APPLICATION OF THE MAGNETIC FLUID ON HIGH-SPEED SHAFT SEALS

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ABSTRACT

In general, if there is a relative motion between mechanical parts, the conventional mechanical seals fail to function rapidly. The characteristics of the magnetic fluid is utilized to position the magnetic fluid in the place of seals. The potential energy of the magnetic fluid due to the influence of magnetic field is able to sustain the pressure difference on both sides of the seals and thus the seals to meet the requirements of relative motion, high pressure, or high degree of vacuum can be achieved. So use of the magnetic fluid has the following characters：high seal level, no need for the accurate surface polishing, no friction loss generally occurred in conventional seals, no contamination due to friction, no high temperature and noise due to friction, longer usage life and low maintenance. In this project, the suitable oil-based magnetic fluids is chosen. The saturation magnetization MS and viscosity of oil-based magnetic fluids will be measured in order to understand physical properties. Next, the influence on the ability of seal to sustain the pressure difference between two sides of seals due to variations of the design parameters will be studied systematically and tested on experiment. The design parameters are the geometric shape of the seal, the strength of applied magnetic field, the speed of rotated shaft. The main objective of this research is to sustain the pressure difference between two sides of seal on high-speed of rotating shaft. However, because the magnetic fluid is a new, advanced materials and also magnetic fluid seal is a new type of seal, there is little knowledge and technology accumulated. Thus, the works of this project are concentrated on the design parameter variation and the establishment of the corresponding database of magnetic fluid seals instead of the manufacture of the product.

Keywords : Magnetic Fluid ; High-Speed Shaft Seals

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REFERENCES

1."磁性流體理論應用",黃忠良 編撰 (1988). 2."ADVANCES IN FERROFLUID TECHNOLOGY, " BY K. RAJ ET AL., JOURNAL OF MAGNETISM AND MAGNET -IC MATERIALS (1995). 3."MAGNETIC FLUIDS ENGINEERING APPLICATIONS," BY B.M. BERKOVSKY, V.F. MEDVEDEV, AND M.S. KRAKVO VOL.128 (1993). 4."MAGNETIC FLUIDS GUIDEBOOK: PROPERTIES AND APPLICATIONS," BY V.E. FRETMAN (1990). 5."DESIGNING WITH FERROFLUIDS," BY RONALD MOSKOWITZ, MECH-ANICAL ENGINEERING, FEBRUARY (1975). 6."FLUID DYNAMICS AND SCIENCE OF MAGNETIC LIQUIDS," BY RONALD E.ROSENSWEIG (1979). 7."A REVIEW OF DAMPING APPLICATIONS OF FERROFLUIDS," BY K. RAJ AND R. MOSKOWITZ, IEEE TRA -NSACTIONS ON MAGNETICS, VOL. MAG-16, NO.2, MARCH 1980. 8."SEMIACTIVE CONTROL OF ELECTROMAGNETIC DAMPER BY NEURAL NETWORKS AND FUZZY REASONING," BY KANAMORI, MITURU; ISHIHARA, YOSHIYUKI; TODAKA JAPAN SOCIETY OF MECHANICAL ENGINEERS, PART C V 59 N 566, 3003 (1993). 9."VISCOSITY, RESISTIVITY AND SURFACE TENSION MEASUREMENT OF FE3O4 FERROFLUID," BY M.S. DABABNEH, AND N.Y. AYOUB, AND I. ODEH, AND N.M. LAHAM, JOURNAL OF MAGNETISM AND MAGNETI -C MATERIALS 125, P34-38 (1993). 10."矽油基磁性流體與減振",洪振義,徐俊仁,14TH CSME全國學術研討會,固體與設計論文集,第594頁, 1998. 11."矽油基磁性流體之合成及在減振上之應用"大葉大學碩士論文,徐俊仁(1997). 12."磁流體軸封之應用研究"大葉大學碩士論文,謝其昌(1999)