NASA TECH BRIEF

Lewis Research Center

Lubricant Selection for Gear Designers

A guide for gear designers, consisting of theory, calculations, charts, curves, and references, has been written that considers the lubrication requirements for gears to insure maximum performance. Mechanical and service variables are considered in order to obtain optimum gear performance under severe operating conditions.

The lubricant in gearing prevents failure under several modes of operation, such as boundary lubrication, mixed lubrication, and full elastohydrodynamic (EHD) film operation. In EHD lubrication, the contacting surfaces under high loads such as those obtained in gears and bearings, elastically deflect. These surfaces are separated by a thin EHD lubricant film, which is a few microinches thick.

Gears operating under boundary and mixed lubrication require added protection. This protection is provided by extreme pressure and anti-wear additives to prevent failures.

The predominant mode of failure in gears that must operate at high speed and transmit high loads is scoring. Basically, scoring results from a breakdown in the lubricant and/or boundary film separating the load carrying members. At the operating load and speed, the lubricant is expected to provide an unbroken film between the teeth or load-carrying members, and cool the gear so that the film of lubricant does not become too thin. Factors that can affect the start of scoring are described in the guide.

In many applications, gears operate with a full EHD film. The method of EHD film formation and how the lubricant properties affect the film are presented and discussed. An analytical method for determining EHD film thickness and how the film affects gear failure are also reviewed. Using the principles and theory discussed in the guide, design procedures for EHD application have been outlined.

Notes:

1. The following documentation may be obtained from:
   National Technical Information Service
   Springfield, Virginia 22151
   Single document price $3.00
   (or microfiche $0.95)

   Reference: NASA-TM-X-52942 (N71-14785),
   Lubrication Considerations in Gear Design

2. Technical questions may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B72-10136

Patent Status:

No patent action is contemplated by NASA.

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