How to Ruin a Mix

Stop. Enough Already with the Cymbals!

By Michael Fay

This morning I sat in church listening to a wonderful 150-voice choir, an 8-person front-line vocal team, a 40 piece orchestra, and a tight rhythm section that included a grand piano, B3, electric and acoustic guitars, electric bass, and a full acoustic drum kit.

Because there are so many acoustic instruments and voices being miked, the drums are in a fully-enclosed plexi booth. The sanctuary stage is not an ideal acoustic environment for all this sound in close proximity, but it's workable for most arrangements.

However… today, for some reason, the FOH engineer was running the overhead drum mics way too hot in the mix.

What a waste of amazing talent.

So, what's my problem?

The problem was the constant drone of metallic hash noise coming from the ride, splash and crash cymbals. Why are you (you know who you are) miking and routing those cymbals to the main mix buss? Well maybe the Death Metal guys can get away with this, but for everyone else, please continue to read on.

Having spent a good deal of my pro audio career in the studio, or behind a FOH console, I've never understood the fascination with overhead drum mics. In the studio, sure, I get laying down discrete OH tracks that can be carefully used in the final mix. But for a live mix, not so much.

Zildjian 20" ReZo Crash Cymbal. See Figures 1 & 2 below for the spectral data from this cymbal. [1]

I love a good sounding drum kit, and have long felt that when properly tuned and mixed, a great sounding kit can make any combination of other instruments and voices sound better than the sum of the parts. But I think the ride, splash and crash cymbals do more to ruin an otherwise good mix than any other class of instrument. IMHO, allowing OH mics to pick up and amplify these cymbals ruins the mix, and here's why.

The Upper Mid-Range Tonal Spectrum Gets Too Crowded

Cymbals occupy a wide swath of the audible frequency spectrum [Figure 1]. And when hit hard, they contain a significant amount of transient energy [Figure 2], and decay much more slowly [Figure 3] than all drum heads.

Amplifying cymbals is particularly bad because of how the tonal spectrum masks other, more deserving sonic content, specifically vocals. Cymbals just raise the noise floor of the overall mix for no good reason. You might as well just feed pink noise into the output buss and raise the level until it's obviously annoying. Even without amplification, cymbals can easily overwhelm solo and background vocals, strings, acoustic guitars, woodwinds, keyboards, and a whole host of other instruments that have fundamental, and first and second harmonic tonalities between 400 Hz and 10 kHz. [2]

