

Wind Power Plants, Fundamentals, Design, Construction and Operation, (Second Edition)

Edited by Gash Robert and Twele Jochen
Springer, Heidelberg, (2012), 548 pp., Softbound,
99 USD, ISBN 978-3-642-22937-4

When I was asked to review the book “Wind Power Plants, Fundamentals, Design, Construction and Operation,” I thought to myself, how would it be possible for me to comment on a book not specific to acoustics and physics and be fair to it? But once I started reading it, I realized that not only was it easy to read, but because of my training, it was easy enough to relate the subject matter to my own personal experience and knowledge. By that I mean, if a book is well written, even the most difficult subjects can be easily grasped allowing a deeper study of those “unapproachable” fields. And this book is well written!

An example of such a case is chapter four of the book “The Wind.” I have read a lot of acoustical literature related to the generation of wind and how it affects sound propagation. This chapter seemed to present meteorology from another point of view, giving me the best insight of how wind generating mechanisms work and how I could put that knowledge into acoustics. Another example is a chapter called “Structural Dynamics,” which gives a great insight on the dynamics of structures. While reading it I thought to myself, how could I put this knowledge, given to me from another point of view, into building and structural acoustics? This book reinforces the idea that seeking solutions in the narrow field of one’s interest can be more difficult than opening up and examining answers to the same question from a different point of view. Simply put, this book was a pleasant eye opening experience.

This book was intended for graduate students, practitioners and anyone interested in the subject. Based on lectures held at several universities, its German version serves as the standard textbook for courses on Wind Energy Engineering.

The first chapter, “Introduction to Wind Energy,” goes directly to the reasons for wind turbines, dealing with energy demand, financial aspects and forecasts related to global energy as they apply to wind turbine farm’s distribution and policies. The chapter, “Historical Development of Windmills” reminds us that wind energy was used in Mesopotamia since 1700 BC, long before Greek civilization was around. It gives a brief but very illuminating story of how wind energy was harnessed by humankind. It moves onto describing how wind energy relates to financial benefits, as is the case with windmills and turbines. The principles of their operation was around since the ancient world but were abandoned when steam engines came about.

Wind turbine efficiency was optimized at the beginning of the last century, yet the machines were only put to use after the oil crisis took place in the 1970s when oil prices began to rise. Nowadays, forecasts show that the high prices are here to stay. I suppose a lesson to be learned by reading this story is that better technologies (i.e. cleaner with abundant natural resources) will never take off as long as cheaper (yet harmful) technologies are still around.

In the following chapter called “Wind Turbines—Design and Components,” the book presents all the component parts that make up a wind turbine and through illustrations, pictures and charts one can grasp the complexity with which a wind turbine designer is faced. The chapter titled “The Wind,” presents the mechanisms causing the wind and the parameters to be taken into account when planning a wind turbine farm, such as the location and the wind turbines spacing for maximizing efficiency.

“Blade Geometry According to Betz and Schmitz” and “Calculation of Performance Characteristics and Partial Load Behavior” are the chapters that provide the equations that govern how to extract energy from the wind. The equations are clearly stated and explained and are easily understood with many of references. The chapter “Scaling Wind Turbines and Rules of Similarity” which follows, demonstrates the benefits of dimensional analysis and how by scaling, some parameters may not vary according to scale. Reading the principles of this chapter and thinking in terms of acoustics is very conducive in exploring various possibilities of the use of scaling in our field. “Structural Dynamics” examines how such huge structures behave under predictable and unpredictable wind loads and directions, while the chapter on “Guidelines and Analysis Procedures” tackles the certification and wind turbine components analysis process. This chapter also includes some examples on components analysis.

The chapter “Wind Pump Systems” discusses water pumping and how modern machines achieve what ancient mills used to do centuries ago, including the types of pumps that are used to extract water and their design as part of such a system. Similarly the chapter on “Wind Turbines for Electricity Generation—Basics” deals with the most important function of wind turbines which is the conversion of wind to electrical energy. “Supervisory and Control Systems for Wind Turbines” examines the means by which one maintains control over the operation and performance of wind turbines. “Concepts of Electricity Generation by Wind Turbines” examines whether wind turbines produce power as part of a grid, as standalone systems or hybrids (together with diesel or photovoltaic systems).

The chapter called “Wind Turbine Operation at the Interconnected Grid” discusses the challenges interfacing wind turbines with grid systems and their compatibility followed by “Planning, Operation and Economics of Wind Farm Projects” which deals with technical aspects, permission and regulations along with economical aspects of wind farms. This is the only chapter which mentions noise impacts, by quoting a very basic equation of hemispherical sound propagation in terms of dBA. I suppose that this is the only part of the book where one of the readers of this journal could contribute considerably to enhancing this book by expanding on wind turbine noise and its effects on humans. Wind turbine noise is a subject which is currently one of the hot topics among discussions today. Nevertheless, the value of this book lies in the rest of the subject matter since noise from wind turbines is a specialized topic and there is a lot of uncertainty as to how and to what degree communities are affected by wind farms. Finally, “Offshore Wind Farms”, deals with installing wind farms offshore and examining the pros and cons of such operations. Since land is very expensive and there is much more wind power to be harnessed offshore, offshore wind farms are becoming a reality despite the almost tenfold increase in installation costs.

I feel that the main purpose of the book is fulfilled. It is well organized and gives the reader enough

information to read the book without having any specialized knowledge on wind energy. Each chapter is independent from the others simply because the authors expand on each chapter as an entity of its own incorporating all necessary information for the reader to make sense of the subject matter of that chapter. Illustrations are plentiful and very good, and equations are clearly stated and easily followed. Furthermore, there are a great number of references at the back of each chapter should one need to go into more depth into the topic.

From the point of view of a non-expert on this subject, I can easily say that by studying this book and applying its mathematics, I would definitely become a “beginner expert” on wind turbines. I am therefore convinced that it is a great tool for students, practitioners, and engineers. However, I wouldn't be able to tell you how an expert would assess this book from a professional point of view. The only thing I found strange was the use of advertising in the beginning of the book.

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