

Engine Coolant Testing

Fourth Volume

Roy E. Beal, editor



STP 1335

STP 1335

Engine Coolant Testing: Fourth Volume

Roy E. Beal, editor

ASTM Stock #: STP1335



ASTM
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Printed in the U.S.A.

ISBN: 0-8031-2610-7
ISSN: 1050-7523

Copyright © 1999 AMERICAN SOCIETY FOR TESTING AND MATERIALS, West Conshohocken, PA. All rights reserved. This material may not be reproduced or copied, in whole or in part, in any printed, mechanical, electronic, film, or other distribution and storage media, without the written consent of the publisher.

Photocopy Rights

Authorization to photocopy items for internal, personal, or educational classroom use, or the internal, personal, or educational classroom use of specific clients, is granted by the American Society for Testing and Materials (ASTM) provided that the appropriate fee is paid to the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923; Tel: 508-750-8400; online: <http://www.copyright.com/>.

Peer Review Policy

Each paper published in this volume was evaluated by two peer reviewers and the editor. The authors addressed all of the reviewers' comments to the satisfaction of both the technical editor(s) and the ASTM Committee on Publications.

The quality of the papers in this publication reflects not only the obvious efforts of the authors and the technical editor(s), but also the work of the peer reviewers. In keeping with long standing publication practices, ASTM maintains the anonymity of the peer reviewers. The ASTM Committee on Publications acknowledges with appreciation their dedication and their contribution of time and effort on behalf of ASTM.

Foreword

The Symposium on Engine Coolant Testing was held 5–7 November 1997 in Scottsdale, Arizona. Committee D15 on Engine Coolants sponsored the symposium. Roy E. Beal, Amalgamated Technologies, Inc., presided as symposium chairman and is editor of this publication.

Contents

Overview	1
-----------------	---

ORGANIC ACID INHIBITOR TECHNOLOGY

Testing of Organic Acids in Engine Coolants —T. W. WEIR	7
--	---

Composition of Incipient Passivating Layers on Heat-Rejecting Aluminum in Carboxylate- and Silicate-Inhibited Coolants: Correlation with ASTM D 4340 Weight Losses —F. T. WAGNER, T. E. MOYLAN, S. J. SIMKO, AND M. C. MILITELLO	23
---	----

Fleet Test Evaluation of Fully Formulated Heavy-Duty Coolant Technology Maintained with a Delayed-Release Filter Compared with Coolant Inhibited with a Nitrited Organic Acid Technology: An Interim Report —S. S. AROYAN AND E. R. EATON	43
--	----

Engine Coolant Technology, Performance, and Life for Light-Duty Applications —D. E. TURCOTTE, F. E. LOCKWOOD, K. K. PFITZNER, L. L. MESZAROS, AND J. K. LISTEBARGER	52
--	----

Copper-Triazole Interaction and Coolant Inhibitor Depletion —L. S. BARTLEY, P. O. FRITZ, R. J. PELLET, S. A. TAYLOR, AND P. VAN DE VEN	76
---	----

TEST METHODS

Corrosion and Testing of Engine Coolants —R. E. BEAL	89
---	----

Predictive Tools for Coolant Development: An Accelerated Aging Procedure for Modeling Fleet Test Results —A. V. GERSHUN AND W. C. MERCER	113
---	-----

Rapid Electrochemical Screening of Engine Coolants. Correlation of Electrochemical Potentiometric Measurements with ASTM D 1384 Glassware Corrosion Test —G. P. DOUCET, J. M. JACKSON, O. A. KRIEGEL, D. K. PASSWATER, AND N. E. PRIETO	133
--	-----

Long-Term Serviceability of Elastomers in Modern Engine Coolants —H. BUSSEM, A. C. FARINELLA, AND D. L. HERTZ, JR.	142
---	-----

Engine Coolant Compatibility with the Nonmetals Found in Automotive Cooling Systems—J. P. GREANEY AND R. A. SMITH 168

Influence of Engine Coolant Composition on the Electrochemical Degradation Behavior of EPDM Radiator Hoses—G. L. M. VROOMEN, S. S. LIEVENS, AND J. P. MAES 183

HEAVY-DUTY COOLANT TECHNOLOGY

Assessment of the Validity of Conductivity as an Estimate of Total Dissolved Solids in Heavy-Duty Coolants—R. P. CARR 199

Scale and Deposits in High-Heat Rejection Engines—Y.-S. CHEN, E. I. KERSHISNIK, R. D. HUDGENS, C. L. CORBEELS, AND R. L. ZEHR 210

ENGINE COOLANT RECYCLING TECHNOLOGY

Overview of Used Antifreeze and Industrial Glycol Recycling by Vacuum Distillation—
D. K. FRYE, K. CHAN, AND C. POURHASSANIAN 231

Recycling Used Engine Coolant Using High-Volume Stationary, Multiple Technology Equipment—M. E. HADDOCK AND E. R. EATON 251

Development of Mobile, On-Site Engine Coolant Recycling Utilizing Reverse-Osmosis Technology—W. KUGHN AND E. R. EATON 261

Heavy-Duty Fleet Test Evaluation of Recycled Engine Coolant—P. M. WOYCIESJES AND R. A. FROST 270

Evaluation of Engine Coolant Recycling Processes: Part 2—W. H. BRADLEY 292

ENGINE COOLANT CHARACTERISTICS AND QUALITY

Methods and Equipment for Engine Coolant Testing—S. A. McCRACKEN AND R. E. BEAL 319

Silicate Stabilization Studies in Propylene Glycol—S. A. SCHWARTZ 327

Antifreeze: From Glycol to a Bottle on the Shelf—Manufacturing and Quality Control Considerations—J. STARKEY AND M. COUCH 352

ENGINE COOLANT SERVICE AND DISPOSAL

Extended Service of “Fully Formulated” Heavy-Duty Antifreeze in American Cars—E. R. EATON AND H. S. EATON 361

Fleet Test Evaluations of an Automotive and Medium-Duty Truck Coolant Filter/Conditioner—A. B. WRIGHT 370

Overview of Engine Coolant Testing in Europe with Particular Regard to Its Development in Germany—M. B. BRÖSEL	392
Development of an Extended-Service Coolant Filter—W. A. MITCHELL AND R. D. HUDGENS	409
Author Index	427
Subject Index	429

ISBN 0-8031-2610-7