



Materials Performance & Characterization

Contents:

*Special Issue on Crude Oil Analysis: History
and Development of Test Methods From 1854
to 2016*

by Harry N. Giles

with a foreword by Kishore Nadkarni

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Foreword

Crude Oil Analysis: History and Development of Test Methods From 1854 to 2016

British nuclear scientist Lord Ernest Rutherford (1871–1937) reportedly said, “In science there is only physics; all the rest is stamp collecting!” The irony is that Lord Rutherford received a Nobel Prize not in physics, but in nuclear chemistry. Dubious as that statement may have been, it can be paraphrased to state that, “In petroleum chemistry there is only crude oil; all the rest are its by-products.”

It was on August 28, 1859, that “Colonel” Edwin L. Drake drilled the first commercially successful well at Titusville, PA. In 1870 John D. Rockefeller founded the Standard Oil Company, and in 1882, Standard Oil Company of New Jersey (later to become ExxonMobil Corporation, the world’s largest oil company) was born [1]. After the breakup of Standard Oil Trust and the formation of several new oil companies, the industry expanded exponentially to become the behemoth that it is today [2].

Crude oils are a highly complex combination of hydrocarbons; heterocyclic compounds made up of nitrogen, oxygen, and sulfur; organometallic compounds; inorganic sediment; and water. More than 600 organic compounds have been identified in crude oil, and it is likely that thousands more occur in it [3].

Author of a popular ASTM International manual, *Crude Oil: Sampling, Analysis, and Evaluation* [3], Harry N. Giles is an internationally recognized scientist in crude oil analysis area. Until his retirement, he was a manager of crude oil quality programs for the Strategic Petroleum Reserve for the US Department of Energy. He has co-authored a number of articles in the crude oil analysis area. He also teaches the ASTM course on crude oil characterization that has been given in numerous locations worldwide since 2005. Thus, this special issue on history and development of test methods for analysis of crude oil could not have come from a better source.

Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants is one of the oldest committees in ASTM, having originated as Committee N (later redesignated as D02) in 1904. It held its first meeting in May 1905 in Pittsburgh, PA, with a membership of 10 people. The earliest standards issued by this committee are still in use: D56 *Flash Point by Tag Closed Cup Tester*; D86 *Distillation of Petroleum Products at Atmospheric Pressure*; D90 (later called D1266) *Sulfur in Petroleum Products by the Lamp Combustion Gravimetric Method*; D92 and D93 *Flash Points by Cleveland Open Cup Tester and Pensky-Martens Closed Cup Tester*, respectively; D94 *Saponification Number by Titration*; D97 *Pour Point*; D130 *Copper Strip Corrosion*; D445 *Kinematic Viscosity of Transparent and Opaque Liquids*; D664 *Acid and Base Numbers by Potentiometric Titration*, etc. It speaks to the quality of these early developments in analytical test methodology that most of these physical test methods are still valid and are in routine use in thousands of petroleum testing laboratories across the world.

With the explosive growth of industries throughout the developing world, ASTM in general and Committee D02 in particular have achieved pre-eminence in test method standardization. A timeline of highlights from the history of Committee D02 and the petroleum industry was

prepared by George Totten [4] at the time of its centenary celebration meeting in Salt Lake City, UT, in June 2004.

About 830 standards have been issued by Committee D02, and it has a membership of about 2,400 people stretching from Afghanistan to Zanzibar. Its semi-annual meetings are attended by about 1,000 members and guests from around the world. A cornerstone of Committee D02's work lies in the characterization of crude oils. There are about 80 standards issued by Committee D02 dealing with crude oils. Technical issues involved in most of these analyses have been discussed by various authors [3,5-15].

George Santayana (1863–1952), American poet and philosopher, wrote that, “Those who do not learn from history, are destined to repeat it.” This special issue on history of crude oil analysis is replete with factual tidbits and anecdotes, along with a thoroughly documented history of the developments in analysis of crude oils. In assembling this special issue, the author has assiduously used the resources of the US Library of Congress.

After discussing the history, discovery, and development of crude oil technology, the principal sections are devoted to the most commonly used test methods in the crude oil industry, such as gravity, sulfur, water and sediment, pour point, carbon residue, acid number, viscosity, salts, nitrogen, trace metals, vapor pressure, and asphaltenes. As a group these tests constitute what is generally called the “crude assay” in the oil industry, the bulk of crude oil in the world commerce is evaluated, bought, and sold on the basis of the crude assay.

Along with the Manual 68 that was earlier published, this review is a valuable addition to the oil industry literature.

Kishore Nadkarni

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Dedication

This article is dedicated to my daughter Victoria Clare Bulloch, January 21, 1970–July 13, 2014.

