosing a pump for use by the emergency services is the wide range of tasks the pump is required to undertake. On one day it may need to feed fire hoses at high pressure, taking water from a well or river, and on the next it may be used to pump out a cellar filled with debris. Unfortunately, from the pump designer's point of view, these two requirements really call for two totally different designs!"

Space and weight

Mills explains that any pump must provide an adequate performance for both firefighting and salvage work and there are a number of pumps

"On multi-pressure vehicle mounted pumps there is a tendency to leave the high pressure stage engaged when only low pressure is needed. This causes an unnecessary power draw on the vehicle engine consuming more fuel and creating more pollution through engine emissions,"

David Burton, Hale Europe



Artist's impression of the Ld1200, a new Angus Fire portable pump that uses a simple industrial three-cylinder engine.



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on the market that fulfil this need. But there are two additional criteria that modern brigades take into account.

“Firstly space and weight. In the past, British brigades – for instance – were required to carry pumps that would supply 1,100 l/min at 7 bar (250 galls/min at 100 psi), but space and weight restrictions have meant that these rules have been superseded and they now carry pumps with capacities from 500 to 900 l/min at 7 bar.”

This has resulted in a weight saving of anything from 25 to 40 kg, allowing more equipment to be carried. In practice, brigades have found very little, if any, reduction in their capabilities when using the smaller, lightweight pumps. In line with this trend Angus Fire has designed their current range of air-cooled pumps to occupy the smallest small footprint while keeping weight to a minimum.

Secondly, modern brigades are rightly concerned with the overall operating cost of their pumps. Reliability and ease of service are now high on the list of requirements for any equipment on a tender.

When choosing a pump brigades are looking at the easy of service, simplicity of design and the cost of ownership. In some cases these requirements are put above performance.

To meet these needs, Angus Fire and other manufacturers are increasingly using simple, reliable, air-cooled industrial engines in their portable pumps.

Nearly all fire brigades and emergency services use single stage centrifugal pumps for applications ranging from feeding a fire hose pumping out a cellar.

“Centrifugal pumps are simple, lightweight and able to tolerate dirty water and even solids up to 9 or 10mm diameter. For example Angus Fire pumps have a clearance between impellor and casing of 10mm and are fitted with a screen on the inlet with hole sizes of 9mm diameter which ensures all solids will pass through the pump without damage,” explains Mills.

According to Mills the main differences between pumps lie in the type of engine used, the way power is transmitted from the engine to the pump and the method used to prime the pump. Other factors such as the robust design of the frame on a portable pump play an important part in its suitability for brigade use.

Industrial engines are far simpler to service than adapted car engines. Using a modern car engine in a portable pump is almost impossible since the electronic controls built into a modern car power plant need major modification to make the engine run out of a car.

An additional benefit of an industrial engine is



The Hale World Series vehicle pump with CAFS – a unit driven directly from the pump PTO for compressed air foam firefighting. CAFS unit is a compact package (attached to pump rear) comprising a compressor, FoamLogix proportioning unit and a mixing manifold.

its extended crankshaft. Where a car engine finishes at the flywheel,

industrial engines can be supplied with a long crankshaft extension which is ideal for mounting the pump impellor. This removes the need for a coupling or gearbox between the engine and pump; reducing weight and complexity. The use of modern material and technology means that air cooling is now a reliable alternative to water cooling, even in tropical environments.

“Exhaust gas priming is also preferred by many users, as it is simple, efficient and there are no moving parts to maintain. Other features such as electric start and good instrumentation are also desirable and most modern portable fire pumps offer these features.”

*Michael Mills,
Kidde Angus*

Exhaust gas priming

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The pump fitted to most tenders is ideal for all the applications a portable fire pump performs, however there are instances where the ability to move the pump independently from the appliance is essential.

Transferring water from a source a long way from a fire often means the pump has to be positioned near the water source. If the pump is portable this can be done while leaving the tender near the incident to supply high pressure hoses.

“When pumping out flooded areas it is convenient to move the pump as the water recedes. In addition a portable pump can be left in situ while the tender is used elsewhere or on another call,” Mills concludes.

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