SINGLE CYLINDER ENGINE TESTS FOR EVALUATING THE PERFORMANCE OF CRANKCASE LUBRICANTS (Abridged Procedures)

ASTM Approved, but not a Standard

ASTM SPECIAL TECHNICAL PUBLICATION 509

04-509000-12

AMERICAN SOCIETY FOR TESTING AND MATERIALS

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Sponsored by Section I on Engine Oils of
Technical Division B on Automotive Lubricants of
ASTM Committee D-2 on Petroleum Products and Lubricants

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List price $5.00

04-509000-12

AMERICAN SOCIETY FOR TESTING AND MATERIALS
1916 Race Street, Philadelphia, Pa. 19103

Library of Congress Catalog Card Number 75-189600

Printed in Alpha, N. J.
March 1972

Foreword

The test methods described in this publication have not been subjected to the ASTM Standardization Procedure. They are not standards or standard recommended practices of the American Society of Testing and Materials (ASTM).

The heavy duty non-corrosive compounded oils introduced in 1939 or earlier were the basis for the first specification oils. Caterpillar and General Motors were the first engine manufacturers to approve compounded crankcase lubricating oils on the basis of satisfactory performance in laboratory engine tests. These early manufacturer specifications were also the basis for the first military specification oils which were introduced in 1941. Over the years, performance standards have been raised as required to meet new service operating conditions and/or the requirements of new engine designs.

Since these engine procedures, serving as a basis for many manufacturer's and military specifications, were not available in a single-publication in a convenient form and since these procedures have been the subject of a number of changes and additions, Section I on Engine Oils of Technical Division B recommended in 1967 that they be made available as an ASTM special technical publication. This ASTM format will permit the periodic updating of the single-cylinder test procedures, including an analysis of test precision, for the benefit of the petroleum and automotive industries and the consumer. The present printing represents the first of these publications.

In submitting this current STP, the panel recognized and wishes to specifically draw attention to the fact that the data which form the basis for these statistical analyses was obtained in actual engine tests conducted in two time periods. The original data covers tests conducted in or prior to 1967; the up-dated precision data covering the Caterpillar Test No. 1-H and the Caterpillar Test No. 1-G (see Tables X to XII - Section IV for the 1-H; see Tables XVI to XVIII Section V for the 1-G) cover in addition the period through December 1970.

Since refinements in engine test techniques, changes in lubricant technology, improvements in engine metallurgy, and shifts in test objectives (to cite a few factors) are constantly occurring in this dynamic field; it is important to emphasize that the precision picture derived by the panel's study is certainly not to be construed as reflecting the current (December 1970) variability of single cylinder engine tests.

Accordingly, the panel recommends that continuing efforts be directed towards up-dating our knowledge of the precision of single cylinder engine tests (just as is currently done for the IIB-IIIB and VB).

NOTE: The Society is not responsible, as a body, for the statements and opinions advanced in this publication.

Not ASTM Standards

CONTENTS

CONTENTS (Continued)

Section IV FTM(1) 346 - Ring Sticking, Wear and Deposit Diesel Test (Caterpillar Test No. 1-H)

Section V FTM(1) 341.2 - Ring Sticking, Wear and Deposit Diesel Test (Caterpillar Test No. 1-G)

Section VI - Appendices

(1) FTM -- Federal Test Method.

SINGLE-CYLINDER ENGINE TESTS FOR EVALUATING THE PERFORMANCE OF CRANKCASE LUBRICANTS

Prepared by Section I of Technical Division B of ASTM Committee D-2

Not ASTM Standards

This report provides a brief description of the engine test procedures used to qualify crankcase lubricants against MIL-L-2104B, MIL-L-46152, MIL-L-45199B, and MIL-L-2104C; specifications established by the U.S. Army Materiel Command (AMC).

Federal Test Method 3405.1 (CRC L-38 Test) employs a single-cylinder CLR Oil Test Engine for defining the oxidation resistance, corrosive tendencies, and the deposit control characteristics of crankcase lubricants under conditions of high-speed, high temperature operation. Federal Test Method 348T-568 (CRC-LTD) also employs a single-cylinder CLR Oil Test Engine. Operation of the engine under Method 348T-568 is at steady speed and constant load; however, the jacket coolant temperature is cycled between cold and hot operation. This test is useful in defining the sludge deposition characteristics of crankcase lubricants. Three of the single-cylinder tests employ two versions of a Caterpillar diesel engine to assess the performance of crankcase lubricants with respect to detergency, wear and piston ring sticking. The tests employed for these evaluations are:

Federal Test Method[1] Std. No. 791a	Engine RPM	BMEP	Fuel S. %
FTM-340.2 (Caterpillar Test No. 1D)	1200	134	0.95-1.05
FTM-346 (Caterpillar Test No. 1H)	1800	110	0.35-0.45
FTM-341.2 (Caterpillar Test No. 1G)	1800	137	0.35-0.45

Qualification crankcase oils are required to meet minimum acceptable standards as determined by the judgment of the AMC "Review Board." Shown below are the various engine tests required for the approval of an oil against MIL-L-2104B, MIL-L-46152, MIL-L-45199B and MIL-L-2104C specifications. In addition some of these test methods are used to describe the

(1) Complete unabridged copies of this standard and methods may be ordered from GSA Business Service Centers in Boston, New York, Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Washington.

new API service Classes (SA-SE and CA-CD)(2) and some are used by engine builders for describing minimum lubricant performance levels for gasoline and diesel service.

Engine Test	Military Specification Lubricants			
	MIL-L-2104B	MIL-L-46152	MIL-L-45199B	MIL-L-2104C
CLR L-38	X	X	X	X
CLR LTD	X			
Caterpillar Test No. 1-H	X	X		
Caterpillar Test No. 1-D			X	X
Caterpillar Test No. 1-G			X	X
General Motors IIB(3)	X	X		X
General Motors Seq 3C(3)		X		
Ford Seq VC(3)		X		X

(2) See Engine Oil Performance Classifications, ASTM Research Report RR D-2:1002, Section 1, Technical Division B-ASTM Committee D-2, December 1970.

(3) Details of these test procedures are given in ASTM publication STP-315E.