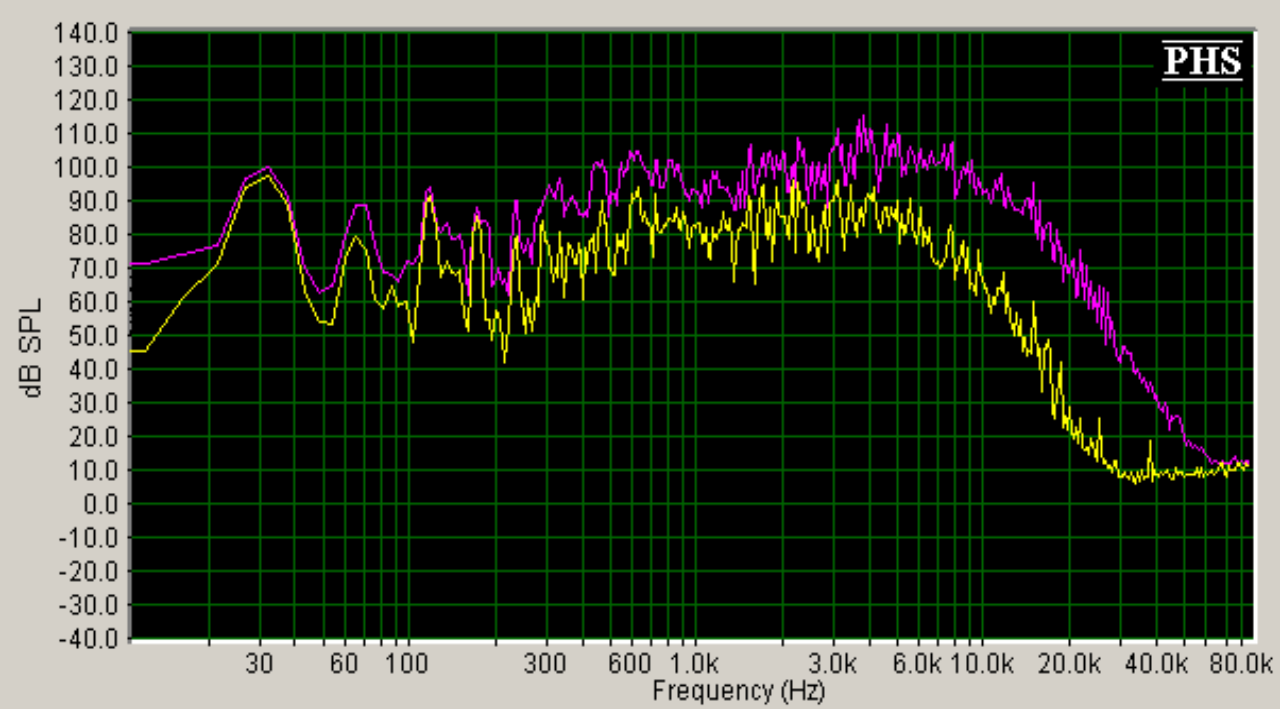

Figure 1 - Frequency response of a Zildjian 20" ReZo crash cymbal. Notice the energy density between 100 Hz and 10 kHz. The magenta spectral line is the peak volume at the initial crash. The yellow trace is the sound level 2 seconds afterward, so the yellow line shows the decay. [1]

The only cymbals I consider worthy of miking for live reinforcement are the high-hat pair, presuming the drummer isn't too heavy handed when the pair are open. There are many effective ways to mic the hat, so I won't go further into that topic.

If you absolutely have to throw up a couple of overhead mics (e.g. because the drummer insists they're needed for his in-ear monitor mix) pull them out of the house mix and only consider bringing up those faders during a soft ballad, when the drummer is most likely playing as light as they ever do.

Or, perhaps consider putting up under-hung mics on each cymbal. The closer placement, and upward facing positions, will reduce much of the drum and room bleed (based on the polar cancellation properties of each mic) giving more control over individual cymbal sounds. But even with this technique, you must be very careful with the levels

There is enough energy coming off most cymbals to easily carry into your drum mics, and likely, every other open mic on stage. Obvious examples are: vocal, choir, acoustic piano, string and acoustic guitar mics. I'm sure you can fill in other examples.

Should We Blame the Drummers?

The easy answer is yes, they deserve some of the blame. But they aren't alone. For all but a very few gifted drummers, the sonic and transient impact of their cymbals seem to escape their sense of balance and blend within the context of their own kit, let alone their ability to blend and balance with all other voices and instruments.

Their playing style seems to be more about brute strength and muscle memory than listening to what's going on around them. I imagine this subconscious thought process: "I'm hitting the snare and toms this hard, so I need to hit the cymbals just as hard, if not harder".

