

Technical Brief No. 42

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Consumer & Industrial Applications

Sound Quality Engineering Consumer Products

Why Consider Sound Quality (SQ) Engineering?

Until recently, most consumer product companies and acousticians sought only to design quiet (or at least quieter) products. Now these product companies are becoming increasingly aware that the perceived sound a product produces has a direct effect on the overall feeling of quality that the user links to the particular product in question. In other words, there is a direct correlation between a product's sound and the perceived quality of the product in the user's mind.

What is SQ?

SQ refers to a user/listener's perceptual reaction to how acceptable the sound of a product is; the more acceptable, the greater the SQ. However, what is meant by SQ will vary from one application to another. At times it can relate to the loudness of the product; the sound may interfere with the intelligibility of speech, potentially cause hearing loss, or possibly intrude on a neighbor. At other times it may convey a sense of malfunction; a slight rattle or buzzing may make a user feel the product is unsafe, unreliable, or poorly manufactured. Conversely, it may convey a sense of a well-built and well-designed product such as the "solid" sound of a car door being closed.

Practical Issues

In many products, such as air-conditioners, lawnmowers, and automobiles, noise is generated by a variety of mechanisms. A practical issue faced by a designer is to decide which mechanisms are appropriate to quiet. The measurement of SQ tells the designer to concentrate on those sources which are detracting from the product's overall SQ. If the designer, conversely, concentrates on reducing those sources whose sound would otherwise be more appealing to the user, the overall SQ may decrease. An example of this is found in quieting the

engine exhaust noise of a car while all but ignoring the tiny but audible rattle of a door lock. Should this occur, the car's subsequent SQ will probably be low.

Measurement of SQ

Subjective evaluation of the sound quality of a product is typically obtained by exposing a panel of listeners, or a jury, to the product's sound and asking for subjective responses (on an appropriate scale). This might first include the acoustical measurement and recording of the product's sound. This is followed by the jury's subjective ratings of a processed recording of the acoustical data (either monaural or binaural). For instance, by editing out a particular tone, we can determine whether or not the edited version improves the perceived sound quality of the product and, therefore, quiet the appropriate

noise source(s).

Various psychoacoustic metrics such as loudness, noisiness, roughness, and sharpness have been developed to assist in predicting SQ. However, RH Lyon feels that these psychoacoustic metrics, though useful in scaling certain features of a product's sound, have not been shown to predict a product's acceptability with regard to SQ. Consequently, RH Lyon supports the measurement of SQ through assessment of subjective jury evaluations.

Related Areas of Interest

Further details on the theory and application of Sound Quality Engineering can be found in various RH Lyon technical papers. Further information on the application of SQ with regard to specific products can be found in other RH Lyon Technical Briefs.

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