Tar and Pitch

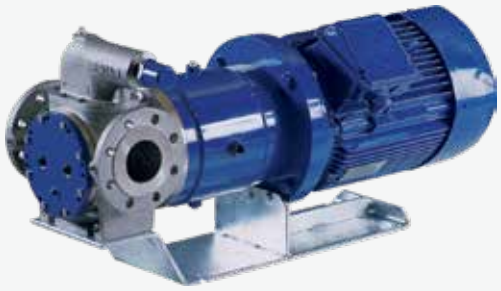
Pumping liquid tar and pitch with zero leakage and reduced maintenance

CASE STORY

The pumps used have to be heated and have wear resistant bearings.

Tar is often transported in ships. The pumps on board bring the tar to the storage tank from which it is pumped to the distillation towers where it is fragmented. During the process about half the tar ends up as pitch.

Pitch is among others used to produce electrodes for the aluminium industry. Normally the pitch is circulated in a ringmain by means of a 6" pump and from the ring main the pitch is dosed by a 2" to 3" pump through a mass-flow meter to the mixers. The dosing pumps are frequency controlled.



This looks like a simple system but there are lots of details that have to be correct to avoid damage to the pumps. Koppers Denmark A/S are specialists in constructing pitch systems where ROTAN® magnetically driven pumps with bearings in solid tungsten carbide are used. ROTAN® pumps are used for these applications in Europe, South Africa and the Middle East. If you are planning to build a system where pitch has to be pumped, be sure that you involve only experienced specialists in the erection of the system.

Tar and pitch have cancerous vapour thus a seal-free pump should be used for these liquids. Both liquids are pumped at elevated temperatures and contain abrasive coke.

In the following we shall go over some of the design "details". A fine system should be build quite like this:

Canister exposed to too high pressure

Outer magnet when started on canister

The storage tank is to be heated at the bottom. The suction is placed at the centre of the tank and the suction pipe is traced the whole way to the suction hole. The pump is heated to max. 230°C/446°F (could be a separate system).

If tracing and insulation are optimal you do not need heat transfer oil at a temperature higher than 250°C/482°F anywhere in the system. (In this way you do not have any “hot spots” creating extra coke). The circulation pumps are doubled and each pump has a strainer with sufficient surface to avoid cavitation. The strainer has 3 mm holes. There is no strainer before the dosing pumps.

Just to describe how sensitive the system is:

If the tracing around a valve is incorrectly a possible “cold spot” that could create lumps or make a restriction for the flow. We have experienced a system where the magnets were not strong enough to transmit the torque as part of the pipe system on the pressure side was not sufficiently insulated or the heating system was not good enough. We could start the pump at 10 Hz and let it run for some minutes (during this time the “cold spot” was heated and the pipe had a full flow value).

After this we could start the pump at 50 Hz without problems. Of course pipe dimensions should always be calculated according to normal practice for pumps. Pumps used for pitch should be EDXXXEDK-1U88 equipped with max. number of samarium cobalt magnets (just to allow some small errors in the pipe system). The heating connections should be flanged, as it is impossible to make a tight thread. No threaded plugs!!

Even a minor thing like heating the system in the correct way may cause serious problems.

If you start the procedure by heating the pump (you may think this was a good idea, as the distance to the centre of the pump is rather big compared to the surrounding pipe system), the liquid in the pump and the pipe close to the pump starts to expand and the liquid cannot escape as the pipes are “frozen” in both suction and pressure side of the pump. The result may then be as shown in pictures!

You have to heat the suction pipe from the tank to the suction of the pump. After this you can heat the pump, and finally the pressure pipe from the pump and out.

If a pump with a large volume and a maximum of 150 RPM was selected, internal friction in the pump would also be reduced to a minimum.