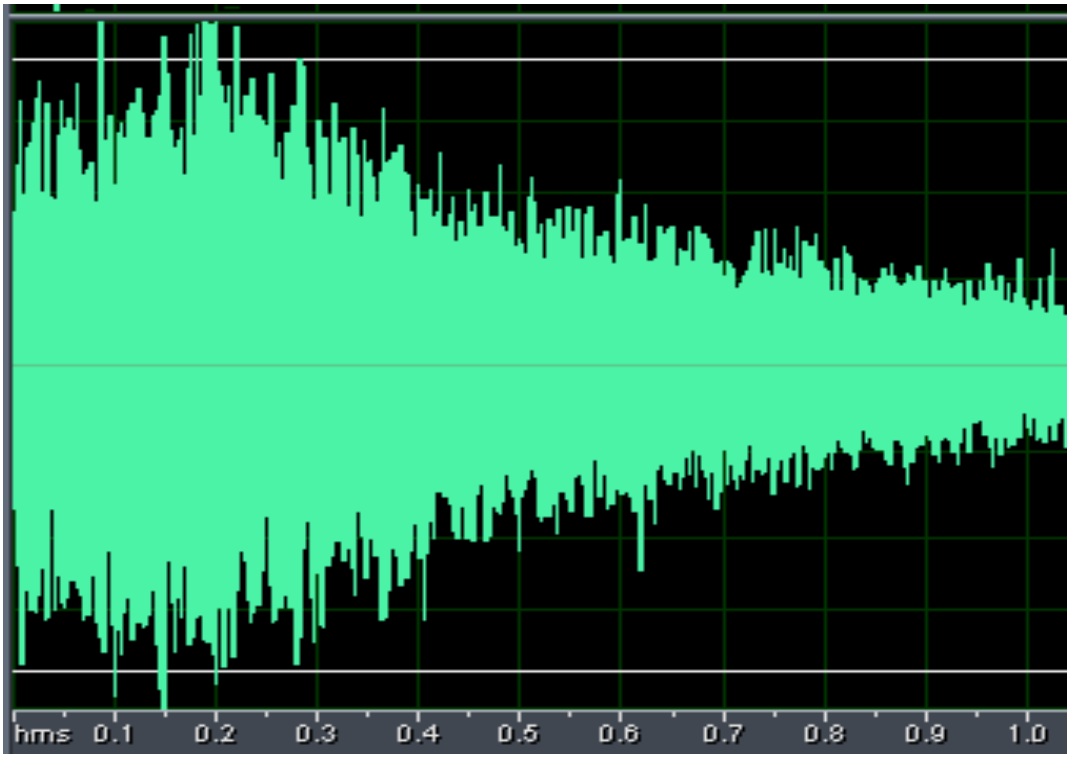

Figure 2 - The Zildjian 20" ReZo crash cymbal. This graph shows the recording level vs. time, in 10ths of a second. The peak level of sound is reached at 0.15 - 0.2 seconds, followed by the decay. [1]

I'm not a drummer (well maybe a little closet drumming back in the day), so I can't speak to what drummers hear when sitting on their throne. It may be they don't hear the dynamic differences from above the cymbals that the audience hears from below. I'm also pretty sure they're not thinking about human hearing sensitivities based on frequency (Fletcher-Munson).

The reason for the kick, and most toms, is to produce low-frequency tonality with a short, metered, rhythmic punch. The snare delivers a short, crisp, lower-mid to upper mid-range pop or snap. But cymbals easily dominate at least four octaves with dense fundamentals and harmonics -- smack in the frequency bands where our ears are most sensitive. And, their resonant decay is incessant; usually lasting much longer than the time that elapses before they are struck again, and again, and again.

Drum Booths Aren't the Answer

The most common reason for using a drum booth is to contain *all* the energy coming off the drum kit. It's like a giant 30 dB pad being wrapped around the whole kit so the FOH guy has a fighting chance to place the individual drum mic levels where they need to be in the mix; for the arrangement, room, and audience. Without a cage, things often get too loud real fast, and there's nothing that can be done electronically to bring the volume down to an appropriate level.

How many times have you sat in the front rows of a church or small club and felt the overall band mix was pretty good? If only the drummer played softer, and OMG, the cymbals are killing me! If you're like me, the answer is too many.

As I'm sure most of you already know, acoustic drum kits almost always set the bar for acoustic energy on stage. And in most small- and medium-size rooms, they usually set the bar for the whole room. By that I mean: if the un-miked drum kit averages 90 dB in the house, then every other instrument and voice needs to run at about 90 dB or more through the loudspeakers, just to approximate a balance and blend. If you can't turn the drums down enough (or at all) for a good mix, then the only option is to bring everything else up.

If you think about it, many drum cages could be eliminated altogether if the big three cymbal types were eliminated. At least the drum heads can be tuned and dampened to produce a rich, deep, punchy tone, with little ringing or decay. Try doing that to the cymbals. Most drummers will lose their minds.

What About Recording Cymbals?

I'm not suggesting you never mic cymbals in a recording studio, or for live tracking, where each channel can be assigned to separate tracks for post processing and mixing. I do however, implore that if you have to throw up overhead mics, keep them muted during all the loud and up tempo songs, or set to a very, very low volume in the main house mix. For me, leakage into the snare, toms, and other mics is more than enough.

Now, you may argue that you've gated the snare, kick, and toms, so there won't be much leakage into those mics. That may be true, but even if a little of the initial attack comes through, that's usually all that's needed. Plus, there are probably any number of other open mics nearby. They will see enough of the transient energy to leak through. If you still need a little more, try opening up the gating threshold and release time on one of the tom channels.

What Do the Pros Do?

Listen to the mix on shows like The Voice, American Idol, Darryl's House, or Later with Jools Holland. Notice that the mix they broadcast is essentially devoid of any direct cymbal miking. Music videos, live theater, and movie soundtracks follow a similar pattern. Sure, you might occasionally hear a little leakage, but you'll probably never hear a ride or crash cymbal that is equal to, or louder than any of the drum heads, other tonal instruments, or vocals.

In fact, you generally just get kick and snare in the mix, with maybe a little tom support if the arrangement specifically calls for it. When hit hardest, none of the cymbals should come through at a level that is equal to any of the vocals, nor even as loud as the main chordal instruments.

