Subject: How to choose the correct Horn??
Posted by Jeremy Bridge on Thu, 06 Nov 2003 01:39:27 GMT
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I was directed this way by members from another board, they commented there is an all knowing man here named Wayne that would most likely have the answers I am looking for? :)So on to my question. I am in the process of building new cabinets for my PA rig. It will be a medium size 4 way rig. I have decided on the 300hz-85hz-down range, but I am in need of guidance for 300hz +Right now my plans for this consist of 8 two way cabinets with one 12" and 2" compression driver each. Ideally I would like to horn load the 12" but it will probably end up being front loaded, as I lack the experience to correctly design a horn loaded midrange, and cannot find any solid plans for building one, which I know will sound nice. (open to sugestions)Right now I am goning to use either a Kappa Pro 12, or a B&C PE32 12" for the midrange.But my real question lies in the mid/high 2" horn. I am confused on how to choose the correct horn flare for the compression driver. I will be using either a Zomax 2445, or a Selenium 3300TI (depending on funds). I would like a 60x40 dispersion, and for the horn to go down to 1000hz. But past that I really do not know how to go about choosing the horn as it seems manufactures provide little information about them.If anyone can shed some light on this mater I would greatly apreciate it!Thank you!

Subject: Set your goals, model a design and build it
Posted by Wayne Parham on Thu, 06 Nov 2003 04:29:57 GMT
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I like midrange horns using medium-format (8" - 12") cone drivers. To me, they sound very clear and natural. You just really can't take a modern compression driver down to 100Hz-200Hz, and that's where the larger cone-driver horns really shine. These kinds of horns are pretty simple devices really, having a low Q midrange driver and typically a simple conical flare.

Construction is straightforward. Bring four sides of a truncated pyramid back to form a square hole meeting the loudspeaker's baffle. The side of the hole sets the compression ratio and forms the throat area. The flare of the sides and their length sets the coverage angle and the expansion for the horn. You might add a final increased expansion section about 20% from the mouth, in order to maintain uniform dispersion as the horn frequency drops near the point where the mouth begins to form a diffraction orifice. But this then is a simple conical horn, with only two sections and you can easily model a horn like this with Hornresp, so grab a copy if you haven't already.

For 2" exit compression horns, you might look over at www.WoodHorn.com and see what Bill is doing. He makes some great horns, and if you're inclined to make the wood flares yourself, then maybe he'll sell you the billet aluminum throat piece. Hard to beat that part - It's durable, has an O-Ring for compression sealing and is very consistent in manufacture, being made on a metal CNC lathe.

Your coverage angle and decision to go axisymmetic or not is up to you and the coverage pattern

you need. So is your choice of flair - If you want constant directivity, then just make the sides straight, perhaps with a final width expansion about 20% from the mouth. You can make an exponential or tractrix horn that's has a little bit flatter response, but at the expense of poorer off-axis performance.

Exponentials provide better response at the lower end of their response curve than tractrix, but tractrix is very popular these days and is said to be improved in the top end. Honestly, I find very little difference in these two types, and I like them both.

My preference has been a horn having constant directivity in the horizontal plane but with an exponential flare in the vertical, i.e. radial horns. I also like the axisymmetric horns best, with 90° x 40° coverage, but this is because my applications are typically home and small sound production applications, where few loudspeakers cover an entire room. Uniform wide coverage from a single loudspeaker is required in these applications, and that is something I feel my designs do very well.

Keep us posted with what you do. Maybe post some photos when you get 'em done.

Subject: Re: Set your goals, model a design and build it
Posted by Jeremy Bridge on Thu, 06 Nov 2003 12:51:18 GMT
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You commented that the length of the sides and thier angle control the dispersion in a low-mid horn. But do you know how I would go about making that 60x40 to match the high horn?I have used horn resp, before but I am just not confident of my results. I have a very hard time getting any response abouve 1000hz out of any mid horn I model in it. Perhaps I should bite the bullet though and take a shot at building one. You commented you like Constant Directivity Radial horns, one of the horns on the top of my list is just that. Do you happen to know if Eminence's TI2000 is a nice sounding, good quality horn?

Subject: Re: Set your goals, model a design and build it
Posted by Wayne Parham on Thu, 06 Nov 2003 13:17:21 GMT
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You can make a simple conical horn having each side at the angle desired. Start with the throat area needed for the compression ratio desired and end where the area is large enough to support the lowest frequency passed.

Hornresp models do a great job of predicting performance, but understand it calculates pistonic

behavior only. Your driver will have output over and above the point where mass rolloff causes the pistonic output to droop. It's almost like you have a horn with the diaphragm as one sound source, and the you have sections of the vibrating plane as other sound sources. These secondary vibrations will generate significant output, which is shown on the measured frequency response graph.

Subject: Re: Set your goals, model a design and build it
Posted by Jeremy Bridge on Thu, 06 Nov 2003 17:38:18 GMT
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So what you are saying is that to creat a 60x40 midrange horn you simply need to have the angle between the vertical walls 60 degrees, and the angle between the horizontal walls 40? Seems almost to simple :) Perhaps I am misinterpreting.Would there be a better horn choice to extend the HF response? I would rather only use one compression driver, if at all possible.

Subject: Re: Set your goals, model a design and build it
Posted by Wayne Parham on Fri, 07 Nov 2003 05:19:25 GMT
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For the most part, the pattern from a conical horn is set by the wall angle. So a straight-walled

bandwidth. At low frequencies, where mouth dimensions get close to a wavelength in scale, mouth diffraction will start to set in. So the patten will narrow slightly, and then as frequency drops, it will widen considerably.At the other end of the passband, throat and diaphragm size become more important. The larger diaphragms obviously cannot be used to as high frequency as smaller ones, and phase plug and throat throat size and shape set a limit on HF performance too, both in terms of amplitude response and directivity. As a result, a 1" exit driver is capable of greater HF extension than a 2" exit driver, all other things being equal.
