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Rock Island Arsenal Laboratory



TECHNICAL REPORT

EVALUATION OF GREASES SPECIFIED BY AUTOMOBILE
MANUFACTURERS FOR USE IN EXTENDED LUBRICATION OF CARS

By

S. Fred Calhoun



Department of the Army Project No. 593-21-060

Ordnance Management Structure Code No. 5010.11.801

Report No. 62-2333

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IEL 1-8-107-2

Date 3 July 1962

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Approved by:

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Laboratory Director

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Rock Island Arsenal
Rock Island, Illinois

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ABSTRACT

Six commercial greases of the type specified by automobile manufacturers for use in late model cars of the extended lubrication type were secured from a grease manufacturer. The greases were tested according to the requirements of Specification MIL-G-10924B and in addition, for water washout and for antiwear and extreme pressure characteristics. The greases were all found to be below the specification standards in one or more of the following requirements: corrosion protection, antirust properties, apparent viscosity at low temperatures, mechanical stability and water stability. They gave better extreme pressure results but showed no consistent improvement in antiwear over the MIL-G-10924 greases. Tabular data and photographs are included in support of the conclusions.

CONCLUSIONS

1. The greases do not furnish adequate protection against rusting or corrosion when evaluated by Military standards.
2. The resistance to mechanical breakdown is below standard for two of the greases and to consistency changes due to absorbed water for three of them.
3. The poor low temperature properties of all the greases render them inadequate for arctic uses.
4. The inclusion of molybdenum disulfide in one of the greases improved its extreme pressure properties but was detrimental to its wear resistance. The other grease was not benefited by addition of molybdenum disulfide in either wear or extreme pressure properties.
5. The antiwear properties were not significantly better than the MIL-G-10924B grease. The extreme pressure properties are generally somewhat better. Since the MIL-G-10924 greases have proven adequate in extreme pressure properties for a number of years it is questionable if the extra values exhibited by the commercial greases are necessary.

RECOMMENDATIONS

It is recommended that Specification MIL-G-10924 greases continue to be used in all Military vehicles as a general chassis and wheel bearing lubricant. It is also recommended that field tests be set up which are designed to demonstrate the ability of the grease to perform satisfactorily in 1961 and 1962 cars.

**EVALUATION OF GREASES SPECIFIED BY AUTOMOBILE
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EVALUATION OF GREASES SPECIFIED BY AUTOMOBILE MANUFACTURERS FOR USE IN EXTENDED LUBRICATION OF CARS

OBJECT

To determine the pertinent characteristics of the greases specified by automobile manufacturers for use in 1961 and 1962 automobiles, and to compare them with presently used MIL-G-10924 grease⁽¹⁾.

INTRODUCTION

The acquisition of 1961 and 1962 cars for official use by various branches of the Armed Services has resulted in a lubrication problem. The majority of the cars are of the extended lubrication type which specify chassis lubrication every 30,000 miles. The problem exists in the fact that the manufacturers specify different greases for each make of car, and often a different grease for various areas of chassis lubrication on the same car. Some manufacturers will void their warranty if nonspecified greases are used. This necessitates stocking three different greases for some makes of cars and a total of six different greases if cars of all manufacturers are used. To add to the problem, different grease fittings are employed for each type of grease. This is to prevent mixing of the different types of greases which might cause trouble due to incompatibility. This makes it necessary for each motor pool and depot to stock six different types of greases, and have in the maintenance department six different grease guns with special fittings, one for each type of grease. The logistic and maintenance problems, especially in isolated installations in foreign areas, thus becomes apparent. In addition, each installation would have to stock the presently used GAA grease and conventional lubricating equipment for use on equipment now in the system.

