

Book review

GEOTHERMAL POWER PLANTS: PRINCIPLES, APPLICATIONS AND CASE STUDIES.

R. DiPippo. Elsevier Advanced Technology, 2005.
ISBN 1 8561 7474 3, £145, 512 pp.

Every now and then a textbook is published that is destined to become the definitive book on the subject for many years—this is one such book. The comprehensive, accurate and authoritative nature of the book, coupled with an accessibility of the subject matter, makes it so important. It will engage both the specialist and non-specialist in equal measure. The author has spent many years working with and visiting the full spectrum of geothermal power plants; many of the photographs in the book were taken by DiPippo himself. The book covers all aspects of the generation of electricity from geothermal resources worldwide and, moreover, provides probing questions at the end of each chapter.

The geothermal industry does not have the same 'image' as the photovoltaic business or the 'novel technology' label of wave devices. However, it has been developing steadily since 1904 and, until very recently, was generating more energy than all the other new 'renewable' sources combined. This book ought to help thrust geothermal onto the agenda of all low carbon and renewable energy assessments; there is no longer any excuse for ignorance of the subject matter.

The first four chapters cover the fundamentals of the nature of the geothermal resource, exploration strategies to find suitable high-temperature sites, how to access the heated fluids, be they steam or hot water, and finally assessment of the size of the reservoir before selecting the type and size of power plants. The great advantage of this book is that each chapter is written with a view to the end use, namely power generation, whereas many of the specialist resource and geology books focus on the geological aspects of geothermal rather than the application. There is an amazing quote from 1925 at the start of Chapter 4 that echoes similar comments made by Parsons in the UK in 1918, but I shall leave the details for readers to discover for themselves. It is slightly jarring to have to swap from imperial to SI and various mixes of units, but that is the nature of the industry and the book merely echoes reality.

Dry steam and flash steam plants make up most of the current power generation plants today (about 9000 MWe of plate rated

capacity). Chapters 5 to 7 cover the range of both theoretical sizing and the practical matters of particulates, non-condensable gases and corrosion that, if not considered at design stage, can wreck the economics of a project. This type of plant will continue to be the mainstay of the geothermal industry for many years to come but increasingly the use of a secondary working fluid is proving very advantageous for several reasons.

The secondary fluid systems or binary cycle plants allow turbines or other types of expander to work in clean fluids at the expense of some losses in the heat exchangers. Chapter 8 covers the basic Organic Rankine Cycle system through to advanced concepts in such plants. Apart from the discharge of waste heat, this type of system is the most benign of all power plants from an environmental point of view. There are no physical discharges of any sort—it is genuinely CO₂- and pollution-free. These plants will be taken forward by the application of power recovery from industrial waste heat using similar technologies to the geothermal business. One such application that might be called geothermal is the recovery of power from the water co-produced from oil and gas operations. Equally, the waste heat discharges from binary plants can be, and are being, used beneficially in combined heat and power applications. Advanced applications are analysed in Chapter 9. Chapter 10 brings the presentation of the technologies to a close by looking at the thermodynamics and energy analysis of the overall system.

The work of the first ten chapters, where most books would normally stop, is brought to life by a wide range of case studies from around the world. Most of the case studies start with historic photos of wooden scaffolding and facilities leading through to the most modern functional systems. It is the details of the case studies, all researched personally by the author, that make this section so important and lift the book to its definitive position.

Finally, comprehensive appendices include the status and size of every plant in the world in July 2004. This book is an essential source for practioners, interested investors and students alike. It has been a great pleasure to review.

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