Review

Raum-Akustik und Lärm-Minderung: Konzepte mit innovativen Schallabsorbern und –dämpfern (Room Acoustics and Noise Reduction: Concepts with Innovative Sound Absorbers and Silencers), Helmut V. Fuchs. Springer Vieweg, Berlin 2017. XXI-717 pp. 565 b/w illus., 124 in color. Hardcover €145.79 eBook €109.99. Hardcover ISBN 978-3-662-53162-4, eBook ISBN 978-3-662-53163-1, DOI 10.1007/978-3-662-53163-1. 4th Edition, with previous book title: Schallabsorber und Schalldämpfer (Sound Absorbers and Silencers)

The 4th edition of this book has a new title of 'Room Acoustics and Noise Reduction: Concepts with Innovative Sound Absorbers and Silencers'. After giving a comprehensive overview of the current state of knowledge and technology in airborne-sound absorbers, in terms of materials and components, the new edition of the book puts more emphasis in tackling current problems in the acoustic design of large and small rooms, various anechoic test facilities, and flow ducts. A significant feature of the book is that it contains fundamental descriptions, design concepts, and practical applications with more than 100 case studies. The book gives a particular focus on the performances at low frequencies.

The first three chapters are on essential fundamentals in acoustics relating to the context of this book. It starts with a brief introduction of key basic concepts and terms in acoustics (Chapter 1), and a general analysis of the necessity and importance of noise control and acoustic comfort tasks at low frequencies, in room acoustics in particular (Chapter 2). This is followed by a discussion on the key issues and possible strategies in noise control and room acoustics design, including sound field in rooms, preventing the Lombard effect, reducing sound level in rooms, attaining acoustic transparency, acoustic test rooms, protection against noise from the outside, application of silencers, and reduction of structure-borne sounds (Chapter 3).

A major part of the book, from Chapter 4 to Chapter 10, systematically presents various kinds of absorbers, many of which are based on the interesting and relevant research by the author and his team:

1) Passive absorbers, including fibrous materials, open-pore foams and puffed materials (Chapter 4);
2) Panel absorbers, including foil absorbers, panel resonators and compound panel absorbers (Chapter 5);
3) Helmholtz Resonators, including perforated panel absorbers, slotted panel absorbers and membrane absorber boxes (Chapter 6);
4) Interference silencers, including quarter-wavelength resonators, half-wavelength resonators and tubular silencers (Chapter 7);
5) Absorbers with active components, such as active mass-spring systems, active side-branch resonators and active mode silencers (Chapter 8);
6) Micro-perforated absorbers, including micro-perforated panels, micro-perforated foils and micro-perforated surface structures (Chapter 9).
7) Integrated sound absorbers for applications, including sound absorbers as constructive elements, broadband compact absorbers, sound absorbers in edges and corners, sound absorbing furniture, thermally activated acoustic elements, acoustic activated air ducts, micro-perforated absorbers for windows and facades, anechoic claddings, absorbing chimney inlays and porous glass absorber modules in sound barriers (Chapter 10).

The rest three quarters of the book systematically present general principles, specific strategies and application examples of sound absorbers and silencers, in large rooms (Chapter 11 & 12), in small rooms (Chapter 13 & 14), in

anechoic test facilities (Chapter 15 & 16), and in flow ducts (Chapter 17 & 18), with a large number of representative projects in which the author was involved.

Chapter 11 discusses fundamentals in acoustic design of large rooms. It starts with basics such as various objective room acoustics criteria as well as characteristics of sound sources, and this is followed by interesting new views on early reflections and relations between low and high frequency reverberance, as well as design principles of various spaces ranging from churches, to rock music spaces, to ancient theaters. Correspondingly, Chapter 12 presents 17 representative examples of acoustic design of large rooms ranging from performance spaces, conference centers, to sport halls. Among the detailed discussions of those practical projects, the use of several innovative absorbers is propagated.

Chapter 13 first analyses the acoustic phenomena in small rooms, followed by current trends and relevant standards. It then presents general design principles for small rooms, as well as for several specific room types including open plan offices, classrooms, and musicians' workplaces. Correspondingly, in Chapter 14, a large number of room acoustics projects are presented, including dining rooms, meeting rooms, places for learning, musicians' workspaces and music studios, offices, and enclosures for transportations. Again, the use of the above mentioned absorbers in those projects are discussed and demonstrated and the acoustic effectiveness is given.

Chapter 15 discusses the concepts of measurement rooms with specific foci, including reverberation chambers considering low frequencies, wind tunnels considering noise sources in motor vehicles, and anechoic rooms by comparing conventional and alternative absorption materials. Correspondingly, in Chapter 16, a number of examples of anechoic test facilities, including aero-acoustic wind tunnels, for leading automobile brands such as BMW, Audi, Mercedes, Volkswagen, and PSA-Peugot/Citroen, are presented, along with a larger number of examples in China.

Chapter 17 is on the silencers in flow ducts. It starts with an introduction of silencer systems and their key geometric parameters, followed by a systematic discussion on the calculation of damping from influencing parameters, estimation of self-noise, noise radiation into a room, and silencer testing. Correspondingly, in Chapter 18, there is a large number of examples of innovative duct linings, for various applications, including resonator silencers for mine ventilation systems, membrane absorbers in exhaust-gas filter systems, silencers for paper mills, mineral-fiber production plants and heating systems, considering certain special requirements like wet dust scrubbing and dust-loaded exhaust air.

The author, Prof. Dr.-Ing. Helmut V. Fuchs, studied electrical engineering at the TU Berlin, where he received his PhD from L. Cremer and R. Wille. After carrying out basic research at the German Aerospace Center, at Southampton University Institute of Sound and Vibration Research, UK, and at Stanford University, USA, he founded in 1979 the Department of Technical Acoustics at the Fraunhofer Institute of Building Physics (IBP) in Stuttgart, where he worked until 2005. He was also a professor at the University of Applied Sciences in Stuttgart. He and his team at IBP developed a series of absorbers and applied them successfully in a range of practical projects in a close cooperation with industrial partners. After his retirement, he devoted his research and consultancy to the implementation of the innovations described in this book. This book is therefore a reflection of such achievements in both product development and application.

While absorbers in one form or the other – installed at boundaries, in rooms or ducts – have become indispensable for noise control and acoustical comfort in diverse areas of life - at work, at home or in recreation,

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this book is a very useful practical reference book for acoustic designers, engineers, architects, and researchers. I very much enjoyed reading this book.

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