Are submersible pumps right for dry pit service?

Whether you are dealing with a new dry pit installation or replacing an aging conventional dry well pump, today's advanced technology in pump designs and manufacturing capabilities offers the pump station designer and end user many alternatives to consider when selecting a new pump. Randy Crawford addresses some of the benefits of placing a submersible pump in dry well service.

Unlike wet well pump installations, dry well stations are not flooded with sewage or water. Yet, because they are typically built below ground level, the dry well pumping station is most always vulnerable to flooding. To overcome this vulnerability, past common practice generally dictated the installation of a conventional non-clog pump, usually vertically mounted in the dry well area with a conventional air cooled motor installed above grade and coupled to the pump by an extended shaft. This practice was followed so that in the event of flooding the pump could remain operative until the station could be cleared and cleaned.

While every type of pump installation has its associated positive and negative aspects to evaluate, this article addresses some of the benefits of placing a submersible pump in dry well service. In addition, it also describes some key constructive features of a submersible dry pit pump engineered specifically for dry pit pumping applications.

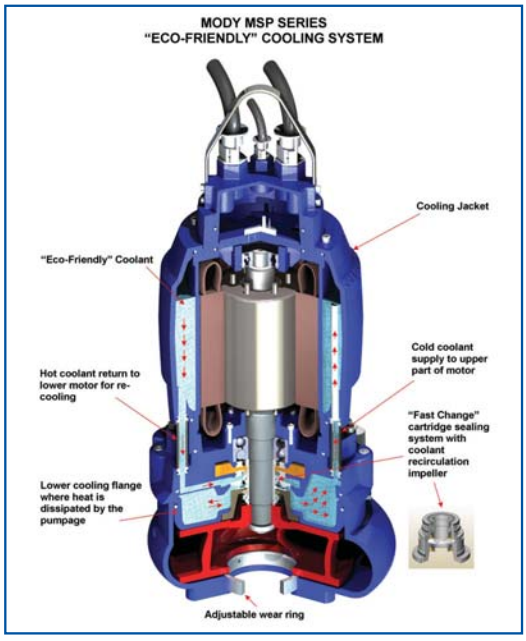

Figure 1. The Mody MSP Series "Eco-friendly' cooling system.

Conventional dry pit pump

The conventional dry pit pump has been used for many years by municipalities across the United States with reasonable effectiveness as insurance against an inoperative pump state in the event of station flooding. Typically high in initial cost, these pumps require precious space to accommodate not only the base suction elbow, pump-end and its vertical mounted bearing frame, but also the above grade electrical control panel, motor, couplings, intermediate shafting, bearings and support blocks, controls, accessories and necessary guards for personnel safety. Factoring an added structure to house and support the above grade components and the associated maintenance requirements of the entire equipment package, it is easy to understand the high expense that is generally connected with conventional dry well pump installations.

Submersible dry pit pump

Submersible pumps have been successfully used in wet well installations around the world for years. These pumps were purposely designed to continuously operate while submerged, using the same wet well liquid being pumped to dissipate the heat generated by the motor during operation.

A number of submersible pump manufacturers have adapted their products for use in dry well pumping stations by incorporating certain design modifications that enable the pump to operate either intermittently or continuously in air, as well as fully submerged. Enter Mody Pumps, Inc. and the recent launch of their MSP Submersible Dry Pit Series product line.

Dry pit submersible pumps are well accepted today by engineers and end-users alike in new dry well applications. Additionally, as aging dry well pump stations are being upgraded to new standards, more and more dry pit submersible pumps are replacing the old style conventional dry well pumps. Submersible dry pit pumps offer several benefits.

First, the pump is close coupled and compact in design, which means:

- The motor shaft and pump shaft are one. Energy losses through couplings, bearing frames, intermediate bearings and shafts are eliminated, resulting in improved operational efficiency.
- Precision machined registration fits provide positive alignment during assembly, minimizing potential vibration issues during pump operation.
- The compact design requires minimal space and allows the product to be easily supported, adapted and handled during installation and maintenance.
- This close coupled design virtually eliminates human exposure to hazardous rotating components.

Second, dry pit installations are typically easier to service than wet pit installations. In general they require less downtime for maintenance and many of the health and safety risks associated with a traditional wet pit pump covered in sewage sludge are eliminated with a dry pit installation.

Third, dry pit submersible pumps will not be damaged in the event of flooding.

Compact in design, the dry pit submersible pump is highly versatile and efficient, offering considerable savings in terms of initial purchase price and installation, operation and maintenance costs.

Mody MSP submersible

The entire Mody MSP submersible dry pit pump line has an advanced, cost-effective and efficient product design that improves pump performance in terms of reliability, efficient operation and ease of maintenance. Design features include:

Modular construction

Major components such as volutes, impellers, cartridge mechanical seals, motor housings, stators and rotors are capable of being exchanged or mixed and matched within the series. The same pump model is capable of being used in dry pit, wet pit or portable installations and each can be easily adapted in the field with common tools if necessity ever presents itself to change installation type. Modular construction helps to reduce both inventory and spare parts requirements.

Channel or vortex impeller

Further expanding the modular construction concept, the MSP series enclosed channel and semi-open vortex impellers are completely interchangeable with one another within the same size pump module. Additionally, these impellers may be exchanged in the field without special tools or modification to any pump component at any time pumping conditions so warrant.

Each impeller is designed with back vanes to prevent solids build-up in the mechanical seal area. These back vanes also help control axial thrust loads on bearings during operation. Impellers are dynamically balanced and can be trimmed to the appropriate diameter to meet specific hydraulic operating conditions, including single-vane impellers.

