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Quantifying effects of moisture-contaminated lube oil on machine life

Last month's column dealt with lube oil particulate contamination and its detrimental effect on bearing life. This month, we will examine the life extension factor (LEF) that accompanies changing from moist oils to drier lubricants.

Using data published by Tulsa, Oklahoma-based Noria Corporation (www.noria.com), we can enter Table 1 at a current, known moisture level, and move across to an achievable reduced moisture level. The resulting LEF can be read on the top line.

Obviously, excluding moisture and/or solid contaminants from bearing housings and other machine shaft penetrations will have economic benefits. However, inexpensive bearing housing seals, such as lip seals, are prone to wear. Most rotating labyrinth seals ("bearing isolators") have an air gap and will allow air-borne contaminants to reach both lube oil and bearings. Spring-loaded mechanical seals are either too expensive or take up too much space.

Fortunately, we know from several decades of aerospace experience that magnetic seals similar to the industrial version shown in Fig. 1 have often been certified serviceable after well over 50,000 operating hrs. Justifying their use is now made easy. We simply multiply the LEF for reduced particle contamination shown in last month's column with the LEF for improved oil dryness obtained from Table 1. We can assume, with reasonable certainty, that our bearing life will either increase in that proportion or will reach the manufacturer's stipulated bearing L-10 life. The greater of the two should be used in the justification calculation.

Here is an example. Say, the two LEFs are 3 and 4, respectively. The product of the two numbers is 12. Our present "contaminated" bearings last 1.9 yr, but have a load and speed-dependent L-10 life of 84,000 hrs, or 9.6 yr. We could now reasonably expect that with hermetically sealed bearing housings, i.e., bearing housings with plugged vents and oil cleanliness assured by retrofitting magnetic seals, bearing lives of 9.6 yr will be reached.

Bearing life will thus be extended five-fold and several repairs will be avoided. With suitable magnetic seals typically costing considerably less than even one single repair, such upgrades are almost always cost-justified. **HP**

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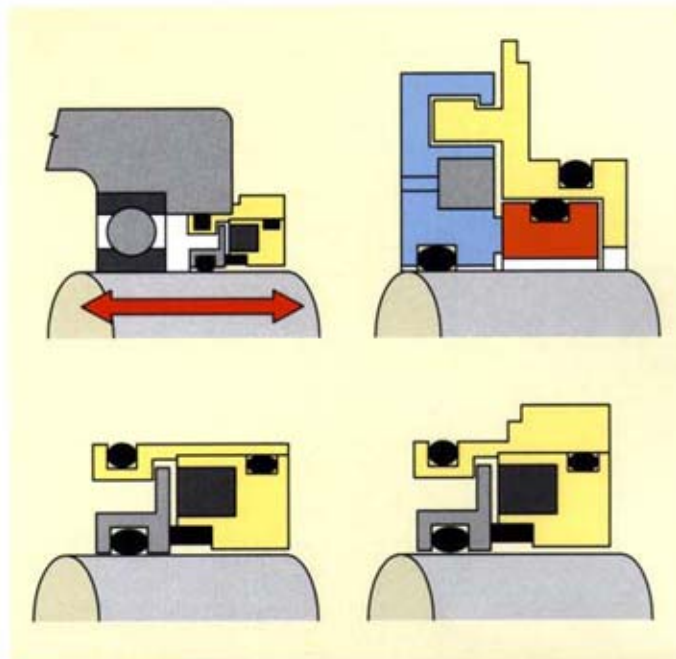


FIG. 1 Magnetic cartridge-type bearing housing seals (Source: Isomag Corp., www.isomag.com).

Table 1. Effect of moisture content on machine life

Current moisture level, ppm	Life extension factor (LDF)									
	2X	3X	4X	5X	6X	7X	8X	9X	10X	
50,000	12,500	6,500	4,500	3,125	2,500	2,000	1,500	1,000	782	
25,000	6,250	3,250	2,250	1,563	1,250	1,000	750	500	391	
10,000	2,500	1,300	900	625	500	400	300	200	156	
5,000	1,250	650	450	313	250	200	150	100	78	
2,500	625	325	225	156	125	100	75	50	39	
1,000	250	130	90	63	50	40	30	20	16	
500	125	65	45	31	25	20	15	10	8	
250	63	33	23	16	13	10	8	5	4	
100	25	13	9	6	5	4	3	2	2	

In the above example, reducing water content of an oil from 500 ppm to 45 ppm would increase the machine life by 4 (400%).



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