BOOK REVIEW:

THE EFFECTS OF LOW-FREQUENCY NOISE AND VIBRATION ON PEOPLE

[Edited by Colin Hansen, 416 pages, Multi-Science Publishing Co. LTD, 5 Wates Way, Brentwood, Essex. CM15 9TB, UK, 2007. [Price £42.50]

This book begins with an overall Introduction followed by an compendium of 32 selected previously published studies/papers [2000-2005] from the Journal of Low Frequency Noise, Vibration and Active Control. These papers present studies conducted in Japan, Sweden, Denmark, UK, The Netherlands, Poland, Australia, and China; and are organized into two sections consisting of five distinct chapters:

Section 1:
Chapter 1: Perception Thresholds For Low Frequency Noise
Chapter 2: Effect of Low frequency Noise on People in Terms of Annoyance and Sleep Deprivation
Chapter 3: Physiological Effects of Low Frequency Noise;

Section 2:
Chapter 4: Perception Thresholds for Low Frequency Vibration and the Effect of Low Frequency Vibration on People in Terms of Comfort and Annoyance;
Chapter 5: Physiological and Health Effects of Low frequency Vibration.

Chapters 1,2,3 address issues of human response to combined low frequency noise and acoustically coupled vibration resulting therefrom; Chapters 4 and 5 address human response to more traditional mechanically coupled low frequency vibration.

In particular in Section 1, Chapter 1 focuses on human perception thresholds, acoustic masking, and acceptability levels of impinging low frequency noise conducted in 4 distinct Japanese studies. All of these studies were excellent, and the graphical description of Moore's loudness model was particularly noteworthy and very informative.

Chapter 2 consists of 16 excellent papers focusing on human annoyance, unpleasantness, complaints, behavioural changes, and sleep deprivation arising from impinging low frequency noise including infrasound. Comparisons are made between low frequency noise and the A-weighting function; and the difficulties of accurately obtaining and interpreting low frequency noise data are also addressed.

Chapter 3 consists of 7 papers focusing on high level, low frequency noise capable of inducing moderate levels of vibration on human body surfaces such as the head, chest, and abdomen; the main concrns being human illnesses and/or performance decrements resulting from this exposure. These studies too were very well executed.

My overall opinion and impression of Section 1, Chapters 1,2,3, is *excellent* for: defining the scope of and methodically elucidating the salient issues of the low frequency noise problem as it relates to humans, as well as the choice of and inclusion of salient papers; and finally the editor's clear and concise commentary.

Referring to Section 2, where the emphasis is now on traditionally mechanically coupled low frequency Whole-Body Vibration [WBV] and Hand-Arm Vibration [HAV]. Chapter 4 was concerned with human perception thresholds, annoyance, and comfort of vibration; and Chapter 5 was concerned with low frequency vibration induced physiological and health effects.

Chapter 4 consists of 2 papers, one paper was concerned with the perception of

low frequency vibration while operating heavy articulated vehicles; not surprisingly, the WBV vertical [Z] axis was deemed most uncomfortable and correlated well with rough surfaces traversed by these vehicles; the second paper considers HAV threshold perceptions which demonstrate significant variability depending on the test equipment and methods used; this study attempts to clarify and explain these differences in vibration perception results.

Chapter 5 consists of 3 papers, the first paper is a small clinical study of 9 workers exposed to HAV, some of which resulted in well documented Hand-Arm Vibration Syndrome [HAVS]; the second paper was concerned with very low frequency [< lHz] horizontal [X] axis WBV and its perception and response by the human nervous system; the third and final paper once again is concerned with the effects of WBV in the low frequency range of 0.4-0.8 Hz.

Before I comment on Section 2, Chapters 4 & 5, a short digression is needed: The issues of Whole-Body Vibration [nominally 0.5-80 HZ] emerged after World War II, where certain automobile companies were concerned with human comfort, the major WBV research emphasis has been mainly two fold: I] *performance decrements* in both military situations, [operating high performance jet aircraft, helicopters, tanks, personnel carriers; firing of weapons from navy ships in high turbulent seas, etc] *and* civilian operation of vehicles [ie trucks, buses, heavy equipment, farm vehicles, trains, etc.l where performance decrements are related to worker safety issues should the operator lose control of their vehicle, especially during WBV resonant [4-8 Hz] conditions. II] long-term chronic *health effects* in occupational groups [ie truck, bus, heavy equipment operation, locomotive operation, etc.] numerous studies have shown linkage to back pain, lumbar spine disc degeneration, disc distortion, disc tears, prolapse, and herniation, as well as disc buckling under WBV exposure. The issues of Hand-Arm Vibration emerged in 1911 in Italy & since then some 400-500 medical, epidemiological, and engineering studies have been performed world wide as well as numerous medical text chapters and individual texts written elucidating the irreversible condition of the fingers and hands of vibration exposed power tool workers known today as Hand-Arm Vibration Syndrome.

Returning once again to Section 2 of this text, all of the 5 studies presented in Chapters 4 and 5 were done well, but the problem with Section 2, in my view, is that it is devoid of a large critically important body of published knowledge regarding WBV and HAV, compiled over decades, the salient parts of which should have been presented in this Section 2. I fully recognize that the editor used only previously published papers from this journal and some of these salient studies may not have been available for this text, however, he could and should have described these facts of WBV and HAV as part of his personal chapter notes to the reader; then the 5 papers given in Chapters 4 & 5 would have appeared in context.

This reviewer strongly believes that if the reader is interested in purchasing a fine text regarding *only* the effects of low frequency noise and acoustically coupled vibration on people[Section 1]I highly recommend it and am happy to add it to my library; however, if the intent of the reader is only interested in the effects due to exposure to Whole-Body Vibration and/or Hand-arm Vibration [Section 2], I would not recommend it.

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