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GENERAL POINTS REGARDING MECHANICAL SEALS.

The main consideration in starting up equipment with mechanical shaft seals is to ensure that the seal faces are immersed in liquid from the very beginning so that they will not be scored or damaged by dry operation. The recommendations below will be applicable to most types of seal installations, if followed successful start-up and normal seal life can be expected;-

- (1) Caution the electrician not to run the equipment dry while checking the electric motor for the correct direction of rotation. Kestner horizontal pumps are generally despatched from the works with the spacer coupling disconnected to ensure that this does not occur. The direction should be checked and then the coupling can be connected for operation. A slight turnover by hand will not damage the seals, **however**, full motor speed for a short period under dry conditions will destroy or severely damage the rubbing faces.*
- (2) Sealant connections at the stuffing box should be connected and the specified coolant flowrate and pressure should be checked and confirmed prior to starting the equipment. Flow switches in the sealant supply lines may be beneficial to prevent energising the electric motor drive under 'no-flow' conditions.*
- (3) On hot operational equipment that is shut down at the end of the day, it is*

generally advisable to leave the sealant liquid flowing at least long enough for the seal chamber to cool below the temperature limits of the materials in the seal.

- (4) *Most double mechanical seals are dependent upon the controlled pressure and flow of the sealing fluid to function correctly (generally a minimum of 1 bar above the stuffing box/discharge pressure.) Even before the shaft is rotated the sealing liquid pressure must exceed the product pressure opposing the seal.*
- (5) *A squealing noise indicates insufficient liquid at the seal faces (that is the faces are running dry) and to avoid reduced seal life the installation should be checked immediately. Dry operation from the sudden loss of suction liquor is sometimes encountered and should be rectified immediately to prevent possible damage to the seal faces.*
- (6) *New plant start-up should consider the presence of dirt and debris in the system during construction. This cannot be eliminated entirely however, proper cleaning and flushing pipelines prior to running the equipment can greatly eliminate many seal failures. The use of strainers, cyclone separators and filters on critical installations during commissioning is often advisable for new plant initial start-up as a large percentage of seal failures occur during the commissioning process.*
- (7) *If a seal leaks slightly on start-up allow a reasonable period of time for it to adjust itself. Liquids with good lubricating properties will naturally take longer to bed-in. When a seal starts out with a slight leak and get progressively less with running, it is indicative of a leakage across the seal faces and continued running will cure it.*

Where leakage occurs initially and is not affected by running it generally indicates seal damage or misalignment.

- (8) *Unless absolutely necessary **DO NOT OPEN SEAL FACES FOR INSPECTION.** After a seal has been running for some time a wear pattern is established between the two faces which microscopically mates these two faces, since it is very unlikely that the two faces can be put back together in their exact wear pattern position, disturbing the seal in any manner will probably necessitate establishing a new wear pattern, perhaps after re-lapping the mating faces.*
- (9) ***CAVITATION**:- excessive cavitation can cause seal failure, in addition to any damage which may occur in the pump. Cavitation causes severe vibration of the pump shaft, shaft deflection and bearing failure. Pump cavitation is generally*

indicated by excessive noise in the pump casing.

- (10) *Stand-by equipment having mechanical seals should not be allowed to stand idle for long periods of time. Rotate the equipment at least once a week, if only for a few moments. Better still allow a designated period for placing the unit on line. This procedure will generally only take a minimum period of time and effort as almost all stand-by and duty equipment have common suction and delivery pipework.*
- (11) *It should be borne in mind that the driver alignment is checked at our works prior to despatch, however, this should be re-checked after final installation at site. Also the effect of pipework strain is well documented as to the damage it can cause to pump bearings and seals. Pipework should be of the correct size, properly aligned and adequately supported with expansion bellows fitted if necessary. The pump suction and delivery branches should not be used as pipework supports.*
- (12) *Long term storage;- It is recommended that mechanical seals left in storage for over 2 years are returned to the manufacturer for inspection. For seals already installed in the equipment;- Pumps subject to long term storage (over 1 year.) are best stored without the mechanical seals being fitted or with the seal installed on the shaft but left unclamped (i.e. untensioned) in its final set position. Seal installation and setting (tensioning) should only then be carried out shortly before the actual start-up of the equipment.*

(A) *Removing the complete seal :-*

Remove the seal unit from the equipment. Any adapter ring/abutment collar can be left on the shaft, located in its correct position. The seat and its sealing component(s) can also be removed. The seat is to be cleaned and de-greased before being coated in a film of oil and sealed in polythene wrapping. All PTFE and elastomer parts can be disassembled, dried and stored in black plastic bags before being kept in a cool, dark area. The seal unit is to be totally dried and stored in polythene wrapping or a bag containing a moisture absorbing agent, (e.g. a bag of silica gel). The rotating shaft and seat recess/abutment on the equipment should be thoroughly cleaned, de-greased and dried before being protected from corrosion for the duration of its time in storage.

(B) *Leaving the seals in the equipment:-*

*Pumps equipped with double seals;- The seal chamber is to be filled with ethylene glycol with an inhibitor to prevent corrosion. Suction and discharge flanges are to be covered to exclude the ingress of dirt. Covers should be marked:- **DO NOT REMOVE UNTIL EQUIPMENT IS INSTALLED**. The open area between the glandplate and shaft or shaft sleeve, is to be protected from airborne dirt, (e.g. with masking tape or suitable glued in rubber gasket ring, that has a close clearance with the shaft/ sleeve O.D). If at all possible, the shaft should be rotated slowly by hand in the direction of the normal equipment approx. once every week.*

*Pumps equipped with single seals; -The seal chamber should be completely dry. The seal faces should ideally be assembled dry also. If hydrostatic or acceptance testing is to be done by the equipment manufacturer, then the seal area must be flushed clean and totally dried afterwards. Pumps on cryogenic duties should be drained from the lowest point, and then blown through with dry, hot air or nitrogen, for at least 30 minutes. Suction and discharge flanges are to be covered to exclude the ingress of dirt. Covers should be marked;- **DO NOT REMOVE UNTIL EQUIPMENT IS INSTALLED**. The open area between the glandplate and shaft sleeve, is to be masked to exclude dirt. All open ports in the gland, adapter plate and stuffing box are to be plugged and sealed. Clamp bolts can be loosened off approximately 3 turns of the thread to relax the spring loading. The corresponding gap left between the stuffing box face and the glandplate should be masked to exclude dirt. If the shaft has to be rotated by hand occasionally to comply with the bearing manufacturers recommendations, then the sealing faces should be coated with a light film of clean lubricating oil.*

IF THE PUMP IS TO BE STORED IN-SITU, THEN IT IS RECOMMENDED TO DISCONNECT ALL ELECTRICAL CONNECTIONS TO THE PUMP MOTOR OR AT LEAST EARTH THE PUMP CASING.