Subject: Webster's equation verses FEA / BEM
Posted by Wayne Parham on Mon, 24 Mar 2008 18:55:44 GMT
View Forum Message <> Reply to Message

There has been some discussion over the years about how accurate the Webster's equation is at describing horns. It is a mathematical model, and with all models, it is accurate at some level but misses some of the details. It is a one-dimensional model for axisymmetric Salmon shapes: parabolic, conical, exponential and hyperbolic. It makes an assumption of equal cross-section pressure. All of these things are simplifications, as all models truly are.Does that make it "wrong"? Is any model that misses some detail "wrong"? Or is it a useful tool that can be used to approximate a real device with a mathematical abstraction. Obviously, this is the case.Over the last couple of decades, a new suite of tools has been evolving, called Finite Element Analysis, or FEA. It is a way of reducing a model into many component pieces and analyzing each one separately. Deformation/stress analysis can be made of complex shapes. Heat flow and magnetic flux are modeled with FEA. Recently, an adaptation called Boundary Element Modeling or BEM has been used for acoustics problems. You can model wave propogation and resonance with it, so better models can be made of oddly shaped acoustic apertures, chambers and devices.Here are a few links about BEM for acoustics:The Sound Field at the Mouth of a Horn, Rick Morgans, Colin Hansen, Anthony Zander, David MurphySimulation of the acoustic field produced by cavities using the Boundary Element- Rayleigh Integral method (BERIM) and its application to a horn loudspeaker, S. M. Kirkup and A. ThompsonBoundary-Element-Method.com