



November 11, 2020

TD 20030-01-03

Dear Ms. Yan,

Laboratory analysis has been completed on the three samples of used Lubrication Engineers 1233 Almatek® General Purpose Lubricant, that were taken from three different bearings, servicing a Yieh Phui Enterprise overhead traveling crane. The purpose of our analysis was to identify the condition of the grease samples from each bearing. This analysis was requested after the bearing bushing was damaged three individual times. A new sample was not provided to verify the new lubricant meets LE QC specifications; however, typical results of new LE 1233 have been added to our analysis for comparison purposes only. Our results are attached for your review.

Results

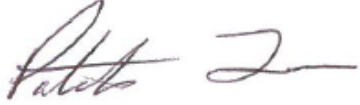
All three grease samples delivered for analysis seem to be in similar conditions. The samples were marked as sample A, B, and C respectively. All three samples have fallen in NLGI grade from original QC levels and the dropping point has decreased slightly. Infrared analysis suggests that each sample is oxidized; however, these results are typical of used LE 1233. Elemental analysis reveals abnormal levels of wear and contamination. The majority of wear is identified as iron and lead, while the contamination is silicon and sodium (likely environmental contaminants).

Conclusions and Recommendations

The overall condition of the samples is poor, and our analysis suggests each sample has reached the end of its useful life. The samples show a decrease in NLGI grade and dropping point, while elemental analysis reveals abnormal amounts of wear particles and contamination. While we did not receive the current re-lubrication practices, these results are not unexpected for used LE 1233 that is being used in high temperature environments that do not get re-lubricated frequently enough. Our analysis suggests the re-lubrication interval should be verified and likely shortened to maintain fresh grease in the application. Re-lubricating more frequently should yield more consistent performance and reduce bearing failures.

If you have any questions or need further assistance, please do not hesitate to let us know.

Sincerely,

A handwritten signature in black ink, appearing to read "Patrick Loe". The signature is fluid and cursive, with a long horizontal stroke at the end.

Patrick Loe, CLS
Technical Services Engineer
/bf

LABORATORY ANALYSIS

LOCATION: Yii-Kei Trading - LE Taiwan

UNIT ID: Sample A, B, & C

GREASE TYPE: LE 1233

SAMPLE ID: TD 20030-01-03

UNIT TYPE, MFG, MODEL: Overhead Traveling Crane, Yieh Phui Enterprise, EF-02

DATE	-	October 2020	October 2020	October 2020		
LAB NUMBER	-	TD 20030-01	TD 20030-02	TD 20030-03		
GREASE SERVICE TIME	-	UNKNOWN	UNKNOWN	UNKNOWN		
TEST	UNITS	Typical New LE 1233	A Sample	B Sample	C Sample	
LUBRICANT PROPERTIES						
Texture/Appearance	No Unit	Stringy/Red	Smooth/Brown	Smooth/Brown	Smooth/Brown	
1/4 Scale Penetration, ASTM D1403 - Worked, 60 strokes	0.1 mm	265-295	365	335	320	
Dropping Point - ASTM D2265	°C	195	158	181	185	
ELEMENTAL ANALYSIS - ASTM D5185						
Wear Metals	Aluminum/Al	ppm	229	1356	374	1077
	Antimony/Sb	ppm	286	153	182	187
	Cadmium/Cd	ppm	0	0	0	0
	Chromium/Cr	ppm	0	71	8	55
	Copper/Cu	ppm	0	176	68	507
	Iron/Fe	ppm	251	9872	1101	8113
	Lead/Pb	ppm	0	197	0	121
	Manganese/Mn	ppm	3	298	19	193
	Nickel/Ni	ppm	0	17	0	0
	Silver/Ag	ppm	0	0	0	0
	Tin/Sn	ppm	0	0	0	0
Additives	Titanium/Ti	ppm	36	221	54	258
	Vanadium/V	ppm	0	0	0	4
	Barium/Ba	ppm	10	62	18	80
	Calcium/Ca	ppm	414	8340	540	4561
	Magnesium/Mg	ppm	318	3501	545	2990
	Molybdenum/Mo	ppm	0	0	0	0
Contam.	Phosphorus/P	ppm	0	0	0	0
	Zinc/Zn	ppm	336	2298	335	1734
	Boron/B	ppm	0	0	0	0
	Potassium/K	ppm	135	461	203	364
	Silicon/Si	ppm	545	3542	880	3173
	Sodium/Na	ppm	9	375	0	264