

Signal Processing for Geologists & Geophysicists

By Jean-Luc Mari, Francois Glangeaud
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This book was written by three IFP (Institut Français du Pétrole) geoscientists. Its main objective is to bridge the gulf which may exist between theoreticians of signal processing and geologists and geophysicists, by equipping them with a usable tool comprising theory and practice.

The book is organized into two main parts. The Seismic Acquisition and Processing part reviews the characteristic properties of seismic waves and data processing in detail.

The description of the main steps of seismic processing is comprehensive with the help of many practical examples. Brief chapters on acoustic logging and VSP processing are also included. Unfortunately, the figures are black and white (only a few colour figures are included at the end of the book) and the quality of some seismic sections is poor.

The second part covers every main topic on Signal Processing in Geophysics. Separate chapters are dedicated to Fourier transform, sampling theory, filters and deconvolution, to mention only a few. More advanced topics, for example the Hilbert transform and Kurtosis, are also addressed. Each chapter can be studied on its own, thus providing an excellent opportunity to use the book as a reference on a widerange of relevant subjects.

An extensive bibliography (up to 1997) is organized by topics, which is helpful for those who would like to further their knowledge on some particular subjects. The overall quality of the translation is excellent.

I think this publication is a successful attempt to lead to a better understanding between geologists, geophysicists and signal processing researchers. Although some may find the mathematical treatment too overwhelming at times, the concepts are clearly explained and illustrated. I would recommend this book as a more concise complement to the two classic ones on this topic, Kanasewich's Time Sequence Analysis in Geophysics and Yilmaz' Seismic Data Analysis.

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Basics of Reservoir Engineering

1 ENSPM – Ecole Nationale Supérieure du Pétrole et des Moteurs,

With "Basics of Reservoir Engineering", Editions TECHNIP have released an admirable review of the breadth of the reservoir engineering field. Compiled by Rene Cosse, the Reservoir Training Manager at ENSPM1 as of the original publication in 1993, across 346 pages the text not only provides a good overview of reservoir engineering fundamentals, but also introduces numerous advanced topics in an accessible manner by the non-specialist. The book is well organized, leading the reader in a coherent presentation from

the most fundamental initial consideration of "What is a Reservoir?" through numerous evaluation techniques culminating in a final review of various detailed case studies of oil and gas fields in France.

While emphasizing primary concepts, the audience for this book is most effectively professionals in related fields looking for an overview of the field of reservoir engineering. Providing a good balance between theory and practical examples, this book does not present a detailed training manual in reservoir engineering techniques. Rather, an overview of essential concepts is provided illustrating general principles and the type of data that can be determined with each method. In this manner, the practical application for each technique is emphasized. Rene Cosse guides the reader to an understanding of what the reservoir engineer can accomplish with common tools and procedures for reservoir characterization within the discipline.

A simple example of this approach is illustrated in the review of drill stem testing, covered over the course of two pages. The reader is provided with a generic graph of DST pressure response over time, with a concise description of each event over the course of the test. This is followed by a summary of the principal information that is derived from a DST: reservoir pressure, permeability-thickness, or kh, productivity index and skin. Over the next two pages, the principal equations for these calculations for oil and then gas are listed. Over a few pages, this provides the reader with the essentials of what can otherwise be a complex field of study, encompassing a specialized text equal in size to the complete book. In this manner, Cosse consistently distills principles and conclusions, permitting insight into the basics of reservoir engineering practices. The reader is provided an excellent survey of customary practices with sufficient depth to understand the workflow a reservoir engineer undertakes in each analysis.

In general, the presentation of the material remains clear and concise. A review of the foundation principles from geology and geophysics is provided in the first chapter. Building upon this, the second chapter examines the characterization of primary reservoir rock properties and how these are obtained from field measurements. Chapter three then examines reservoir fluids and pressure-volume-temperature (PVT) studies. Establishing an understanding of these fundamentals, chapter 4 discusses volumetric reserve estimations with related uncertainties.

Chapters 5 and 6 then move on to considerations of fluid dynamics, both single and multiphase flow, with implications for well test interpretation. Chapter 7 then discusses recovery mechanisms and techniques for the estimation of recoverable reserves. While limited sections, such as the presentation of world reserves now stand as somewhat outdated, the material remains relevant to conventional oil and gas volumes. A discussion of significant reservoir geological settings, such as fractured and karsted reservoirs is included, as well as related topics of substantive impact on recovery, such as horizontal wells. Chapter 8 examines secondary and enhanced recovery principles that are increasingly relevant today. This includes an overview of waterflooding, miscible, chemical and thermal methods inclusive of CO₂ and steam injection. Chapter 9 reviews one of the principle distinguishing functions of reservoir

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engineers, to develop dynamic flow models of reservoir performance. The use of reservoir simulation is very briefly reviewed prior to a discussion in Chapter 10 on the development phases of a hydrocarbon field. This chapter underlines the relationship between technical and economic considerations for the development of a field, commonly the concern of the reservoir engineer for the optimization of an exploitation strategy to the maximum value of the resource. Finally, chapter 11 examines four French field examples within the context of the framework of engineering basics developed.

With an effective translation from the original French text, the book provides extensive clear and simple diagrams reinforcing the principles presented. The range of the reservoir engineering concepts that have been included provides a comprehensive picture of the reservoir engineering discipline that remains current. The aim of the text, to provide an understanding of the reservoir engineering discipline in facilitating communication between different related disciplines, has been successfully achieved. The faults or limitations of the text are comparatively few; mostly corrected only by expanding the size of the book, which is generally left to the reader's initiative to supplement in areas of related interest. From the initial aim, Cosse has accom-

plished a commendable result within the confines of the text as presented.

For a Canadian reviewer, however, it is tempting to identify that the text's listed "proven oil reserves" for Canada of 5.7 billion barrels is now outdated by the currently accepted figure of 179 billion barrels with the inclusion of the emergent oilsand developments over the past decade. In addition, currently recognized reserves remain a meager reflection of what will be achieved with future technologies applied to a resource potential approximating 2 trillion barrels. These statistics illustrate that reservoir engineering is a dynamic science with a body of knowledge that continues to grow rapidly. Rene Cosse has respectably demonstrated the traditional framework of this subject with a book that forms a solid contribution to the introduction of the traditional reservoir engineering discipline. The book forms an excellent addition to the "Oil and Gas Field Development Techniques" series of Editions TECHNIP. **R**

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