

Overview

“Preparing a reliable reference guide on the significance of tests for petroleum and petroleum products is no simple matter. Test methods define product quality. Quality, in turn, can be defined as the ‘fitness’ of the material for its intended use. The history of petroleum is a story of a wide array of end products with continually changing criteria.”

“For those interested in product quality and its assessment, this means the situation is never static. . . . The ultimate adoption of any . . . new testing or evaluation methods will not constitute a ‘final chapter’ on the subject of quality criteria and assessment. The state of the art is in continual state of flux. The need for still another chapter is always ‘just around the corner. . . .’”

Those quotations are from the Introduction to ASTM STP 7C, entitled *Significance of ASTM Tests for Petroleum Products* and published in 1977. They capture the spirit not only of STP 7C, but of this publication. In many regards, this marine fuels special technical publication is an extension of the earlier work, which contained commentaries on residual and diesel fuels in marine use.

The new entry into the family of marine fuels is blended fuel, which in recent years has become the dominant energy source for deep-draught commercial vessels. The rapid development of demand for this fuel has presented producers, suppliers, and vessel operators with many new problems, predominant among which are:

1. Ignition and combustion characteristics, despite considerable expensive research, still produce unexpected variations. Developing a reliable combustion index for heavy fuels, similar to the diesel cetane rating, has proven to be an elusive procedure.
2. The exact nature and full effect of particulate matter in blended fuels is a matter of continuing and inconclusive debate.
3. The potentially expensive result of blending incompatible or unstable fuels continues to plague producers, suppliers, and vessel operators.

Frequently overlooked in the clamor for quick solutions is the fact that the commercial use of blended marine fuels is a comparatively recent development dating from the late 1950s and early 1960s. Many of the contributors to this publication have been directly involved in the process from the beginning.

Complicating the better understanding of this new category of fuels has been the parallel development of new and sophisticated refining techniques. The precipitous oil price increases of the 1970s not only added impetus to the demand for more economical marine fuels, but also hastened the conversion of refineries to

new production techniques. The increased conversion of crude oil to light fuels coupled with increased use of blended marine fuels created a demand for research and scientific judgment that frequently outstripped the industry's ability to respond.

There still does not exist at this writing, within ASTM or the International Standards Organization (ISO), an approved specification for blended marine fuels. More important, adequate test methods have not been developed for several important properties such as compatibility, particulates, ignition quality, and combustion.

It was to these issues that ASTM responded in 1979 by establishing a marine fuels task force. In December 1983, the Committee D02 on Petroleum Products and Lubricants sponsored its first marine fuels symposium in Miami, Florida. Papers presented during that symposium are the basis for this publication.

The first section of this publication addresses the issues of fuel quality and product availability from an historical as well as from a contemporary view. The various origins and characteristics of crude oils and the variety of refining methods have resulted in some discernible regional patterns. For instance, product sold as bunker fuel on the U.S. East Coast may contain undesirable levels of vanadium compared to the U.S. Gulf Coast, where gravity or particulates can be a problem. This regional pattern further complicates attempts to standardize specifications.

An important view put forward by James L. Wilkison of the Shell Development Co. is that the degradation of marine fuel oil has reached a nadir in the United States. Given that premise, and the hope of at least momentary stability, the research sector may be given the opportunity to catch up, to develop some reasonable and internationally accepted test methods, and standards.

From the vessel operator's view, the second section puts forward practical experience with current fuels. The need for care and expertise in the on-board treatment of marine fuels is universally stressed.

A significant point is made by Matthew F. Winkler on behalf of vessel operators who are coping with contemporary fuels in vessels of less than contemporary design. In his paper "Shipboard Fuel Handling and Treatment for Diesel Engines," Winkler observes, "It is important to recognize that the existing shipboard treatment systems become more inadequate with every day that bunkers degrade. The ship operator cannot protect his propulsion system by waiting and hoping his problems will go away. . . ." In the haste to deal with new developments and new engine design, we cannot overlook the huge investment and fuel needs of the United States and the world fleets as they exist today.

Another proposal of interest was by Alan E. Swinden et al, in a paper jointly authored within BP Marine International, that "We would have thought that the provision of an adequately designed fuel treatment was so fundamental to the security of a marine diesel engine that it should be a condition of the guarantee provided by the engine builder. Arguably, a vessel's fuel treatment arrangement is an area that should be brought within ship classification. . . ."

The second section also deals with the void in test methods for the more critical and less understood product and performance parameters of marine fuels—ignition and combustion, compatibility, and particulates. Ongoing research is reported, as well as proposals for three new test methods.

The attempt in the symposium and in this special technical publication was to be as comprehensive as possible and to collect in a single volume the vast amount of research, judgments, and opinions presented. Hopefully, we have arrived at a better definition of issues confronting the industry. And, hopefully, some specific and workable solutions have been proposed.

This publication is not intended nor can it be considered as the final word. Rather, it is a reference point for the considerable work already done and for the considerable work that remains.

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