

aX Visits SEAS

SEAS (Scandinavian Electro-Acoustic Systems; www.seas.no) is a household name in the audioworld, known for its high-performance speaker driver units. In this age of massive outsourcing to low-wage areas, SEAS (pronounced sā'az) maintains a full R & D, production, and quality assurance facility in Moss, Norway, alongside the impressive Oslo Fjord.

The history of SEAS has been closely tied to other well-known Scandinavian acoustics companies. The company's technical roots go back to a driver designed by Vebjorn Tandberg in the 1920s. SEAS was formed in 1950 as an offshoot of the Radionette company that produced complete radio sets just after World War II. SEAS sold speaker units to other companies as well as to their parent company.

During the 60s, SEAS acquired the Videback Højtalerfabrik (later ViFa) speaker company in Denmark. Both companies enjoyed strong growth, with about 450 employees in the mid-70s. In the early 80s, economic conditions became less favorable, and the two companies split. SEAS became a fully employee-owned company in 1986 and proceeded to win the prestigious Norwegian Export Price award in 1997 and has enjoyed a D&B AAA rating since 1999.

Many of today's technological advances in today's drive units were either pioneered or first applied by SEAS: closed and shielded magnet drivers for use in TV sets (1952), woofers with rubber surrounds and soft dome tweeters for hi-fi (1968), and the patented DD-rings as part of the dynamic damping concept (1977). The accumulating capabilities and know-how led to the design of the Dynaco-A25 speaker in 1969, one of the most successful speakers ever produced with over a million units sold.

In 1988, SEAS developed coaxial drivers with neodymium magnets almost simultaneously with KEF, with

neither company apparently aware of the other's accomplishments. KEF beat SEAS with a patent application by a few weeks, partly because SEAS was not sure it would be patentable at all. In 1993, SEAS introduced magnesium cast and machined cones. Another patent was granted in 1997 for the Hexadym magnet system based on an assembly of six neodymium magnets.

KEYS TO SUCCESS

Norway is a high-wage nation with almost zero unemployment. SEAS management knows that in such a situation it is impossible to compete with mass products and low prices. As Managing Director Jan Paus explains, the company focuses on a clearly defined portfolio of technically advanced drivers for demanding high-fidelity applications: "We realize that consistent quality is king in our business. So, even if we outsource parts and subassemblies, we keep the critical capability in the areas of design and development, final assembly, and production as well as quality control. We try to make our subcontractors part of the family. We keep a close relationship with them and we actually go out to train their employees to produce the quality we require." SEAS is now in the position where it receives regular offerings from subcontractors and can pick and choose the best ones.

Continued success also comes from constant improvements to construction and production methods. One example is the new spider ring assembly. Most drivers feature the lead-out wires coming out through or along the cone and

then attached to the connector plate. That means several steps during assembly to route and connect the wires while the cone is already attached, increasing the risk of damage.

PRODUCT LINE

SEAS now uses a new subassembly that makes the voice coil, the spider ring that keeps the voice coil centered, as well as the wire connection plate together in a single assembly (**Photos 1 and 2**). Driver assembly is now much faster and of better quality because the spider ring assembly can be tested dynamically in a magnet system before the loudspeaker is built.

"We have basically three product ranges," says Paus. "For high fidelity ap-

PHOTO 1: New voice coil and spider ring subassembly.

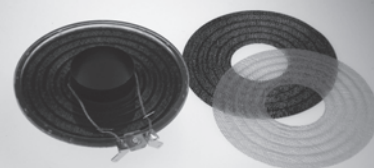


PHOTO 2: SEAS driver featuring spider ring.



plications there are the Excel and Prestige ranges, and for car sound applications we have the Lotus range. We are also introducing a new range, the Exotic drivers. Initially we will offer an 8" full range driver with a papyrus cone and an hf sub-cone¹, the F8 (Photo 3). There is increasing demand for such a unit, which will be a perfect complement to relatively low-power tube amplifiers, especially for reproducing LP records. The Exotic range will be extended with a woofer and a cone tweeter in the very near future."

DESIGN PHILOSOPHY

But fine products are not enough to keep a small company successful. The fact that SEAS is a fully employee-owned company is an important factor. Employees identify with their company and its products and are willing to go the extra mile if necessary. There are no middle management layers, and I had the opportunity to attend the weekly company meeting at the factory floor, where anybody can bring up any issue. Management informed the employees

on business, turnover, order book and plans, to keep them informed and committed.

So, what is the difference between the top-of-the-line Excel range and the Prestige line? "It is all a matter of when



PHOTO 3: Managing Director Jan Paus (center) and his R&D Manager Olav Mellum Arntzen (left) discuss the new Exotic F8 full-range driver with design Engineer Bjørn Børja.



What's new at Seas?

See for yourself.....www.seas.no



L16RNX – 5" Woofer

- Light aluminum cone
- Low loss rubber surround
- Bumped back plate
- Copper clad aluminum voice coil
- Heavy copper rings
- Designed for bass reflex or T-Lines



Exotic F8-X1 – 8" Full Range

- Papyrus fiber paper cone
- Optimally matched whizzer cone
- Special foam rubber surround
- Extreme open weave spider
- Glass fiber VC former
- Alnico V-ring magnet
- Underhung voice coil
- copper cap on pole piece

27TBCD/GB-DXT – Tweeter

- DXT® Lens for directivity control, off axis response, midrange integration and baffle diffractions
- Aluminum/magnesium alloy dome
- Wide Sonomex surround
- Magnetically shielded
- Fine mesh grill to protect dome
- Optimized rear chamber



Madisound: PO Box 44283, Madison WI 53711 USA - Tel:608-831-3433 - info@madisound.com - www.madisound.com

and when not to compromise,” says Olav Mellum Arntzen, SEAS’ R&D Manager. “Obviously, you can never avoid compromises completely, but in the Excel range we tried hard. As an example, using the patented Hexadym magnet system with copper damping rings decreased the distortion caused by the motor system. But that brought out the THD and IM distortion of the cone, which we attacked by developing the cast and machined magnesium cone. Interestingly, we found that there was very little difference in cone performance between stamped cones from aluminum or from magnesium sheet. Our own magnesium cones show much more internal damping and therefore less break-up modes. The only explanation we have is that this is realized by casting the magnesium cone.”

