

SECTION 1

Basic Elements of Lubrication

INTRODUCTION

Lubrication of operating equipment is an essential function of maintenance. It is an important factor in sustaining production, reducing delays, and lowering maintenance costs.

If equipment is expected to produce enormous tonnages and operate under increasingly heavier loads, it is necessary to maintain it in such a way that it can operate for the longest possible time without excessive wear and breakdown. The men who lubricate the equipment play a key role in the achievement of this aim.

FUNCTIONS OF LUBRICANTS

LUBRICANTS

Reduce friction and wear:

Unless an adequate lubricant is present between the moving parts that are in contact, friction and wear will be **EXCESSIVE** and the machine will soon cease to operate.

Lubricants also have other important functions:

For example, they carry away **HEAT** from bearings and running parts.

They often aid in sealing against **DIRT**.

They protect metal surfaces against **RUST** and corrosion.

Sometimes, as in hydraulic equipment, the lubricant actually serves to transmit **POWER** from one part of a machine to another.

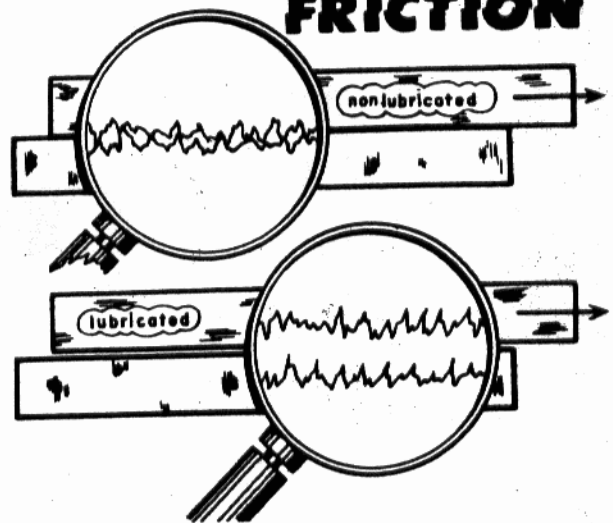
Reduce Friction—How does a lubricant reduce **FRICITION**? Suppose we place two steel blocks with smoothly ground surfaces one on top of the other. If we pull on the top block with a certain force, we can slide it over the bottom block. When we measure this force, we find it requires a pull of perhaps fifteen pounds to move the top block. Now let us place some oil between the blocks and again measure the pull required to move the top block. With oil between the blocks, we find that a pull of only two and a half pounds is required to slide the top block. We say that the oil has reduced the **FRICITION** between the two blocks.

If we were to look at the surfaces of the steel under a powerful microscope, we would see that they **ACTUALLY** contain minute peaks and valleys which **INTERLOCK** and

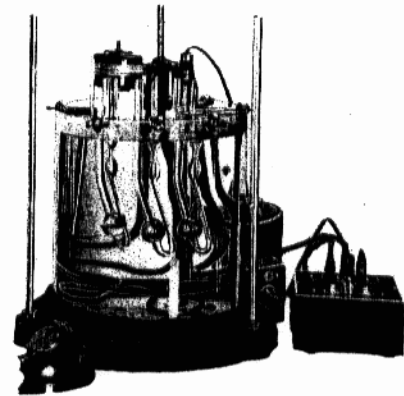
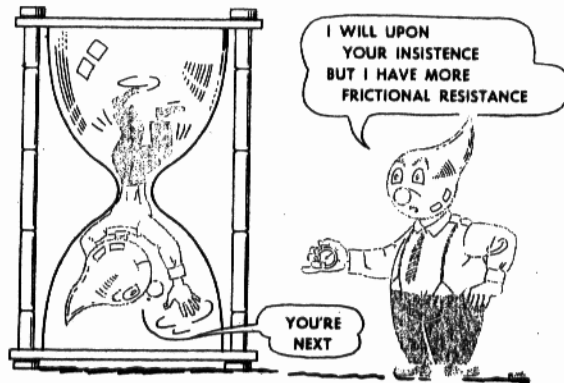
prevent the blocks from sliding freely. When oil is present between the blocks, the blocks are separated and the small peaks and valleys can **NO LONGER** interlock. The top block can then slide very freely over the bottom block.

LUBRICANTS REDUCE

FRICITION



This also explains the manner in which a lubricant reduces wear. If they were not lubricated, some of the small peaks would be **BROKEN OFF** as one block moves over the other. Eventually, this would result in visible wear on the blocks. The peaks **CANNOT** contact each other with lubricant present and wear is reduced accordingly.



WHAT IS KINEMATIC VISCOSITY?

Kinematic viscosity is the time required for a fixed amount of an oil to flow through a capillary tube under the force of gravity. The unit of kinematic viscosity is the stoke or centistoke (1/100 of a stoke). Kinematic viscosity may be defined as the quotient of the absolute viscosity in centipoises divided by the specific gravity of a fluid, both at the same temperature—

$$\frac{\text{Centipoises}}{\text{Specific Gravity}} = \text{Centistokes}$$

WHY THE TEST?

The test is a precise viscosity measurement of fluids.

WHAT IS ABSOLUTE VISCOSITY?

Absolute viscosity is the tangential force on unit area of either one of two parallel planes at unit distance apart when the space is filled with liquid and one of the planes moves relative to the other with unit velocity in its own plane. The unit of absolute viscosity is the poise (which has the dimensions, grams per centimeter per second). The centipoise is 1/100 of a poise and is the unit of absolute viscosity most commonly used.

TYPICAL RESULTS

$$225 \times 0.1200 = \underline{27.0} \text{ Centistokes}$$

Where 225 seconds = Flow Time

0.1200 cs/sec = Viscometer Constant

