When sound is serious.

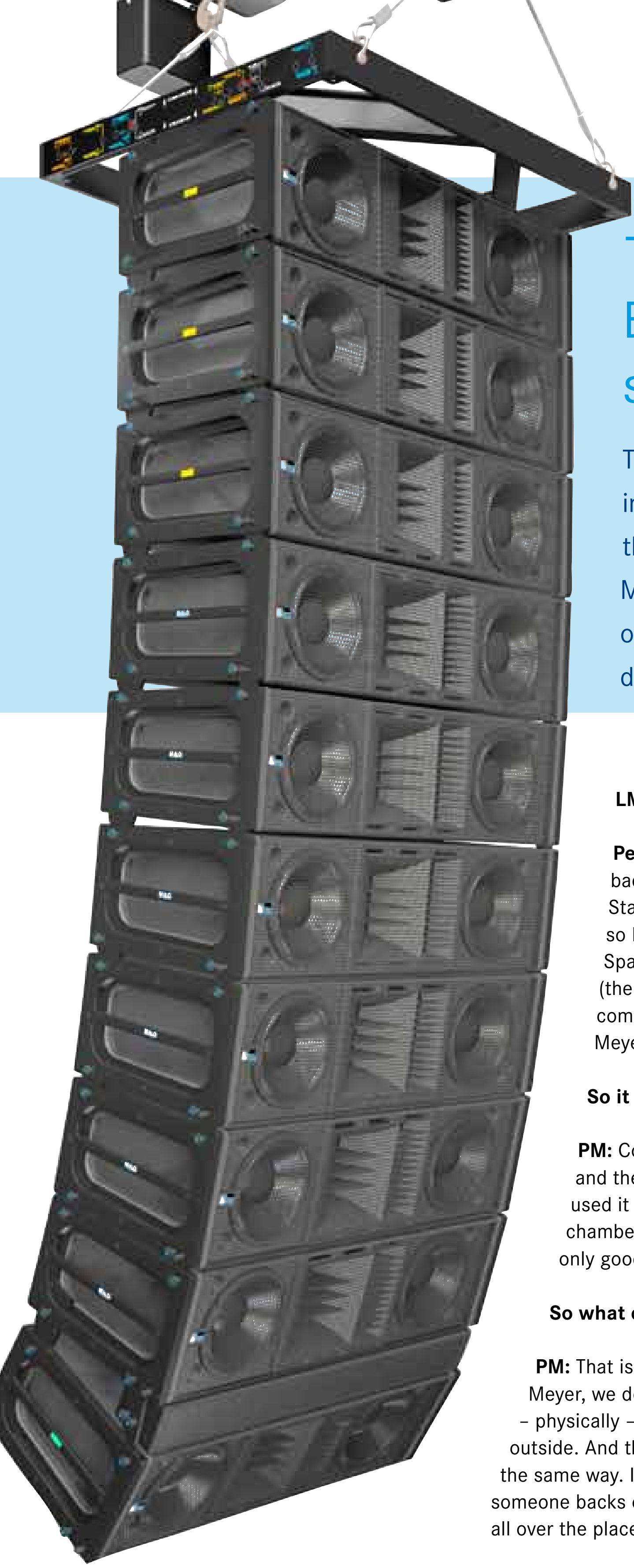
Combining the traditional Meyer Sound experience with cutting-edge technology falls into the lap of Perrin Meyer, son of the founders John and Helen Meyer. He and his colleague Rich Herr engineered a new design for the critical speaker horn of the MINA, the newest member of the MILO family, a series of self-powered high-power curvilinear array loudspeakers that have become the “gold standard” for large-scale music and stage tours worldwide.

Meticulous is the first word that pops to mind when you walk through the factory and watch the Meyer Sound process in action. Each individual station has a dedicated task. And the folks at Meyer Sound believe in manufacturing their speakers in-house, in Berkeley, California.

“We can exercise much tighter quality control on our own floor than if we were to sub-contract the work abroad. In addition to quality assurance, we also have much more flexibility in analyzing production methods and continuously improving our processes,” explained Perrin Meyer, Senior DSP Engineer.

