FERROLUBRICANTS

by

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Magnetic fluids have been formulated into stable suspensions which have potential applications as bearing lubricants in switches, rotary shaft seals, and separation processes. Various classes of lubricants have been formulated into magnetic fluids and are currently being included in the design of rolling element and journal type bearings. The advantages of utilizing magnetic fluids in bearings are that little or no maintenance will be required in these systems. The bearings currently being designed have application both to high speed, high load, and high-speed lightly-loaded industrial equipment.

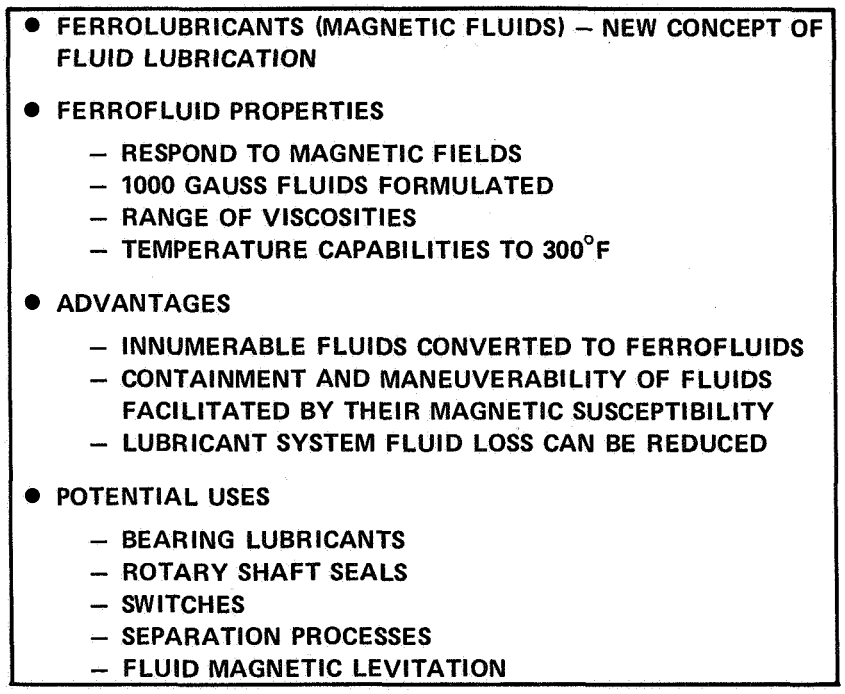

Figure 1. Ferrolubricants.

OIL	PROPERTIES
KRYTOX 143AZ (PERFLUORINATED ETHER)	GOOD LUBRICANT VACUUM STABLE INERT
KG-80 (HIGHLY REFINED MINERAL OIL)	FAIRLY STABLE IN VACUUM GOOD LUBRICANT WITH EP ADDITIVES
BRAYCOTE 813 (PERFLUORINATED ETHER)	SIMILAR TO KRYTOX 143AZ BUT WITH HIGHER VISCOSITY
FOMBLIN Z (PERFLUORINATED ETHER)	VACUUM STABLE HIGH VISCOSITY INDEX

Figure 2. Oils chosen for conversion to ferrolubricants.

PHYSICAL PROPERTY AT 75°F	KRYTOX 143AZ		KG-80		BRAYCOTE 813	
	BASE OIL	FERRO-LUBRICANT	BASE OIL	FERRO-LUBRICANT	BASE OIL	FERRO-LUBRICANT
SURFACE TENSION (dynes/cm)	16	15	35	32	23	22.5
DENSITY (gm/cc)	1.86	1.91	0.87	0.92	1.85	1.90
VISCOSITY (cp)	30	37	130	150	940	–
VISCOSITY (cp) (MAG. FIELD PERPENDICULAR TO ROTATION	–	50	–	225	–	–

Figure 3. Physical properties of 100 gauss ferrolubricants at 75° F.

FUNCTIONAL TESTS

- **THERMAL CYCLING**
- **VISCOSITY TESTS AS FUNCTION OF:**
  - **TEMPERATURE**
  - **VARIOUS SHEARING RATES**
- **ABRASION/POLISHING CHARACTERISTICS IN R4 BEARING TESTS**

Figure 4. Functional properties of 200 gauss KG-80 ferrolubricant.