Why do they mix like that? Because they recognize and understand the negative noise-masking effect that cymbals bring to the show. For most live events, it's all about the vocals; their tone, nuances, dynamics and texture. Cymbals wipe out most of those qualities when allowed to dominate.

Modern Solutions

It seems I'm not the only one who has issues with cymbals. Market demand finds its way to the splashy, crashy, hashy, trashy, bashy, clash, mashy, gnash, washy, world of cymbals. I see that Zildjian, and probably others, has released the L80 series of low-volume cymbals. (nice oxymoron) They claim they're "80% quieter than a traditional cymbal without losing the authentic Zildjian feel".

Another approach comes in the form of product called Cymbomute, from UK Percussion Concepts.

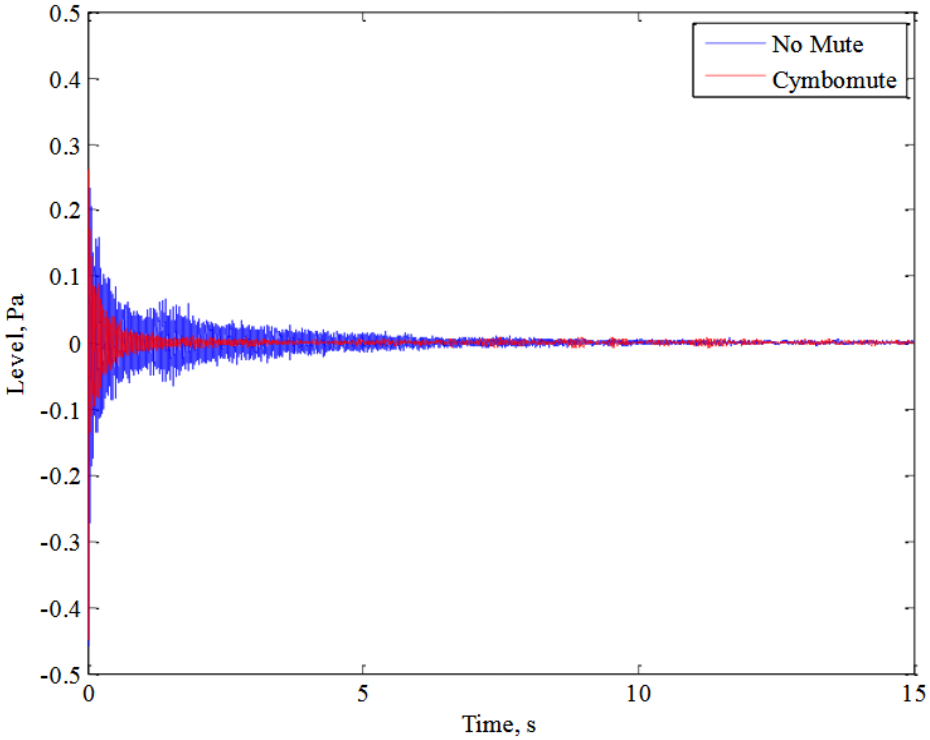

Figure 3: Impulse response before/after overlay of a Cymbomute damping ring. [3]

This product is a damping ring that surrounds the edge of each cymbal. Figure 3 shows a before and after lab test of a 16” crash cymbal. The blue trace shows how much energy still exists after 2-3 seconds. The red trace shows a much quicker decay of about 1 second when the Cymbomute ring is applied.

If you insist on putting up OH mics and routing them into the main mix buss, either of these new solutions could probably help save your mix.

Summary

Last night I watched and enjoyed, *The Show Must Go On – The Queen & Adam Lambert Story*. If you watch it, listen carefully. You’ll notice very little cymbal crash or splash in the broadcast mix. If they can live without this four-octave wash of background noise, so can you.

P.S. – Within a couple of weeks, the mix engineer at church figured out he had the overhead mics running too hot. Things are back to normal now.

Citations

[1] Graphs from *Zildjian 20” ReZo Crash Cymbal* review, published in Secrets of Home Theater and High Fidelity, September 3, 2013: https://hometheaterhifi.com/latest-reviews/cymbal-reviews/zildjian-cymbal-reviews/”

[2] https://www.musical-u.com/learn/percussion-frequencies-part-2-cymbals/

[3] https://ukpercussionconcepts.com/collections/simple-theme-collection/

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Technical Editor Michael Lawrence contributed to this article.