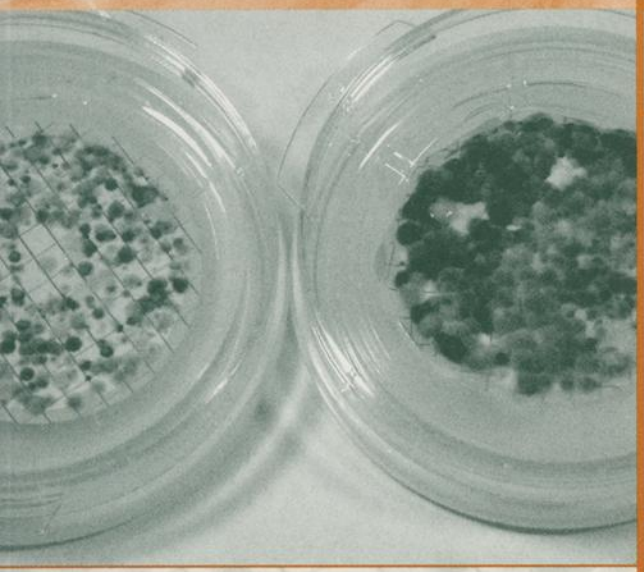
Fuel and Fuel System Microbiology:

fundamentals, diagnosis, and contamination control



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Foreword

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Preface

Frederick J. Passman, Ph.D[1]

The *Manual on Fuel and Fuel System Microbiology—Fundamentals, Diagnosis, and Contamination Control* augments Standard Guide D 6469[2]. It is addressed to all liquid fuel production, transportation, and consumption stakeholders. The target audience includes management, supervisory, operational, quality assurance, maintenance, inspection, and technical personnel responsible for fuel quality, fuel handling equipment integrity, or both. The material presented in this Manual is equally applicable for gasoline, diesel (including biodiesel), aviation turbine, marine, industrial gas turbine, kerosene, gasoline, and aviation gasoline fuels. Much of the information is also applicable to other fuel grades ranging from bunker to natural gas.

This manual seeks to complement the Guide D 6469 in each of four areas. Chapter 1 provides an overview of the microbiological principles underlying fuel and fuel system biodeterioration. The information contained in this chapter will enable the reader to better understand why recognizing biodeterioration is difficult yet essential.

Sampling for microbial contamination detection presents unique challenges. Both the non-homogeneous distribution of microbes and the fact that they are living beings necessitate special handling, not discussed in Standard Practice D 4057 Manual Sampling of Petroleum and Petroleum Products[3]. Consequently, Chapter 2 provides the detailed information personnel need to collect and handle samples intended for biodeterioration diagnosis.

Chapter 3 provides specific, practical recommendations for disinfecting and removing microbial contamination from fuels and fuel systems.

As noted earlier, D 6469 recommends a variety of diagnostic tests, many of which do not appear in the Annual Book of Standards, Volume 5. Since quite a few of the tests examine bottom water properties, they aren't run at fuel labs routinely. Nearly all of the methods that aren't drawn from Volume 5 come from the Annual Book of Standards, Volumes 10, 11, or 14. By incorporating the Standards from these three volumes into this Manual, it was our intention to improve test method accessibility, which would expand the diagnostic capabilities of fuel quality labs.

Our objective in developing the *Manual on Fuel and Fuel System Microbiology—Fundamentals, Diagnosis, and Contamination Control* was to provide a broad range of stakeholders with a readable, accessible insight into the nature of fuel and fuel system biodeterioration, sampling requirements, test methods, and remediation practices.

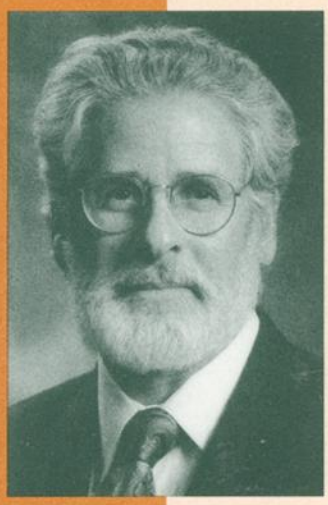
As the Editor of this Manual and Chair of the D.02.14 Task Force on Microbial Contamination, I thank those ASTM International colleagues who have been indispensably helpful in the development of both D 6469 and this document. Harry Giles and Erna Beal, Chair and Secretary of D.02.E.05 and D.02.14 have been remarkably supportive since my friend and colleague Howard Chesneau first proposed inclusion of microbial contamination in each of the product standards under the cognizance of Subcommittees D.02.A, E, and J. I offer my sincerest thanks also to Howard Chesneau, Andy Pickard, and John Bacha, who each contributed tremendously to the development of the Guide and the Manual. Sadly, John Bacha's untimely death in August, 2001 prevented him from seeing the publication of this manual. I dedicate this manual to him

[1]President, Biodeterioration Control Associates, Inc., PO Box 3659, Princeton, NJ 08543-3659.
[2]Annual Book of ASTM Standards, Vol. 05.04.
[3]*Annual Book of ASTM Standards*, Vol 05.02.

in appreciation for his contributions and many years of dedication and commitment to fuel quality science.

Finally, without the guidance and support of ASTM Staff Members Kathy Dernoga, Monica Siperko, and Holly Stupak, the Manual would never have been created. Thank you all.

Fredrick J. Passman
Princeton, New Jersey, USA



Frederick J. Passman

Dr. Passman has over 25 years' experience in environmental-industrial microbiology. After receiving his A.B. in Microbiology from Indiana University, Dr. Passman entered the U.S. Navy, where he served as an Engineering Officer aboard a destroyer. He left active duty and entered the Reserves in 1973 in order to pursue his Ph.D. in marine microbiology at the University of New Hampshire.

Since 1973, Dr. Passman has conducted research and consulted to government and private industry on topics as diverse as composting municipal sewage sludge, U.S. EPA criteria for various groups of toxic substances in fresh-water systems, microbially enhanced oil recovery, and microbial contamination control in industrial process-fluids. Before founding BCA, Inc., in spring 1992, Dr. Passman was the Business Manager of ANGUS Chemical Company's Biocide Division. Dr. Passman is a member of the American Society for Microbiology, ASTM International, Biodeterioration Society, International Society for Stability and Handling of Liquid Fuels, Society for Industrial Microbiology, and Society for Tribology and Lubrication Engineering (STLE). He is an Associate Editor for *Lubrication Engineering*, Chair, STLE Annual Meeting Education Course Committee and member of the editorial board for the *International Journal of Biodegradation and Biodeterioration*. Dr. Passman has received STLE's Wilber Deutsch Memorial Award for writing excellence. He has more than 30 publications to his name.

Dr. Passman's civilian career paralled his Naval Reserve career, during which he served as the Selected Reserve Executive Officer of a minesweeper, the Selected Reserve Executive Officer of a destroyer and as Commanding Officer of five Naval Reserve Commands, including three training units, a naval control of shipping office and a military sealift command unit. During his Naval Reserve career, Dr. Passman was awarded four Naval Commendation Medals. He retired at the rank of Captain in 1998.

Dr. Passman has chaired a Task Group on Fuel Microbiology within ASTM Subcommittee D02.14 Stability and Cleanliness of Liquid Fuels since its inception in 1989. He has also received an ASTM Award of Appreciation for his efforts within D02.14. Dr. Passman is also an active member of ASTM Subcommittees E34.50 Health and Safety of Metalworking Fluids and E35.15 Antimicrobial Pesticides and has drafted ASTM Standards for each of these committees.

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