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Subject Interim Report #2 on Prod Test

#105-17-P Kab Evaluation of Proposed Lubricants

To Simon Mackay-Smith

From S.G. Bankoff

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INTERIM REPORT NO. 2 ON PRODUCTION TEST NO. 108-17-P

LABORATORY EVALUATION OF PROPOSED LUBRICANTS

COPY 1

THIS DOCUMENT CONSISTS OF 5 PAGES NO. 2
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Interim Report No. 2 on Production Test No. 106-17-F
Laboratory Evaluation of Proposed Lubricants

Introduction

The lubricant (Calol A-60) used to reduce pushing forces when discharging slugs from pile tubes forms a cloudy emulsion with water. During the initial period of operation at 100 B and D areas, spillage of lubricant during discharge produced so much cloudiness in the basin water that it interfered with sorting operations. At the request of the F Department an investigation was started to see if a lubricant could be found that would effectively lubricate tubes during discharge and which would form optically clear systems when mixed with water. This report presents the data on a number of lubricants which were suggested for test.

Summary

With the exception of glycerine and freshly diluted FI-115 all the lubricants tested formed cloudy emulsions with water. Also with the exception of glycerine, 25 emulsions of these lubricants reduced the sliding coefficient of friction between aluminum and aluminum to 39-63% of what it was using water alone. The results are reported in Table I. Since the standard plant lubricant, Calol A-60, was substantially as effective as the other products tested in reducing friction desired optical tube ribs, and since none of the effective lubricants had the recommended a change from Calol. Furthermore, during the course of this investigation, plant operating procedures were changed so that the oily effluent from tubes during discharge was collected in a discharge manifold and passed directly into the process sewer. This prevented contamination of the basin water by the lubricant, and made the search for a non-clouding lubricant no longer significant.

Experimental Details

The results are given in Table I and the relative optical transmittance of lubricant-water mixtures are presented in Figure 1. Data for the curves were obtained by the Instrument Development and the Analytical Sections of the Technical Department. The results are given as percent transmittance of light from a tungsten source through 42.8 cm. of the test mixture to a type 5-3 phototube as compared to the transmittance through an equivalent length of distilled water. The values so obtained give a qualitative measure of the relative clarity of the mixtures. No attempt was made to make refined or quantitative measurements.

The lubricity tests were made by submerging a short section of ribbed aluminum tubing containing an aluminum jacketed lead dummy in a bath of the lubricant-water mixture, and determining the angle of inclination at which the dummy just continued to slide down the tube after being displaced slightly. These angles, in comparison to the angle when water alone was used, are a measure of the relative effectiveness of the respective lubricants in reducing sliding friction.

H. WORTHINGTON, CHIEF SUPERVISOR
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Table I
Relative Clarity and Lubricity of
Lubricant-Water Mixtures

<u>Lubricant</u>	<u>Volume % Lubricant</u>	<u>% Transmittance*</u> <u>(water = 100%)</u>	<u>Min. angle for sustained</u> <u>motion aluminum on aluminum</u>	<u>Notes</u>
Water		100%	23 - 27°	
Hydramite	0.002%	84	--	
	0.01	73	--	
	0.1	40	--	
	0.5	--	21	
	1	18	18	
	2	--	13	
	4	--	11	
	100	--	11	
Tenneco Soluble Oil "C"	0.002%	87	--	
	0.01	8	--	
	0.1	0.0	--	
	0.5	--	18	
	1	0.0	18	
	2	--	14	
	4	--	13	
	100	--	10	
Textile Softener #3 (DuPont)	0.002%	79	--	
	0.01	62	--	
	0.1	11	--	
	0.5	--	11	
	1	0.0*	11	
	2	--	10	
	100	--	9	
"Calal" (Std. Oil of Cal.)	0.002%	86	--	
	0.01	8	--	
	0.1	0.0*	--	
	0.5	--	18	A
	1	0.0*	12	
	100	--	10	
Virgo Oil S&W (Shell)	0.002%	10.5	--	
	0.01	0.0	--	
	0.1	0.0	--	
	0.5	--	11	B
	1	0.0	10	
	2	--	9	
	100	--	8	
DuPontol "C"	0.002%	87	--	
	0.01	78	--	
	0.1	20	--	C
	1	0.3	13	
	2	--	11	

Table 1 Cont'd.

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Lubricant	Volume % Lubricant	% Transmittance* (water = 100%)	Min. angle for sustained motion aluminum on aluminum	Notes
Glycerine	0.002%	88	--	D
	0.01	88	--	
	0.1	76	--	
	1	61	20	
	100	--	17	
PL-118 (DuPont Organic Chemicals Dept.)	0.01	79	--	E
	0.1	60	--	
	2.5	--	18	
	1	14	13	
	100	--	11	

- Notes:
- A) Present plant lubricant
 - B) Difficultly emulsifiable
 - C) Heavy solution
 - D) Pure glycerine does not wet the aluminum ribs.
 - E) Water solutions are quite clear when fresh, but on standing for a few hours become cloudy and form a white precipitate.
 - * These transmittances were measured with a 42.5 cm. column using a focussed tungsten light beam. Based on the assumption that a transmittance of at least 10% through 16 ft. of water is necessary for visibility in the pit, all solutions showing transmittances greater than 80% in this apparatus would permit underwater viewing.

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