As we toured the plant on the way to Perrin’s office, we watched people meticulously glue a ring on an in-house-produced speaker magnet and a sound technician test a four-inch-square MM-4XP self-powered loudspeaker before shipping. Clearly, Meyer Sound is all about quality – and innovation.

Since 1979, Meyer Sound has been dedicated to continuously improving the quality of the audio experience for those who listen to it and those who present it. More than thirty years down the road, the world of concert and installed sound is changing and like other industries going high-tech. This trend is reflected in the research and development wing of Meyer Sound as well. Tucked behind the warehouses in a non-descript building, we met Perrin Meyer and speaker designer Rich Herr in a slightly cluttered office and sat down to chat about acoustic simulation.



The beauty of fast multipole BEM and radically redesigned speaker horns

The slotted horn – the sound-quality-critical component – in the middle of the new MINA speaker was designed using the latest version of LMS Virtual.Lab Acoustics. Perrin Meyer and Rich Herr took full advantage of the hyper-speed of the fast-multipole BEM solver to make such a radical design change work. We asked them how.

LMS News: How did you end up working in simulation acoustics?

Perrin Meyer: I was in grad school in New York and I wanted to get back to Berkeley and work with my dad in acoustics. At that time, Penn State had one of the few graduate departments in acoustics in the USA, so I went to summer school to take computational acoustics with Dr. Vic Sparrow. He taught a class in the late 1990s, which used LMS SYSNOISE (the predecessor of LMS Virtual.Lab Acoustics) complete with the UNIX command line scripts. I brought that with me when I came back to work at Meyer Sound.

So it started with LMS SYSNOISE?

PM: Compared to today, we would make relatively simple meshes by hand and then use the tool to see how it all really worked. At Meyer Sound, we used it to predict low-frequency radiation patterns. We have an anechoic chamber with a measurement system, but the wedges in our chamber are only good to about 125 Hz.

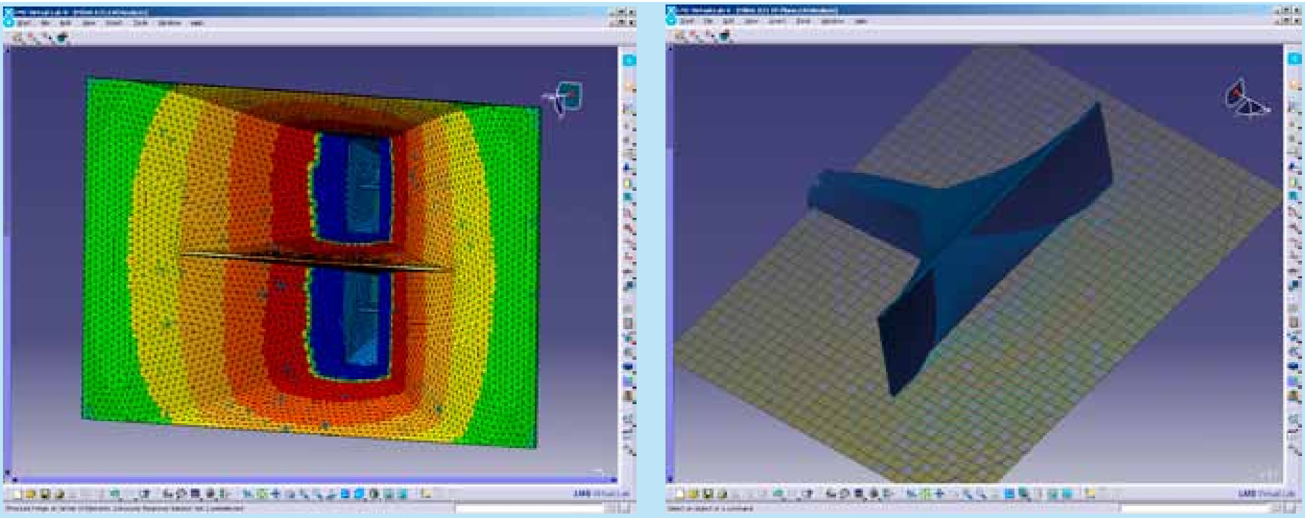
So what did you do if you needed to work below the 125 Hz range?

