Studio Acoustics Notes

Tape Op Interview with Jim Keller, recording studio designer for Sondhus

Regarding in-home studios and the need for bass traps: It's a lot easier to get a good sound in a residential room because most times you don't have to deal with quite the same level of isolation, especially if it's a freestanding house and you don't have to build massive heavy walls that reflect all that low frequency energy. In that case, you've got maybe a layer of drywall, then some insulation, then another layer of drywall for the adjacent room, so the low frequencies pass right through it. Drywall's almost invisible to low frequencies.

Eventually, I started figuring out the low end, which is the most difficult part to really nail. Midrange and high frequencies are generally easy. You don't need very thick absorption to treat that, get reflections tamed, and your decay times to a decent place. But if you want to trap 100 Hz with velocity-based absorption – which is what the typical acoustic panels made from Owens Corning 703 [rigid fiberglass] are – you would have to have a trap that's about 3-and-a-half feet deep.

So, instead of velocity absorption, you can get into pressure-based absorption, or tuned membranes. Those are flat panels, made with as homogenous a material as you can get, that has a certain density and a sealed cavity behind it. There are fairly easy formulas to figure all that out: you've got a sealed enclosure that's maybe 6 inches deep and a layer of, say, 1/2" MDF [medium-density fiberboard] on the front and some fiberglass fill on the inside. A lot of details I'm leaving out, but that's the basics of it; that's the science.

What are the most common causes of ambient noise floor in home studios, and what are ways of dealing with them?

Most can be solved with some combination of technical solutions and compromise in your recording approach. For example, if you live in an apartment and there's an air conditioner on the roof, that's a structure-borne problem. A lot of times it's as simple as a high-pass filter on your preamp or on the mic. Or close mic'ing with a dynamic mic, rather than a condenser further out in the room. That goes a long way for dealing with ambient noise. The next step would be to treat it at the source. Go to the building manager and ask them if you can put some vibration isolating mounts on that AC unit to decouple it from the structure. Hopefully that wouldn't require too much money to do properly, and maybe the building can chip in. It's always best to fix it at the source. If you want to get rid of that structure-borne vibration by modifying your room itself, you'd have to decouple it, and that

gets very expensive. Whereas you could apply a relatively inexpensive solution and fix it at the source. Doors and windows are another common issue. With doors that feed a common hallway, we'll do a door seal system from Legacy Manufacturing or Zero International.

In the case where someone can't do a big construction project – say they have a spare room in their apartment to set up their studio – what are the most reliable ways they can approximate a neutral and linear listening environment?
Midrange and high frequency absorption at the first reflection points from the speaker to the listening position. After that, treating the rest of the room with scattered absorption points following a symmetrical pattern. Instead of covering one whole wall, floor-to-ceiling, with absorption, you could make a sort of grid with pieces of absorption. Then you have some absorption and it's giving a little back. If you cover an entire room with two inches of [Owens Corning] 703, you're gonna get a serious notch filter in the response of that room because you're sucking out a very specific frequency in the midrange, as well as most frequencies above that. It's going to sound very notched and scooped. Getting balance is important – you really don't want too much absorption to where it's dead and uncomfortable. But you can go a long way, and not spend a lot of money, with a couple basic rules of thumb: first [deal with] reflection points, then symmetrical absorption in a semi-randomized pattern, and ideally not having two reflective parallel surfaces.

What if somebody calls you and they've got their mid and high frequency responses under control, but the low end is crazy with certain frequencies that ring out, or certain notes that disappear in the mix position?
Honestly, the best thing you can do for that for very little money is to get a great pair of headphones that you know well. When you get to that point where you're making those decisions in the mix, turn down your monitors, put on your headphones, and you'll know instantly where the balance is. That's an inexpensive way to get where you need to go. You can also experiment with moving your speakers, or your mix position. What you're doing then is not correcting those room modes, but shifting them around. It may resolve the issue at one frequency, but then you could develop issues at other frequencies. At that point, it's about experimentation. Play a sine sweep from 20 Hz to 300 Hz at the mix position and listen for where it's dipping in level or where it's ringing; it's usually pretty obvious. Then play a fixed sine wave at that frequency – say it's 90 Hz – and then move your chair back a little bit. You'll find that there's a point where it disappears almost completely. Then as you move back, it starts coming back into focus, and further back there's a point where it's loud. Somewhere in between there you find a point where it's fairly balanced. That can be a way to put band-aids on specific low frequency problems.