Subject: Re: To horn or not to horn?
Posted by Wayne Parham on Fri, 23 Apr 2004 19:23:40 GMT
View Forum Message <> Reply to Message

I think that horn loading from about 50Hz or 100Hz up makes a lot of sense. At these frequencies, horns do not have to be large to be effective. Below that, it really does require a pretty big device to perform well. If you've got the room, super, but you don't want an undersized horn because it will cause response anomalies. In the other hand, if you install your basshorns in a corner, they can be 1/4th the size they'd need to be in freespace. In fact, the corner forms a horn all by itself, so that's something I'd take advantage of if corner placement is an option.But back to horns above 100Hz. Really, there are few downsides. Horns increase dynamic range and reduce distortion. When used above their cutoff frequency, they load well and are quite linear. That makes the response curve nice and flat. Their only disadvantage aside from their physical size is that horn-loaded drivers generally aren't flat for more than about three octaves, so they're bandwidth limited.That brings me to shapes. Conical (megaphone-like) flares are simple but I generally prefer them, at least through the midrange. A conical flare will give you a constant distribution of sound through its dispersion angle. The dispersion is simple, basically determined by the angle of the horn walls. With a conical flare, if you can see the driver, you are in its dispersion pattern for the entire operating range.Compression horn tweeters almost always need EQ though. Compression drivers don't really push the top octave, so you either must provide EQ or add a super-tweeter. That's why you'll find so many people that like tractrix and exponential shaped horns for compression drivers. These horn shapes focus the sound more tightly at high frequencies, giving some acoustic EQ as a result. Using conical horns on compression drivers necessitates electrical EQ to compensate since the horn does not cause collapsing directivity as a function of frequency.There is also a family of horns that acts in between, and that's the radial and bi-radial horns. These are rectangular horns that tend to provide some increasing directivity but not as much as a axisymmetrical (round or square) exponential horn. The radial horn is made so that there is collapsing directivity in the vertical plane but the horizontal plane remains wide, without any narrowing of the pattern at high frequencies.Radial horn flares have curved walls on the top and bottom, and straight or nearly straight side walls. Bi-Radial horns have some curvature in each plane, but it is designed to strike a balance in the compromise between coverage and acoustic EQ. Radial and Bi-Radial horns need some EQ, but not as much as a conical or CD horn.Lots of hybrid horns shapes exist too. You'll find horns that have throats that act as diffraction slits at high frequencies. These provide some additional horizontal dispersion from Fresnel diffraction rather than the shape of the horn flare. A shape I like has a conical initial section with a radial or bi-radial expansion after that. This provides acoustic EQ by the narrow pattern of the initial expansion but wider dispersion through most of the range, set by the radial flare. Having the mouth edge rounded like a tractrix flare so that the edge makes a smooth transition to the baffle is a nice touch too, giving the benefits of the tractrix horn as well as the benefits of the radial and CD flares.Just like any other technology, there are a lot of good solutions.