The multi-purpose grease, MIL-G-10924, was developed and introduced into the Military systems to eliminate the confusion and logistic problems inherent in the multiplicity of greases used at the time. Greases meeting the specification have been used for approximately twelve years and have proven satisfactory for most applications of automotive and artillery use. Industrial users are increasing and one manufacturer specifies these greases for use in road building and heavy earth moving equipment manufactured by them^(2,3). To revert to the use of several greases for automotive use would be a backward step and the undoing of the progress of the last decade.

PROCEDURE

Quantities of the six different specified greases were obtained from a lubricant manufacturer. These greases, together with a representative MIL-G-10924B grease, were tested according to the requirements of Specification MIL-G-10924B. They were in addition, tested for water washout, and for their antiwear and extreme pressure characteristics.

RESULTS AND DISCUSSION

Examination of the results found in Table I reveals that none of the greases would pass the essential requirements of Specification MIL-G-10924B. Only one of the six, the #5 calcium cup, would pass the rust preventive requirements of the specification. The results of the Rust Preventive tests are graphically illustrated in Figures 1, 2, and 3. The copper corrosion test also resulted in failure for all the greases except the calcium complex one. These two tests are considered indicative of the greases ability to resist rusting caused by the presence of water and to function in journal bearings containing copper and other alloys without deleterious corrosion.

The work stability requirement has a penetration limit of 45 units softer or 25 units harder. Both the barium greases failed in this requirement. The water stability has limits of 45 points softer or 10 units harder. The two barium greases and the calcium complex failed in this test. The water washout test is not a requirement of MIL-G-10924B but was included for purposes of comparison.

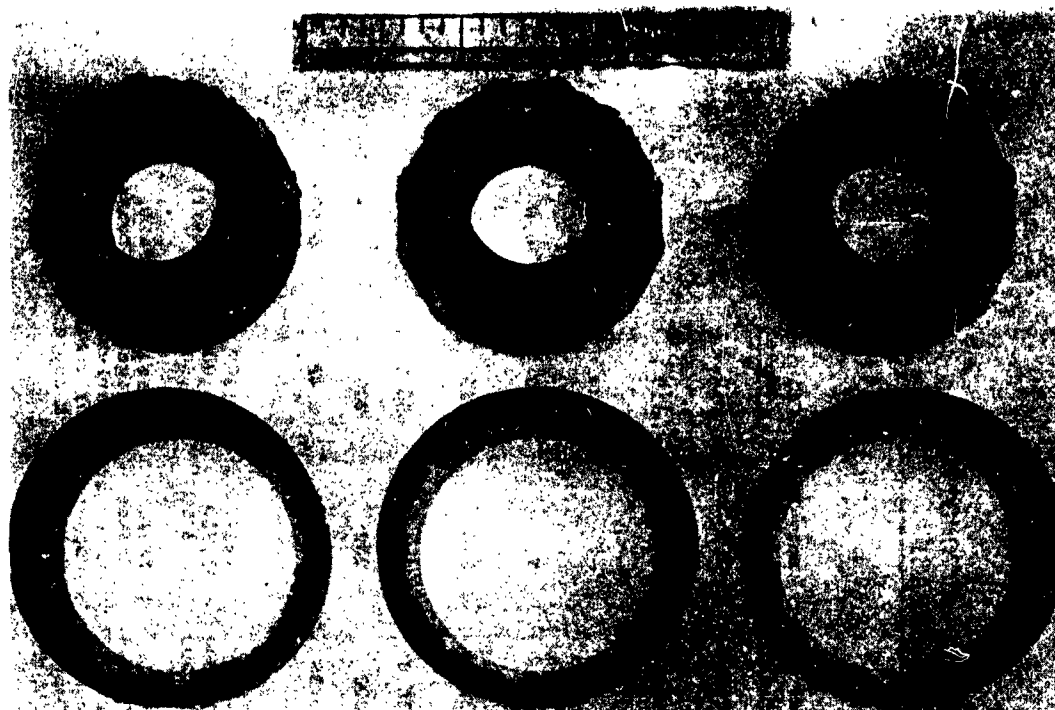
The Mean Hertz load results indicate some superiority of the greases over a MIL-G-10924 grease. This is especially pronounced in the case of the 10% moly-barium and the calcium complex. The welding loads are not substantially better except for the 10% moly-barium grease. The wear test scar diameters indicate some possible superiority for the two lithium and the calcium complex greases. Attention is directed to the fact that the inclusion of molybdenum disulfide did not reduce the wear scar diameter for either grease to which it was added. This is in line with the usual results obtained by this and other laboratories.

