Book reviews

Reservoir Stimulation, 3rd edn. *M. J. Economides and K. G. Nolte (eds). Chichester: J. Wiley, 2000. 856 pp. ISBN 0 471 49192 6. £95*

This massive book consists of 20 substantial chapters—plus appendices, references (∼1300), nomenclature, and an index—all conveniently included as .pdf files on the accompanying CD-ROM. Broadly speaking, this volume covers the two subjects of fracturing and chemical treatments, which are mainly used to enhance the flow of fluids to the wells in petroleum reservoirs. However, these techniques can be applied to other situations, such as water supply and waste injection, and so are of wider interest. A nice touch is the dedication of the book to Jacob Shylapobersky, who was a major influence in reservoir stimulation. The list of authors reads like a 'who's who', with each chapter being written by practising experts from the service sector, academia, and industry (all but three chapters have a Schlumberger employee as an author or co-author). Although I previously felt that I had a good appreciation of rock fracturing, I was chagrined to discover the number of topics in which I could gain new understanding from the chapters of this book. I certainly was surprised to discover the extent of those ideas that are important in the area of chemical treatments—and the range of phenomena that occur during these processes. Most chapters in the book have excellent illustrations, with accompanying formulae and tables of data, and the whole is produced to a very high standard. I particularly liked the sidebars that give extra depth or that work through examples.

In terms of organisation, the book has two main sections. The first, on fracturing, proceeds in a logical sequence, starting with general topics and contextual material (reservoir stimulation in petroleum production, well testing, rock mechanics, well logs), and then leading on to the physical processes of fracturing (basics of hydraulic fracturing, mechanics of hydraulic fracturing), a consideration of materials (fracture fluid chemistry and proppants, performance of fracturing materials), diagnostics (fracture evaluation using pressure diagnostics), design (fracture treatment design), operations (fracturing operations), and evaluation (fractured well performance). The second main section covers chemical treatments. It starts with an introduction to matrix treatments, then turns to formation damage, additives in acidising fluids, fundamentals of acid stimulation, carbonate acidising design, sandstone acidising, fluid placement and pumping strategy, and matrix stimulation treatment evaluation.

A novice could readily use the book to get up to functional speed in the topics covered. Indeed, the first chapter nicely encapsulates the essence of production engineering in a few pages, and other examples of this purposeful style are found throughout the book. With a little bit of diligence, a broad-based technical person should be able to grasp the main elements of the topic areas that are covered. At the same time, the expert can also find intriguing insights (I verified this by polling my colleagues, who represent a wide range of petroleum engineering specialties). As with any general, multi-author compilation, the chapters contain minor points that can be queried. My quibbles of this type were often allayed by a slightly different perspective contained within a companion chapter.

This book should be on the reference shelf of all organisations that deal with reservoir stimulation. Many related groups may well find it a useful addition to their library. Practitioners will certainly wish to have a personal copy.

—G. D. Couples

Wave motion in earthquake engineering. *E. Kausel and G. Manolis (eds). Southampton: WIT Press, 2000. 362 pp. ISBN/ISSN: 1 85312 744 2. £145·00*

This volume is a presentation of the state of the art in seismic wave propagation as applied to earthquakes engineering. The book consists of nine chapters, each written by leading experts in their respective fields, covering important topics in seismic wave propagation. The first chapter, by Francisco Sánchez-Sesma and others, addresses the fundamentals of elastic wave propagation for site amplification studies, focusing on the specific problem of the response of alluvial valleys to earthquake excitation. The introduction states that the chapter is intended to 'give engineers the first rudiments on the topic'. The authors also point out that 'no recipes or direct applications' are given. These statements are relevant to the entire book since it is concerned primarily with the fundamental physical mechanisms of seismic wave propagation. The *raison d'être* of the book is to provide the physical and mathematical background required for valid modelling of wave propagation effects and the correct interpretation of experimental data.

The superb chapter on wave propagation in complex geological structures and their effects on strong ground motion, by Pierre-Yves Bard and Judith Riepl-Thomas, provides a complete and authoritative review of the methods available for assessing the amplifying effects of geological structures. The effects of surface and subterranean topography, soft alluvial layers and laterally inhomogeneous deposits are addressed together with theoretical and empirical approaches to their quantification, including their representation in seismic design codes.

The third chapter, by Aspasia Zerva, addressed the issue of spatial variability of earthquake ground motions, which has important implications for the earthquake performance of lifelines such as buried pipelines and bridges. Rafael Foinquinos and José Roësset look at the seismic response of elastic layered half-spaces subjected to surface dynamic loads as the essential background to methods of non-destructive and non-intrusive testing based on surface excitation.

Eduardo Kausel then introduces the 'thin-layer method', a numerical tool for the analysis of wave motion in horizontally layered media, with applications to site response evaluation and to the generation of synthetic seismograms. Richard Shaw and George Manolis present a chapter on elastic waves in one-dimensionally layered heterogeneous soil media, which is of direct relevance to the calculation of dynamic response at sites where material properties are depth dependent. Christos Vretto presents a companion chapter addressing the propagation of seismic waves in vertically inhomogeneous soils, evaluating the applicability of the available analytical methods for calculating the response at sites at which wave propagation velocity and shear modulus increase continuously with depth.

The chapter by Nimal Rajapakse and T. Senjuntichai examines the dynamic response of poroelastic media, developing models that explicitly address the two-phase nature of saturated soil deposits, using boundary element methods. The final chapter, by Dimitrios Rizos and Dimitrios Karabalis, reviews the available approaches to dynamic analysis of soil–fluid–structure interaction, with particular reference to the earthquake response of concrete dams.

Combining excellent introductions to several key themes in seismic wave propagation relevant to earthquake engineering applications with extensive reference lists in each chapter, this book is an ideal starting point for both researchers and practitioners wishing to delve into this subject beyond 'off-the-shelf' solutions.

—J. Bommer