

1.6 APPLICATIONS OF THE BOOK

The information that is presented in the book may be applied and used in all areas of the petroleum industries: production, processing, and transportation. It can also be used as a textbook for educational purposes. Some of the applications of the materials covered in the book were discussed in Sections 1.2 and 1.3. The applications and uses of the book may be summarized as follows.

1.6.1 Applications in Petroleum Processing (Downstream)

Engineers, scientists, and operators working in various sectors of petroleum processing and refining or related industries can use the entire material discussed in the book. It helps laboratory people in refineries to measure useful properties and to test the reliability of their measurements. The book should be useful for engineers and researchers to analyze experimental data and develop their own predictive methods. It is also intended to help people who are involved with development of computer softwares and process simulators for design and operation of units and equipments in petroleum refineries. Another objective was to help users of such simulators to be able to select an appropriate predictive method for a particular application based on available data on the fraction.

1.6.2 Applications in Petroleum Production (Upstream)

Reservoir, chemical, and mechanical engineers may use the book in reservoir simulators, design and operation of surface separators in production fields, and feasibility studies for enhanced oil recovery projects, such as gas injection projects. Another application of the book by reservoir engineers is to simulate laboratory data on PVT experiments for the reservoir fluids, determination of the nature and type of reservoir fluids, and calculation of the initial amounts of oil and gas in the reservoir. Reservoir engineers may also use Chapter 9 to determine the conditions that a solid may form, amount of solid formation, and method of its prevention during production. Practically all chapters of the book should be useful for reservoir engineers.

1.6.3 Applications in Academia

Although the original goal and aim in writing this book was to prepare a reference manual for the industry, laboratories,

and research institutions in the area of petroleum, it has been written in a way such that it can also be used as a textbook for educational purposes. It can be used as a text for an elective course for either undergraduate (senior level) or graduate level. Students from chemical, petroleum, and mechanical engineering fields as well as from chemistry and physics can take the course and understand the contents of the book. However, it should not be hard for students from other fields of engineering and science to use this book. The book may also be used to conduct short courses in the petroleum industry.

1.6.4 Other Applications

There are several other areas in which the book can be used. One may use this book to determine the quality of crude oils, petroleum fuels, and products for marketing and government organizations that set the standards for such materials. As an example, the amount of sulfur or aromatic contents of a fuel can be estimated through minimum laboratory data to check if they meet the market demand or government regulations for environmental protection. This book can be used to determine properties of crude oil, its products, and natural gases that are needed for transportation and storage. Examples of such properties are density, boiling point, flash and pour points, sulfur content, vapor pressure, and viscosity.

The book can also be used to determine the properties of oils for clean-up operations where there is an oil spill on seawater. To simulate the fate of an oil spill and the rate of its disappearance at least the following properties are needed in order to use appropriate simulators [44, 83–85]:

- Characterization of petroleum fractions (Chapter 3)
- Pour point (Chapter 3)
- Characterization of crude oil (Chapter 4)
- Solubility parameter (Chapters 4, 6, and 9)
- Density (Chapters 5 and 7)
- Vapor pressure (Chapter 7)
- Viscosity, diffusion coefficient, and surface tension (Chapter 8)

Accurate prediction of the fate of a crude oil spill depends on the characterization technique used to estimate the physical properties. For example, to estimate how much of the initial oil would be vaporized after a certain time, accurate values of the diffusion coefficient, vapor pressure, and molecular weight are needed in addition to an appropriate characterization method to split the crude into several pseudocomponents [83].