The apparent viscosity tests could not be determined at any lower temperatures than those recorded. All six greases were too stiff at -40°F for any tests to be made. These results indicate the inadequacy of the greases for Arctic conditions. Only four of the tests were made on the calcium cup grease because it was too stiff for any tests involving the workers.

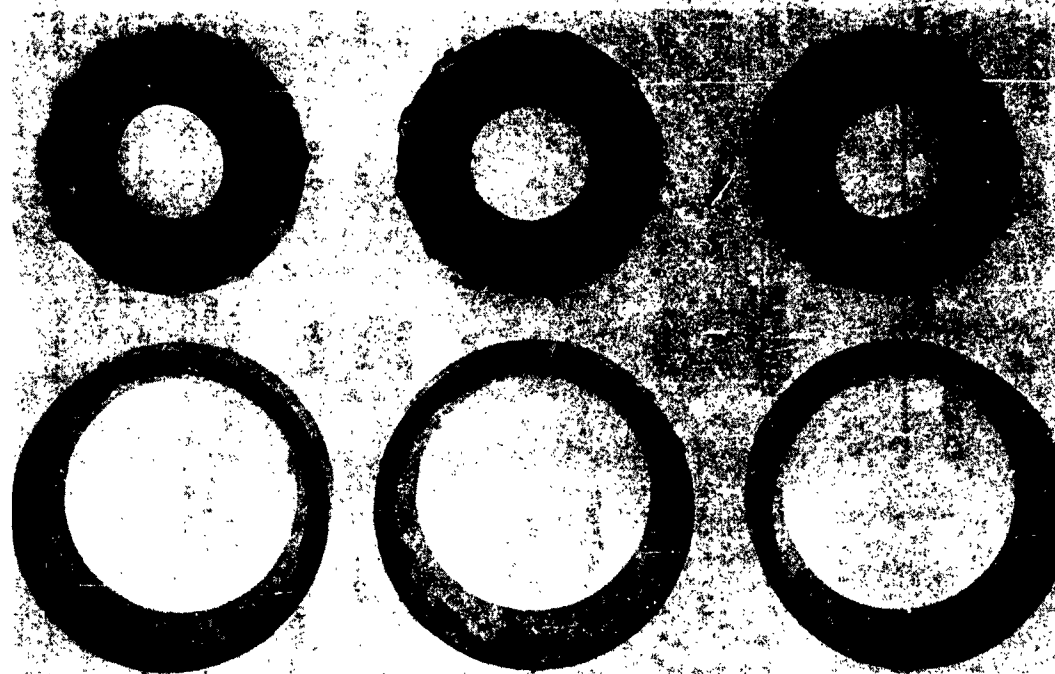
TABLE I

**COMPARISON OF MANUFACTURE SPECIFIED AUTOMOTIVE
LUBRICANTS AND MIL-G-10924B GREASE**

	MIL-G-10924B	Barium w/o Moly	10% Moly barium	EP Lithium	Moly-EP Lithium	Calcium Complex	#5 Calcium Cup
Rust Preventive - Fed. Std.- 4012 rating	1,1,1	3,3,3	3,3,3	3,3,3	3,3,3	2,3,3	1,1,1
Work Stability - Pen. change	+10	+66	+81	+30	+19	+19	Too stiff for worker
Water Stability - Pen. change	+30	+89	+73	+26	-5	-34	Too stiff for worker
Water Washout - ASTM D-1264 % washout	4.7	9.7	4.5	5.3	7.2	1.0	6.6
Worked Penetration	279	278	283	320	320	322	Too stiff for worker
Mean Hertz Load - Kgm.	23.9	27.9	59.0	30.0	31.1	50.6	-
Welding Load - Kgm.	160	160	400	200	200	200	-
Four Ball Wear - Scar diam. 40 Kg, 1200 RPM, 75°C 60 min.	0.59	0.48	0.66	0.38	0.39	0.42	0.59
Apparent Viscosity	Temp. 25 sec-1 100 sec-1	-25°F 20,700 11,300	-25°F 29,600 10,300	-25°F 16,000 10,300	-25°F 5,950 3,600	-150°F 19,000 10,500	Too stiff
Copper Corrosion	Pass. No stain on copper or in grease.	Fail. Grease separated & dark at copper.	Fail. Grease separated & grainy. Copper dk. brown.	Fail. Grease green by copper. Copper dk. brown.	Fail. Grease green by copper. Copper dk. brown.	Pass. Slight darkening of grease & copper.	Fail. Grease liquified & darkened. Copper dark brown.