PM: That is what we refer to as an ‘outdoor parking lot’ measurement. At Meyer, we do basically one-degree resolution. To do this type of measurement – physically – is still very painful. You need to drag microphones and speakers outside. And then get the right set-up… And take 36 separate measurements all the same way. In the end, you’re shouting across the parking lot, the wind starts up, someone backs over the microphone…Well, you get the point: your data is always a bit all over the place.

You’re right. It sounds painful.

PM: After trying this a couple of times, well, we thought, ‘Hey maybe we can do this virtually’. So I started to model the low-frequency patterns of our speakers in LMS SYSNOISE. That ended up working a lot better. We had good correlation between our existing test results. Basically all the measurement data under 125 Hz found in our free online acoustical prediction program, MAPP, is generated using LMS SYSNOISE.

When designing the slotted horn – the sound-quality-critical component – in the middle of the new MINA speaker, Meyer Sound took full advantage of the hyper-speed of the fast-multipole BEM solver to make such a radical design change work.



LMS Virtual.Lab Acoustics lets you design things you couldn't actually try physically like cutting planes through the model to see what happens to the sound field.

That's neat. So when did you take the leap to LMS Virtual.Lab Acoustics?

PM: I have to admit I was a bit hesitant mainly because the core physics behind the GUI were actually pretty much the same as LMS SYSNOISE for a while. When Scott Esposto, our LMS sales rep, mentioned the new version and fast multipole BEM, I was really excited. My grad degree comes from NYU and one of the inventors of the fast-multipole method, Leslie Greengard, still teaches there. My advisor had worked with Leslie Greengard, who together with Vladimir Rokhlin, invented the fast-multipole method. So I knew exactly what it was and said immediately we have to try this. It totally made sense to upgrade.

Why is fast multipole BEM so revolutionary?

PM: Before that you couldn't really work in the real high frequencies because the files would be simply too big to process, but now with the fast-multipole method – oh wow – you can get to those high frequency ranges.

How do you use LMS Virtual.Lab in your day-to-day work?

PM: We recently used it to do some very cool horn design for our new MINA speakers, but I'll hand that baton over to Rich Herr. He'll tell you all about it.

How did you design in the past?

Rich Herr: Well, we used rapid prototyping; you do it reasonably fast, but it was somewhat expensive to do iteration on top of iteration.

What was your past process exactly?

RH: Well, we built a bit on intuition, some equations, past measurements and maybe some things with clay to try a few ideas before putting it in a SolidWorks file. Then we crossed our fingers and hoped the design did what we wanted. It was very iterative. Every time you did a complete 'spin', it was a little over a week: you did your drawings; submitted your drawings to the vendors; got quotes; bought parts; brought them into the chamber; bolted them up; measured it; looked at the data...It was a very time-consuming process.

What was the big difference with LMS Virtual.Lab Acoustics?

RH: First of all, you just grab your virtual model and do your predictions. Because of the speed of fast-multipole BEM, we can pretty much check out a design model within a day. In the past, it would be one iteration in one or two weeks.

Did you have any problems adjusting to new software?

PM: Of course, it has been a bit of a learning curve for both of us since fast-multipole BEM is pretty new. But now it seems to be working fine.

RH: At first we tried a different program as a mesher, but for what I was doing it wasn't particularly slick, so we converted to the internal mesher in LMS Virtual.Lab.

What is the biggest advantage of LMS Virtual.Lab Acoustics?

PM: I think certainly now we can try more ideas and get more radical with our ideas. Look at what we did with the MINA. We were free to say, "Let's go from four ports to two ports." That is something that we probably wouldn't have done before. LMS Virtual.Lab lets you design better and experiment more...

RH: It also lets you design things you couldn't actually try physically like cutting planes through the model and see what is happening to the sound field.

Where would you like to take this in the future?

PM: I would like to start to look at multi-physics models – some of the mechanical movement of the paper cones and the surround speakers. With speakers, it gets pretty complicated pretty fast. Speakers have a pretty complicated magnetic element and very complicated electric element. There's the voice coil with a non-uniform electric field in a permanent magnet. This has a complicated shape and its connected to this flexing paper cone. I think that the tools are getting good enough that we can start to learn useful things for our next-generation speakers. ■