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Technical Guidelines for Converting Greased Bronze Wicket Gate & Linkage Bushings to Self-Lubricated ThorPlas-Blue

Mating Surface (wicket gate stem outer diameter)

- Surface should typically have a minimum hardness of 20 Rockwell C to reduce risk of abrasive wearing of the journal surface.
- Surface should be smooth & free of corrosion.
- Surface should be of a corrosion resistant material – typically this is achieved by using a stainless steel sleeve fitted over the gate stems, or metallization surface treatments (HVOF, hard chrome, etc.).
- In the case of gates that are already made of stainless steel, the additional sleeve may not be necessary.
- Surface finish should be 0.8 – 1.6 micrometers Ra (32 - 63 micro-inch).
- Machining of finished gate stem diameter should be within an h6 size tolerance.

Mounting Surface (housing inner diameter)

- Housing surface should be smooth & free of severe corrosion or pitting in the area where the bushing is to be fitted. Large voids or holes should be repaired with metal putty or similar.
- Accurate housing measurements should be used for sizing bearings, ideally taking a total of four measurements per opening (at the top and bottom of the bore, and in both X & Y directions).
- Machining of newly machined housings should be within an H7 size tolerance on diameter (this will not normally be achieved when measuring existing housings).

Fitting of Seals

- O-rings, or lip seals should be fitted with the ThorPlas bushings directly above and below the wicket gate when possible, in order to minimize entry of abrasive water into the bearing space.
- These seals may be integrated into the ID of the bearing, or fitted separately into the housing.
- These seals may also serve the function of sealing the head cover against water leakage, or separate seals or packing may be fitted depending on turbine design.
- Lip seals generally provide superior sealing effectiveness and durability compared with o-rings in these locations, although o-rings are more economical.

Method of Securing

- Normally the ThorPlas self-lubricated bearing are secured by interference press-fit into the housing.
- Interference between finished bearing OD and housing ID should be calculated by Thordon Bearings.
- Freeze fitting may be used to reduce press-fit installation force using dry ice
- No anti-rotation or locking pins/screws are required to secure the ThorPlas bushings, the interference fit is enough.

Installed Clearance

- All self-lubricated bearings should be sized correctly in order to accommodate thermal expansion and water absorption behaviour of the material in service. Thordon Bearings will provided required minimum installed clearance.
- Bore closure effects must also be considered when determining finished bearing dimensions (ID of bearing will be reduced after fitting as a result of interference fit between bearing OD and housing ID) – different materials will behave differently, so manufacturer guidance should be followed.
- After considering maximum water absorption + maximum thermal expansion effects, a basic running clearance value is still required to ensure smooth movement of the components. Manufacturer should provide minimum installed clearance values required to prevent risk of zero clearance condition in service.
- Normally the installed clearance should be as small as possible, while respecting the thermal and water absorption behaviour of the selected material.
- Larger clearances are not normally problematic for the bearings. The upper limit of acceptable bearing clearance is determined by possible interference of components which will affect the smooth movement of the gates/linkages/etc.

Greasing or Lubrication During Assembly

- Generally greasing at time of assembly or in service should not be required for any self-lubricated bearing materials
- To ease assembly of components, a water based lubricant may be used if desired, although not required (common household dish detergent can easily be used for this purpose)
- Follow manufacturer guidelines regarding compatibility of bearing materials with any lubricants that may be used

Machining Bushings in Place

- Self-lubricated bearings should not normally require machining in-place, if correctly sized for the application and housings are in good condition.
- In some cases it may be desirable to machine the bearings in-place in order to correct problems with housing ovality or alignment between upper & lower gate positions, etc.
- If required, ThorPlas can be machined in place after fitting, with a maximum material removal of up to 10% of wall thickness.