7.3 MAGNITUDE OF UNDAMPED PANEL OUTPUT

Many speaker designers have laboured by trial and error to control cabinet resonance by such methods as the use of high density constructional materials and internal bracing, or loading the panels with ceramic tiles and sand. However, their efforts have met with only moderate success.

Sand is an awkward medium to work with as it requires a retaining panel to hold it in place and has the further undesirable effect of causing the weight of an enclosure to soar dramatically. However, this treatment can be quite effective due to the added mass and also to the loss imparted by the vibration of the individual particles.

Rank's Leak/Wharfedale division hold a patent for an intriguing variation on the theme of filled cabinets, namely a water 'sandwich!' The enclosure is presumably a double skinned synthetic moulding, the intention being that the purchaser should fill the cabinet on delivery. An obvious advantage for the manufacturer is the greatly reduced transit weight of the partially completed system.

Resonant modes can be modified by increasing the thickness of the panels or by attaching battens to them, but although these measures may displace the resonances to more subjectively acceptable frequencies, they usually have little or no effect on their magnitude. Beam coupling of two opposite panels will only effect the fundamental bending reso-

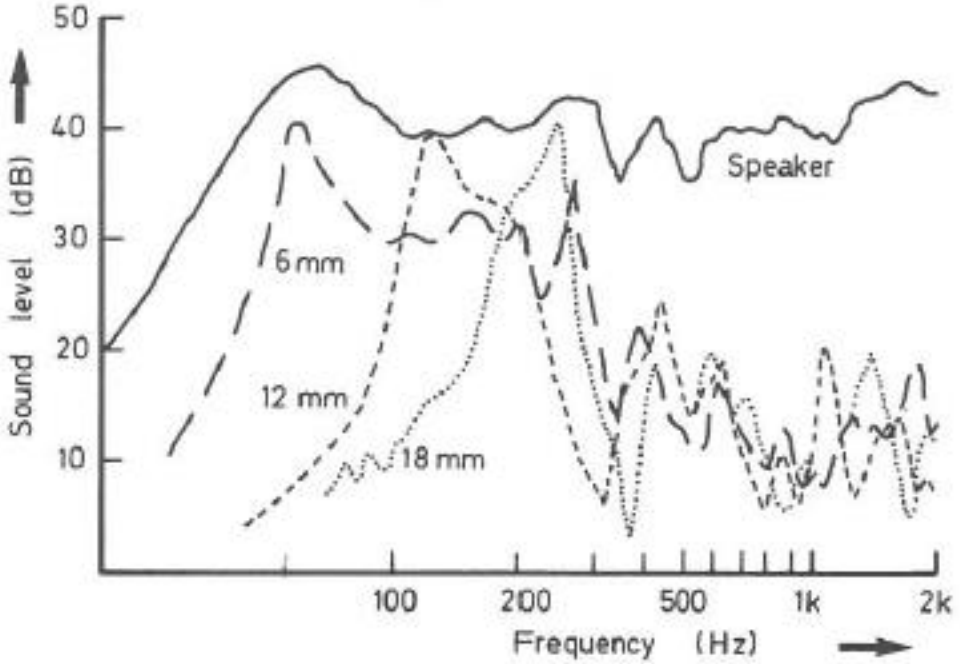

Figure 7.1 Sound output of Birch-ply panels (after Barlow)[3]

nance, where a major stiffening will result, suppressing this mode. Barlow[3] measured the sound output of square birch-ply panels excited by a driver mounted on the inside surface. A remarkable discovery was made, namely that the output at certain of the resonances approached the level achieved by the driver with the panel absent, thus indicating that the panel was almost wholly acoustically transparent at these frequencies (Fig.7.1).

However this is an exaggerated case as enclosure panels tend to be rectangular rather than square, and the listener is rarely on the panel axis. Nevertheless Stevens[1] has shown that for a typical 50 litre enclosure built of 18 mm chipboard, radiation from an undamped rear panel may have peaks which are only 10 dB below the front axial output (Fig.7.2).

In a normal sound field the output of the six cabinet walls will contribute to the desired forward radiation, and Harwood has noted a working '*Q*' of up to 100 in cabinet panels made from several varieties of wood. Subjectively derived evidence has shown that these resonances are clearly audible, and may have delay times of half a second or more. Clearly the choice of panel material alone is not likely to reduce either the '*Q*' or the reverberation time to a level where it becomes unobtrusive.