

Hot Oil Transfer – Tire Manufacture

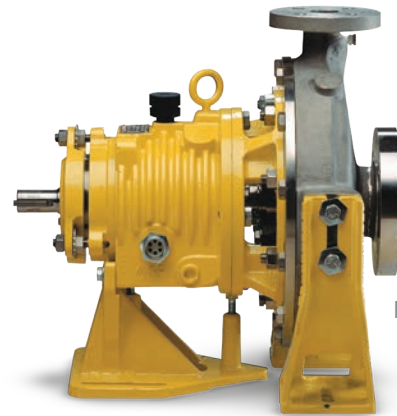
APPLICATION DOCUMENT

Vehicle tires may just look like simple round pieces of rubber, but in reality, manufacturing them requires the optimization of a special blend of engineering, physics and chemistry. This alchemy consists of a mixture of various types of rubbers, pigments, silica, antioxidants, carbon black and special oils.

In addition to being integral to producing a vehicle tire that can withstand the abuse of high-speed, long-range and long-life driving, the hot oils used have strict handling characteristics that must be met, the most stringent of which is that they must be kept at a very high temperature, in many cases approaching 700°F (371°C). Successfully handling a heat-transfer oil, or heat transfer fluid (HTF), at this elevated temperature brings with it a number of significant challenges.

The first is obvious: if the plant does not have its required amount of hot oil ready for use, then the production process will be halted, which will adversely affect production schedules and delivery routines. The second main challenge is finding a way to keep the oil from reaching a condition known as “coking up” in which the hot oil that supports the pump’s primary seal face is exposed to the atmosphere; this can result in seal failure and leaks. At the same time, the pump’s internals can be affected by the high temperature of the oil, so the pump’s seal chamber will need to be jacketed and cooled by a barrier fluid.

Obviously, achieving the balancing act between handling a hot oil that must be kept at an elevated temperature with a pump that cannot be subject to excessive heat requires the use of a targeted pumping technology. In many cases, ANSI centrifugal pumps have been utilized, while some manufacturers have resorted



FRAME A/LD17

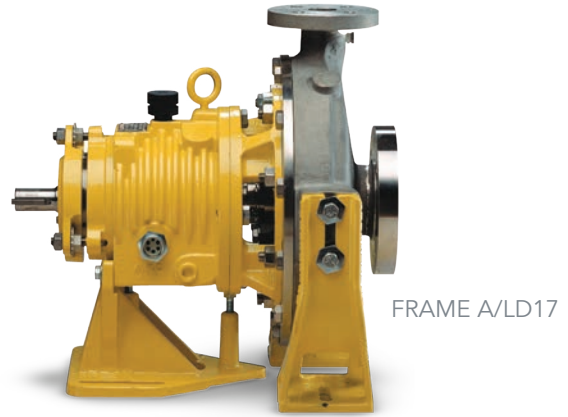
to seal-less models in an attempt to eliminate the seal degradation that can lead to catastrophic leaks. Seal-less centrifugal pumps ended up not being the best choice since the heat transfer fluid can leave behind a chalky particulate residue and seal-less pumps are unable to provide peak performance with solid-laden liquids.

Taking all of these operational concerns into account, a better choice for tire manufacturers may be the Frame A Series Centrifugal Pump from Blackmer®. All 11 Frame A pump models are designed around the seal, where 90% of failures occur, and have larger bearings than competitive models, which results in greater load-bearing capacity and bearing life. Every Frame A pump meets ASME/ANSI dimensional specifications and are equipped to accept a C-Frame (NEMAD)/D-Flange (IEC) motor adaptor, which allows for proper alignment of the motor and power end with no need for special tools, excessive labor costs or inefficient installation times. The Frame A pumps have a standard temperature limit of 400°F (204°C) and can achieve flow rates up to 1,400 gpm (320 m³/hr). An additional option is the Blackmer Centrifugal High Temperature Series Pumps that allow the handling of materials with maximum temperatures up to 750°F (398°C) with additional configurations and factory consultation.

All Frame A models are ATEX and ANSI B73.1M certified and come with a five-year power-end performance assurance and one-year mechanical-seal performance assurance warranties.



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COMPETITION

• Other Centrifugal Pumps

Common centrifugal pumps are prone to extreme vibration when run at high speeds, which leads to noisy operation and premature pump wear that can result in breakdowns and associated downtime that will affect the overall production process. This vibration can exacerbate failure modes when the hot oil must be kept at extremely high temperatures, as is the case in tire manufacturing.

• Seal-less Centrifugal Pumps

The lack of seals can help eliminate the leaking of hot oil, but the type that is used in tire manufacturing can leave behind a chalky substance on the pump's internals. This chalky substance can then enter the liquid stream, which can give the oil a level of particulates that seal-less centrifugal pumps are not compatible with. This can lead to failures and breakdowns that will compromise production schedules.

FROM THE FIELD

An American vehicle-tire manufacturer needs a constant flow of 680°F (360°C) heat transfer fluid (HTF) in order to perform its manufacturing process. In addition to the high temperatures that the pumps charged with transferring the HTF must be compatible with, if a leak were to occur it would create a huge mess in the plant since it smells terrible and can be difficult to clean up.

Two decades ago, the plant operator began to notice that the common centrifugal pumps that were in use required constant maintenance and seal replacement. In the search for a solution, the operator initially replaced the compromised centrifugal pumps with seal-less models. As noted, the chalky residue that the HTF left behind immediately began affecting the seal-less pump's operational ability, which led to a failure that saw the release of 680°F (360°C) HTF into the facility.

The next solution involved the installation of specially configured Blackmer Frame A Centrifugal Pumps. Since the HTF can be very unkind to mechanical seals, the Frame A models were outfitted with double seals to better protect the pump from the temperature of the HTF, along with its abrasive tendencies. Backed by 20 years of reliable performance from the Frame A pumps, two High Temperature Frame A pumps – an enhanced temperature-sensitive model that had been developed in the interim – were installed in 2020. At that time, the size of the cooling lines was increased from 1/8" to 1/2" and the cooling tanks were repositioned so that they would be closer to the mechanical seal. The result for the tire manufacturer is that since these changes were implemented nothing more than routine pump maintenance has been required with much fewer seal replacements needed.

For more information on these additional solutions, visit us at blackmer.com.

atk0120-074 01/22

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