Another interesting product is the recently introduced DXT tweeter. One of the issues with tweeters is that with increasing frequency you get increased

directivity—the beam becomes narrower and narrower. At the same time, you want the beam to remain homogeneous, without interferences from the faceplate, the baffle, or even the mounting screws. That’s why you see so many flat faceplates, with recessed mounting screws, with the whole assembly recessed in the enclosure front baffle. In the DXT, the faceplate is deliberately shaped to enhance controlled reflections to improve the directivity and battle the beaming effect. You can see the shaped faceplate in **Photo 4**; the concentric surfaces are not flat but slightly concave. The improved directivity of this design is shown in **Fig. 1**.

TOUR OF FACTORY

Olav Mellum took me on a tour (**Photos 5-7**) of the development labs. Needless to say, SEAS has its own anechoic chamber. As a driver manufacturer, SEAS also invests in testing materials and mechani-

cal behavior; most of that equipment is by Klippel, augmented with Bruel and Kjaer and ATB equipment. “We’re really happy with that stuff,” Olav explains. “The Klippel equipment gives us the means to really find out what’s going on inside the driver, and that is an absolute must for us.” A subset of Klippel equipment is available at final production QC; every single driver is tested before leaving the factory and test data is saved. The people at the development lab have access to all the data of all the drivers ever produced. “Tell me,” I asked him, “what’s the *real* story behind ‘speaker break-in?’” It is real, he says. When a new driver is being used, the spider suspension properties change slightly, resulting in perhaps up to a 10% change in driver resonance frequency. The impact on the complete system is, of course, less, and I doubt whether it is actually audible. But if necessary it can be done in as little as one minute, if you



PHOTO 4: The concave and angled surfaces of the DXT driver prevent beaming at higher frequencies.

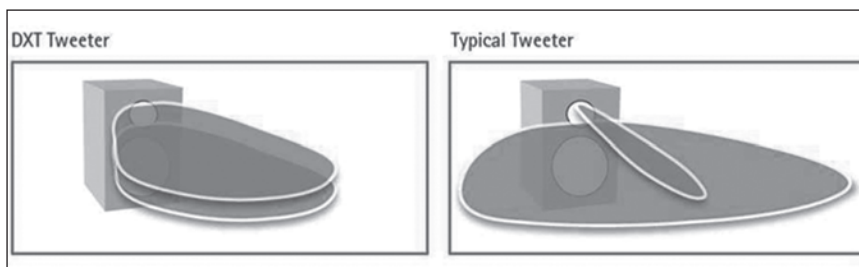


FIGURE 1: The effect of the special faceplate surface of the DXT tweeter provides much better dispersion (left) than common tweeters (right). Company figure.



PHOTO 5

PHOTOS 5 and 6: Shareholders at work at the employee-owned company.



PHOTO 6

would stretch the spider to its limits.

In addition to the "scientific" labs, there is the company listening room. You can make the world's best measuring drivers, but in the end it's the sound from a complete speaker that is the goal. The listening room is where complete speakers and crossover filters are developed and evaluated. "I guess by now everybody knows that the flattest response doesn't mean the best sound," Olav says with a wink. So, a lot of work goes into cabinet and crossover design. Although, with a few exceptions, SEAS does not produce complete speakers, they have developed speaker and crossover sets as an application service to their customers.

Not surprisingly, SEAS' view of the audio scene is that real progress today doesn't come from new amplifiers or sources, but from better speakers. There is still much unlocked potential in the electromagnetic driver. But improved products seldom result from radical breakthroughs. Step-by-step refinements, new materials, and constructions will deliver better and more lifelike audio performance in the future. SEAS clearly

intends to be on the forefront of that.
ax

REFERENCE

1. The new Exotic F8 wideband driver has many of the attributes of the legendary Philips type 9710M wideband driver of the 1960s and is targeted at similar applications.

Author's note: SEAS has recently launched a new website at www.seas.no. The site will be expanded shortly to include complete distortion and linearity data of all drivers as well as application notes.



PHOTO 7: Completed drivers waiting for final QC test before being shipped.

NEW FROM



A Brief History of Bendix Red Bank Tubes

by Charles Hansen

Hansen has uncovered the history of these mysterious tubes and presents the history of these rugged, highly reliable tubes made for the military for use in guided missiles. An interesting story of one company's approach to extremely high quality vacuum tube design. Also features a reprint of Eric Barbour's 1996 article from *Vacuum Tube Valley*, "Red Bank: The Ultimate Tube" which examines several models of Red Bank Tubes in detail. 2007, 8½" x 11", 100pp., softbound, ISBN 978-1-882580-50-7. Sh. wt. 1 lb.

BKAA71\$24.95

To order call 1-888-924-9465 or visit www.audioXpress.com

Old Colony Sound Laboratory PO Box 876 Peterborough NH 03458-0876 USA

Phone: 603-924-9464 Fax: 603-924-9467

E-mail: custserv@audioXpress.com

