Fixed Installation Firewater Pump Packages

Internationally, there is a continuing movement towards installing more fixed installation fire sprinkler/hydrant/water-mist/deluge systems into a wider variety of sites ranging from schools and hospitals to shopping centres, manufacturing plants and distribution warehouses. Fixed fire extinguishing installations are a vital component within any overall facility design to protect life and property and their more widespread use provides facility owners with further benefits in terms of risk insurance premium reductions and reduced facility downtime in the event of an incident.

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The capability of the water supply to meet the water flow and pressure requirements for fixed installation extinguishing systems is of paramount importance and is determined by the extinguishing system design. Where this cannot be adequately achieved, it is necessary to incorporate fire pumps within the system.

Globally, there is a vast range of local, regional and international standards in existence for pump system design and selection. For example, within Europe nearly every country currently has its own national sprinkler and fire pump standards although much effort is being applied to introduce a harmonised European Standard EN12259 of which Part 12 will apply to fire pumps. Ultimately, when formally adopted as an EC Directive, the harmonised standards will supersede the current European national standards. However, the National Fire Protection Association Standard NFPA No. 20 (Standard for the Installation of Stationary Pumps for Fire Protection) has progressively and positively evolved since 1896 and is currently looked upon as the standard which is most widely known and adopted internationally.

In addition to designing and manufacturing to comply with the relevant codes and standards, fire pump producers also commit their products to extensive testing to obtain approvals from recognised organisations such as Factory Mutual (FM), Underwriters Laboratories (UL), Loss Prevention

Certification Board (LPCB) Great Britain, VdS Germany, etc. to enable their equipment to be installed and accepted on particular projects. These approvals are the attestation that the manufacturer has complied with the appropriate codes and standards, operates effective quality systems and provides correct product support for their equipment.

Fire pumps can work in a variety of configurations – boosting town mains water pressure directly or from intermediate water storage tanks, either above or below ground. Generally, for above ground water supply applications, 'end suction' or 'horizontal split case' centrifugal pumps are used. Below ground water applications can use an underground storage tank, river or even the open sea as their water source and for these installations 'vertical turbine' or 'submersible' pumps are generally used. Irrespective of the configuration, the final intention is to produce a certain volume of water at a certain pressure – in other words its design duty.

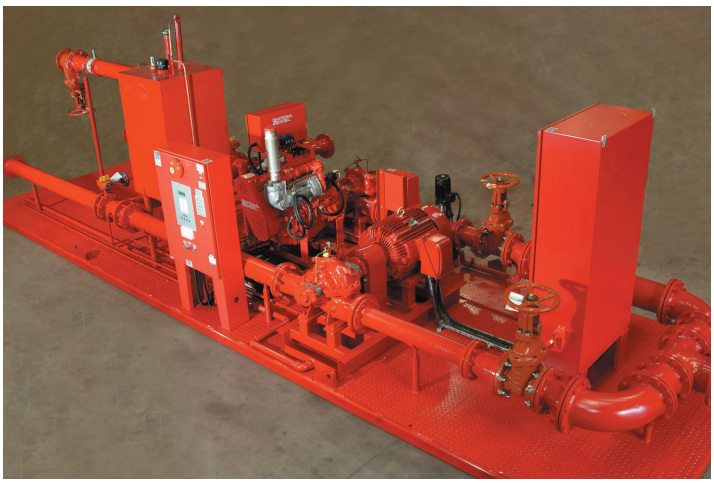
The capacity of the fire pumps required for a particular installation is determined by the extinguishing system design requirements and standards and these can typically range from 550 litres per minute (150 US Gallons per minute) to 19000 litres per minute (5000 US Gallons per minute) at pressures from 2.75 barG (40 psi) to 26 barG (390 psi). Depending on the risk insurer's philosophy, the required system design duty may be provided by a single pump system or may be shared between, say two pumps (known as 50% duty pumps) or more. Frequently, two 100% duty pumps will be installed and each one either designated as 'duty' or 'standby'. All reputable fire pump manufacturers will assist the sprinkler design consultants with determining the optimum pump system selection and specification as required.

Fire pump design and construction is developed around reliable operation. Many fire pump designs available on the market have evolved from manufacturers' proven continuous service process pump designs which have been subsequently adapted for fire pump applications. Although under normal circumstances it may only be run for 30 minutes each week for test purposes, when called on to 'operate in anger' it must start and perform flawlessly and provide firewater to the seat of the incident. This not only means installing and maintaining a reliable fire pump but also its driver, control system and accessories which form part of the overall fire pump package and must be equally as reliable.