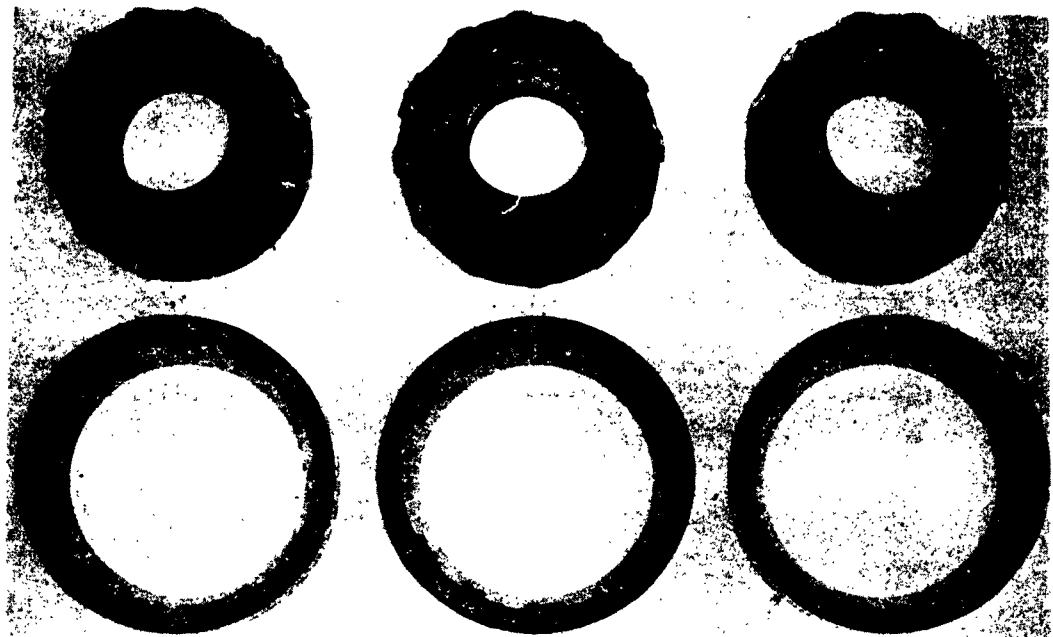


BARIUM W/O MOLY

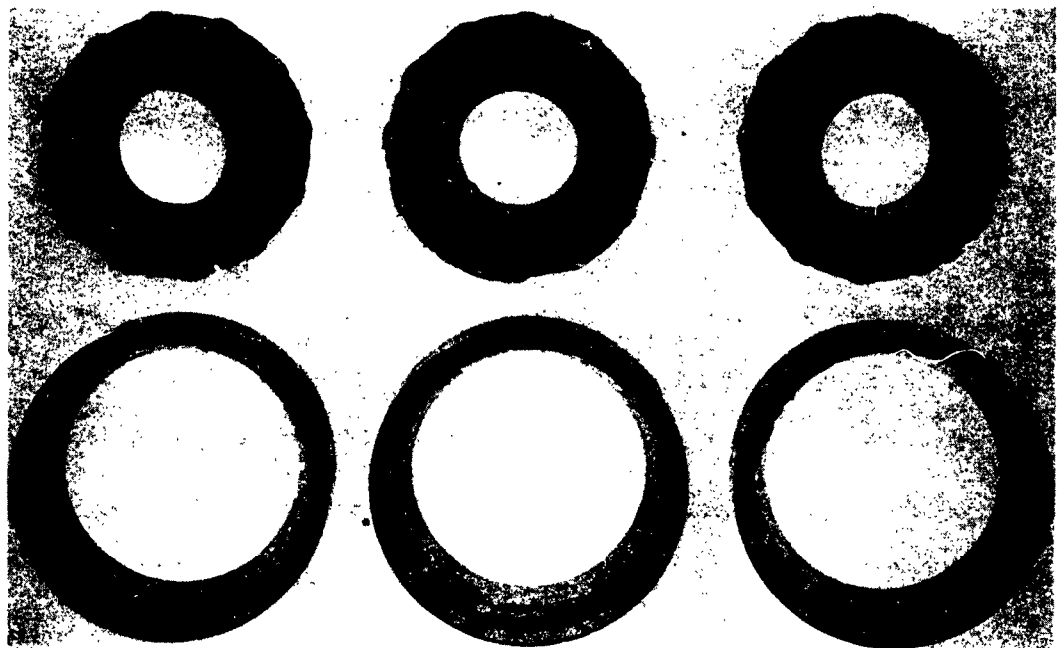


10% MOLY BARIUM

**RESULTS OF RUST PREVENTIVE TESTS ON
COMMERCIAL TYPE AUTOMOTIVE GREASES**

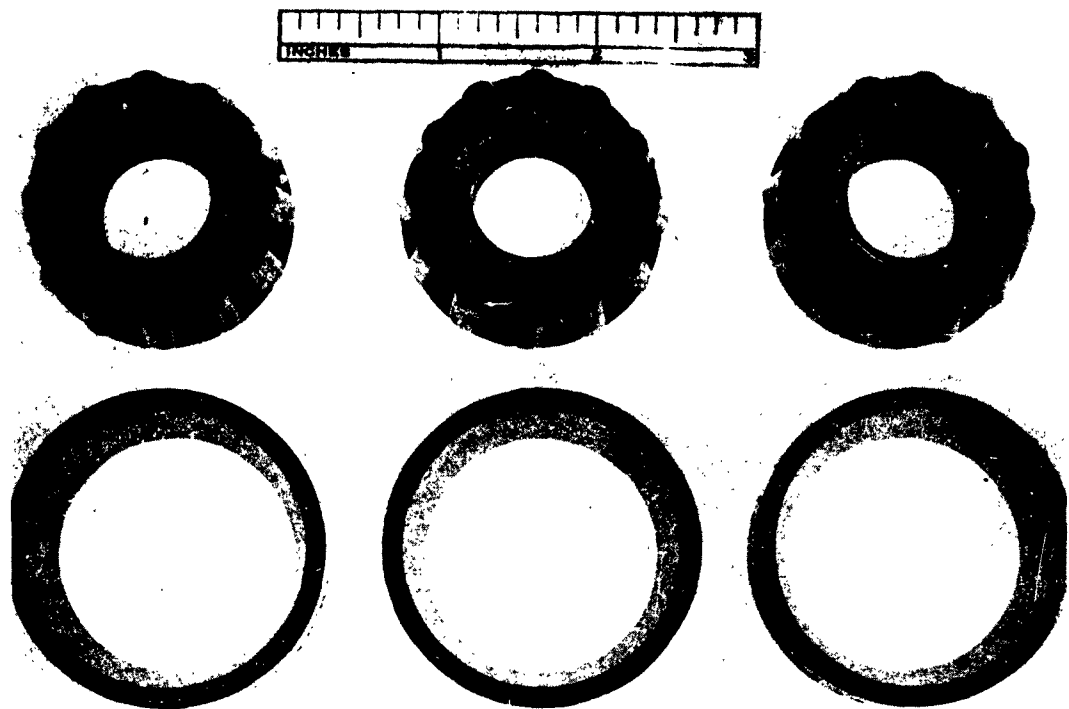


E. P. LITHIUM

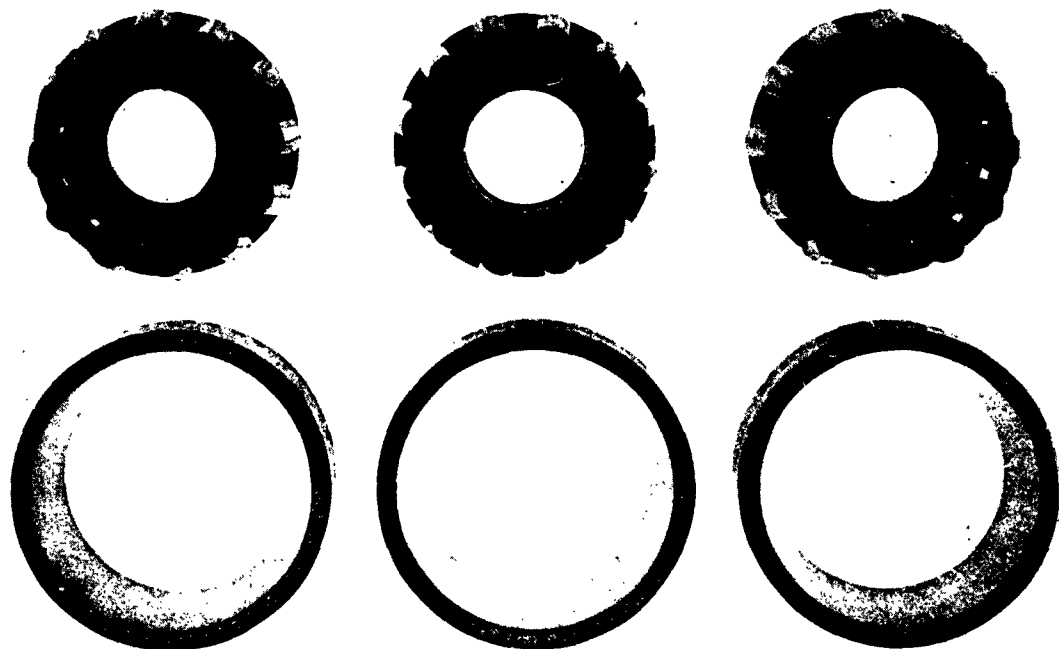


MOLY E. P. LITHIUM

RESULTS OF RUST PREVENTIVE TESTS ON
COMMERCIAL TYPE AUTOMOTIVE GREASES



CALCIUM COMPLEX



#5 CALCIUM CUP

RESULTS OF RUST PREVENTIVE TESTS ON
COMMERCIAL TYPE AUTOMOTIVE GREASES

LITERATURE REFERENCES

1. Specification MIL-G-10924B, Grease, Automotive and Artillery, 1 July 1961.
2. Brower, G. K., "Lubricating the Construction Giants", NLGI Spokesman, Vol. 21, No. 11, Page 21, February 1958.
3. Brower, G. K., "Discussion of NLGI-ASTM Symposium Paper On The Experience of the Ordnance Corps With Greases Made From Low Viscosity Oils", NLGI Spokesman, Vol. 25, No. 9, Page 284, December 1961.

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