Lubrication Requirements for SILVERLINE High Performance

Water Lubricated Bearings

The outstanding performance of the SILVERLINE bearing is dependent on an unrestricted flow of lubricant of an amount determined by operating conditions. The lubricant dissipates heat and flushes harmful abrasive matter from the bearing.

Marine bearings on struts (and continuously immersed pump bearings etc.) situated in the flow stream are adequately provided with lubricant. Bearings installed in positions of inadequate circulation or where conditions are very dirty should be provided with a forced piped flow of water. This applies particularly to stern tube bearings, dredger cutter-head bearings and industrial bearings, especially where water may not be present for start-up purposes.

Lubrication Flow Rate

Guide for Average Conditions

The following calculation can be applied for water lubrication:-

0.7 litre/hr per cm^2 of bearing projected area

Example 1

A bearing of 75mm shaft dia. x 150mm long will require a flow rate of:-
0.7 x 7.5 x 15.0 litres/hr
= 79 litres/hr approx.

NOTE: In extremely abrasive application (e.g. dredger cutter-heads) this flow rate should be increased to 1.5 - 2.0 litres/hr per cm^2.

Calculation of Minimum Forced Feed Lubrication

In applications where the bearing feed pump capacity is restricted or if it is desired to minimise the flow through a bearing the following procedure can be applied.

Assume all the heat generated by friction must be dissipated by the lubricating fluid. Find the relevant coefficient of friction and calculate the flow rate of lubricant required for the predicted speed and load.

Example 2

As previously detailed, but assuming it is known that the bearing load is 9,000 N, shaft speed is 100 rpm, and a fluted bearing is being used.

- For a bearing of 75mm shaft diameter and 150mm long, this corresponds to a bearing loading of 80N/cm^2 and a peripheral speed of approximately 4 m/s.

- For a fluted bearing an approximate coefficient of friction is μ = 0.02.

- Calculate power loss

From: $P_L = \dfrac{2\,\pi\,N}{60}\,T$

$P_L = \dfrac{2\pi\ \ 100}{60} \times \dfrac{0.02 \times 0.075 \times 8000}{2}$

P_L = 63 watts

Where

P_L	=	Power loss (watts)
N	=	Shaft speed (rpm)
T	=	Torque (Nm) = $\dfrac{\mu dl}{2}$
μ	=	Coefficient of friction
d	=	Shaft diameter (M)
L	=	Load (N)

- Now, power loss = heat gained by water

$P_L = CP \times \theta \times M$

where

CP	=	Specific heat capacity 4200/kg°C (for water)
θ	=	Temp rise 5°C (say)
M	=	Mass flow rate (kg/s)

Hence

$M = \dfrac{P_L}{CP \times \theta}$

but density of water = 1 kg/litre

Volume flow rate = M x 3600 l/hr

$= \dfrac{63}{4200 \times 5} \times 3600$

= 10.8 l/hr

NOTE: The feed water should be clean filtered supply. For lubricants other than water and at temperatures above 200°C Dellner Polymer Solutions Ltd specific recommendations should be sought.