Drivers for fire pumps comprise diesel engines, electric motors and steam turbines. Generally, spark-ignition internal combustion engines are not permitted. The popularity of using a diesel engine versus an electric motor as the fire pump driver depends on where you are. In North America it is estimated that 80% of fire pumps are electric motor driven whereas in Europe the converse is true and diesel engines account for 80% of all fire pump drivers. It is true that electric motor driven systems provide for lower overall maintenance and relatively low emissions in a more compact pump room floor area but a diesel engine driven system is virtually independent of reliability on external power sources.

Selection of the correct driver for the fire pump again depends on the codes and standards the fire pump package is being designed to. Whilst the correct pump speed is fundamental, the driver power rating will need to be sized to accommodate the absorbed power rating of the pump – for some codes this is only at the pump design capacity but for the more rigorous codes it needs to cover pump end of curve performance which demands a considerably higher power rating.

Diesel engine drivers specifically developed for fire pump applications are available. These are usually proprietary well tried and tested brands and models of diesel engines which are then dressed or customised and tested to meet specific codes and approval body requirements. Usually a de-rating factor of 10% is applied to the gross available power when used for fire pump drives but further de-ratings will need to be applied if



the engine is installed in ambient temperatures above 25°C (77°F) or 91 metres (300 feet) above sea level to compensate for reduced engine performance. Nearly all codes and standards call for dual redundant battery electric starting systems. This is to ensure reliable starting in the event of one set of batteries failing. Although radiator-cooled engines are permissible, heat exchanger cooling is the usual method with cooling water being taken directly from the discharge of the running pump via the exchanger and returned to waste or to the water storage tank.

Another essential component within the fire pump system is the automatic controller. The principle of this is to detect a fall in the firemain water pressure when a sprinkler head ruptures, deluge valve operates or a fire hydrant is opened. This is achieved via a pressure switch or pressure transducer and, when the controller is in 'automatic' mode, initiates the starting sequence and operation of the fire pump. Controllers also provide local manual operation overrides for the automatic starting system as well as remote alarm circuits to enable pump status to be monitored in a permanently manned position such as a gatehouse, reception area, building monitoring system or by the local fire brigade.

Controllers for electric motor fire pumps are relatively straightforward in design and usually employ direct-on-line (across the line) or star delta (wye delta) open transition motor starting techniques. However, when there are mains supply power limitations, more diverse starting methods are available such a primary resistor, autotransformer or electronic soft start.

Controllers for diesel engine driven fire pumps are necessarily more complex in nature. Mostly, they will include a cyclic cranking feature to alternate between the dual redundant battery electric starting systems. A crank termination feature is also included to withdraw the starter motor from further cranking once the engine has started. In addition, both battery systems are catered for by fully automatic battery chargers operating from the pump room AC power supply ensuring that they are always in a full state of charge ready for the pump set being called into operation. Engine protective devices are limited but usually engine oil pressure and cooling water temperature are monitored with audiovisual alarms and certain codes require the inclusion of an engine overspeed protection alarm and safety trip circuit.

More and more frequently, fire pump manufacturers are being called on to provide complete pre-packaged fire pump houses. These are fully manufactured at the fire pump manufacturer's facility on a unitary baseplate including all suction and discharge valving, test lines and are ready to install immediately on delivery to the work-site. They can be supplied with (or without) a pre-fabricated pump house building fully wired out with electrical system, lighting, heating and ventilation system. Smaller capacity units can be fabricated using customised shipping containers. The increasing popularity of the pre-packaged pump house system is without doubt due to the speed and convenience of installation, requiring just fixing to the pre-prepared support base, attaching of suction and discharge lines, electrical supply and the unit is then ready to be commissioned and start its working life. A further major benefit is the elimination of site building costs associated with the construction of a conventional 'bricks and mortar' pump room and its subsequent fitting out costs.

Whilst purchasing and installing any type of fixed extinguishing system is an extremely wise measure in reducing fire risks to life and property and the associated disruption to a business when a fire incident occurs, it is absolutely essential to ensure that the fire pump system is correctly installed and commissioned. Incorrect installation can lead to serious problems later on; for example coupling failure due to incorrect or mis-alignment of the coupling halves. Reputable fire pump system manufacturers will provide local trained engineers to carry out this work to the acceptance of the facility owner and his risk insurer's requirements and also to put into effect the manufacturer's equipment warranties.

Pump system testing should be conducted by the facility owners on a weekly basis and records accurately maintained. Any abnormalities with its operation should be rectified without delay.

It is also imperative that correct regular maintenance is carried out on the system. Most fire pump system manufacturers and risk insurers require equipment to receive servicing and maintenance annually.

Remember – fire pump systems are provided for life-saving and property protection and are not something to fit and forget! IFP