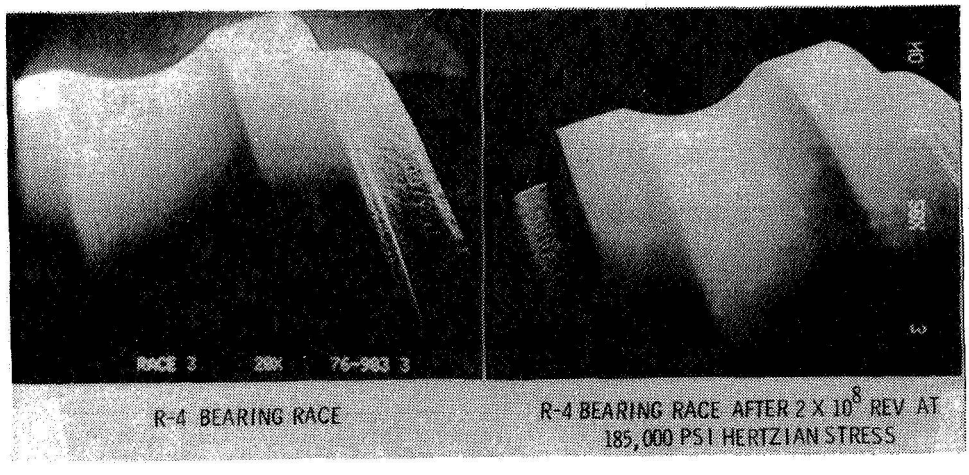

Figure 5. Ferrolubricated R-4 bearing tests.

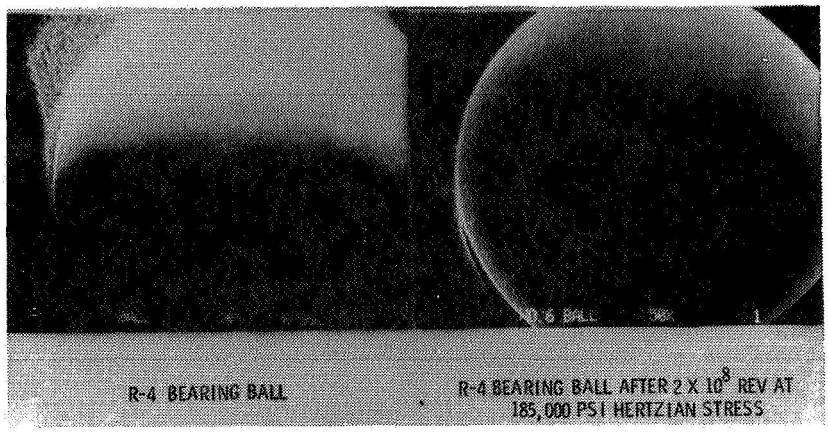

Figure 6. Ferrolubricated R-4 bearing tests.

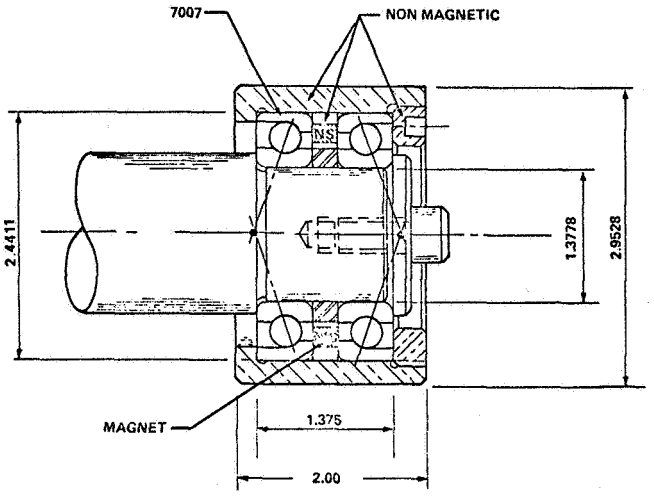

Figure 7. Ferrolubricated ball bearing.

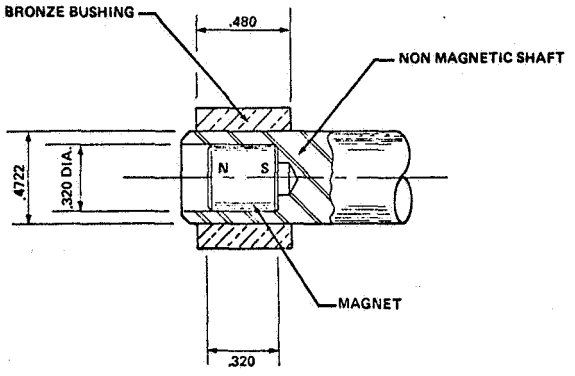

Figure 8. Ferrolubricated journal bearing.

- 815Z OIL CONVERSION STUDIES
- FERROLUBRICATED BALL AND JOURNAL BEARING TESTS
- EXTEND STUDIES TO OTHER BEARINGS
- APPLICATION TO INDUSTRIAL PROCESSES

Figure 9. Future work in ferrolubricants.