Closed loop motor cooling system

This system is standard for all MSP dry pit pumping applications. In addition, it is often used in wet pit and portable applications where partial submergence during pumping operations may be a frequent occurrence. The cooling liquid is an environment friendly mixture of water and glycol, circulated by an

Figure 2. The Mody MSP submersible dry pit pump.

internal impeller. No external cooling water system is required and being totally enclosed (no contact with pumpage or external cooling source), fouling and clogging that is commonly experienced with systems that circulate external pumpage inside a jacketed motor is totally eliminated.

The eco-friendly system is excellent for optimum cooling of a motor across a wide range of operating conditions, including inverter duty operations or run dry events where potential for overheating is likely to occur.

EFF-1 high efficiency motors

EFF-1 high efficiency motors are equivalent to the NEMA "Energy Efficient Class". In addition to reducing operating costs, high efficiency motors have numerous benefits. They have excellent insulation systems, run quieter, operate cooler and typically last longer in high temperature environments. They generally have better overload survival rates, are less sensitive to voltage variations, and tolerate more frequent starting.

Class H insulation has a temperature rating of 180°C as compared to Class F, which has a temperature rating of 155°C. Class F insulation is generally adequate for most applications. Class H, however, provides much greater tolerance to the variables identified in the previous paragraph.

Thermal overload protection

Thermal overload protection switches are internally wound into each phase of the motor, protecting it from high temperatures.

Connected in series, these switches are set to automatically open when a predetermined temperature value is reached. If any one switch senses the predetermined value, it will open its circuit and automatically shut the motor down to avoid potential damage from continued operation. The motor may be safely restarted only when all switches sense a temperature level equal to or less than a predetermined low-end temperature value, allowing their respective circuits to close and the motor to restart.

Moisture sensors

Moisture sensor probes are installed in the motor at three locations for detecting the presence of water by electrical resistance. These locations are the seal oil reservoir, the lower motor cavity area, and the electrical junction chamber.

Should water enter any of the monitored locations, the respective probe signals a relay device that energizes a warning light, or a shutdown circuit in a control panel, protecting the motor from potential damage due to moisture intrusion. This method of detection is extremely simple, yet highly reliable and effective.

Shafts and bearings

Conservatively sized shafts and bearings help provide for smooth, vibration free operation. These components absorb variable radial and axial thrust loads that are imposed by hydraulic forces over a wide range of operating conditions, helping to extend service life of the pump.

Bearings are adequately spaced to minimize shaft deflection. They are also maintenance free in that they are permanently sealed and greased for life.

Cartridge mechanical seals

Each pump is equipped with a cartridge double mechanical shaft seal system that is extremely user friendly when seal changes need to be facilitated.

By contrast, component mechanical seals consist of a large number of parts that must be carefully assembled and precisely installed, which is not easily accomplished in the field. On the other hand, cartridge mechanical seals are easily removed and installed on-site by means of a precise registration fit, using common tools, without having to follow precise seal setting instructions. These seals contain all components in one complete assembled part. They are inspected for quality and pre-tested at the factory for integrity, ensuring reliability when field replacement is necessary. In addition, cartridge mechanical seals can generally be refurbished and re-used at less expense than a new seal. When recycled in this manner, the end-user's cost of maintenance is greatly reduced.

Seal face materials and lubrication

Rotating and stationary seal face material on both the impeller and motor side of the cartridge seal is silicon carbide against silicon carbide. This material consists of graphite impregnated carbide and silicon, a combination that provides exceptional self-lubricating properties, low rate of thermal expansion, and high resistance to corrosion. The material has excellent re-surfacing properties and typically provides longer than normal service life when compared to other sealing materials.

The seal does not rely upon pumped media for lubrication. Instead, the seal operates maintenance free in a reservoir of environment friendly, food grade oil that hydro-dynamically lubricates the

seal faces at a constant rate, providing superior heat transfer and maximum seal cooling. The reservoir is designed to prevent overfilling, and allow for oil expansion during operation.

Adjustable wear ring system

To preserve optimum efficiency and to prevent 'ragging' as normal wear takes place during operation, the MSP pump includes an adjustable wear ring system.

The adjustable wear ring feature saves the end-user on downtime for maintenance and spares inventory. Instead of replacing an entire wear ring, a simple adjustment with common tools allows original factory running clearances to be maintained.

Volute latch bolt system

To permit easy and quick removal and separation of the motor unit from the volute without disturbing system piping, a "Fast-Lock, Quick-Release" latch bolt system is included in the MSP pump design. Compared to conventional studs, this proven system saves on maintenance downtime when removing or re-installing the motor unit.

Adjustable support legs are also standard with the MSP pump. These allow the installer to easily mate the pump suction and discharge flanges to system piping with minimal effort.

When planning for a new dry pit installation or retrofitting an existing conventional dry well station, the benefits of using a dry pit submersible pump should not be overlooked. These space saving units are generally low in initial cost, efficient to operate and maintain, and easy to handle and install or retrofit. Highly reliable and virtually silent in operation, dry pit submersible pumps have no exposed rotating parts and are safe if flooding occurs. ■

Figure 3. Retrofit installation of the Mody MSP submersible dry pit pump.

CONTACT
Randy Crawford
Director, Business Development
Mody Pumps Inc
2166 Zeus Court
Bakersfield, CA 93308 USA
+1 (661) 392 7600
+1 (661) 392 7601
Email: randy@modypump.com
Website: /www.modypump.com