

Preface

This book has been written with three objectives in mind. Firstly, to emphasise the issues that the customer faces in vehicle refinement: those issues that directly influence the customer's purchasing decision. Secondly to include all of the mathematics needed to fully understand the subject along with as many full derivations of the key equations as practicable. Thirdly to construct a full reference list in order to direct further study.

As a result it should prove useful for the practising automotive engineer to read and then keep as a reference text. It should also prove useful as a teaching resource since much of the material is drawn from a lecture-series originally written for the Automotive Product Engineering MSc course at Cranfield University (UK).

The scope of the book is wide, covering all the main sources of noise and vibration in road vehicles. It also provides an introduction to both acoustics and dynamics so that a wider readership can gain an appreciation of the physical processes that cause, propagate and control noise and vibration.

The book is indexed and organised into six cross-referenced chapters, each one with its own reference list. A number of classroom-type demonstrations and group exercises are included.

Chapter 1 introduces the subject of vehicle refinement, setting out objectives and targets, and includes a case study.

Chapter 2 describes the physical behaviour of sound and gives practical advice on how it can be measured, recorded and analysed.

Chapter 3 describes how vehicle exterior noise can be assessed and controlled. Tyre noise, intake noise and exhaust noise are considered in detail.

Chapter 4 discusses the process of assessment and control of vehicle interior noise including discussion of road noise, engine noise, wind noise, brake noise and squeaks and rattles. The physics of sound absorption and sound encapsulation are explained. Chapters 3 and 4 together give the details of key vehicle refinement tests: noise homologation, noise source ranking, sound power measurement, interior noise measurement, engine noise testing, subjective rating, noise path analysis.

Chapter 5 describes the physical behaviour of vibration and advises on how it can be measured and analysed. A discussion on modes of vibration and resonance leads to a description of the modal analysis technique.