

NU FORCE

Speaker Technology

To begin, the NuForce S-9 was conceived on the premise that true high fidelity performance should be based on solid, quantifiable engineering principles while achieving the highest possible degree of value. In order to achieve those goals it became obvious that a slight departure from traditional methods and technologies would be required.

In order to fulfill these objectives, NuForce selected SP Technology Loudspeakers, Inc. as the primary design contractor and initial production manufacturer. The progeny of this union, the NuForce S-9, is now a reality and is poised to establish a new reference for high fidelity loudspeaker performance at a remarkably reasonable price.

Defining one single technological attribute that sets the NuForce S-9 above the competition is impossible. The combined philosophies of NuForce and SP Tech do not permit products to be designed around singular, one-dimensional technological offerings. Instead, they insist upon viewing the product as a complete system, wherein every possible parameter is optimized within established price constraints. Such thorough design requires a much higher level of engineering than is normally encountered in the high fidelity marketplace.

In the earliest days of high fidelity, it was considered that the reduction of all possible forms of distortion to be the key for successful design. In relatively recent times, it seems much of the market has departed from this philosophy. The NuForce S-9 will ultimately prove such departure from rational logic to have been a serious mistake. Although the advanced technological features are many, we will attempt a simple summery here.

Even the most casual observer can hardly miss the “horn-shaped” device in the center of the enclosure. Although it derives its basic principles of operation from horn theory, the more appropriate term is “waveguide.” The waveguide was chosen as a solution to the many problems plaguing even the most expensive and exotic of tweeters. A “point of diminishing returns” is the result of implementing exotic tweeter technologies and their use drives the extreme costs incurred by many other designs. Even when the most expensive and exotic of devices are used, many problems remain. The waveguide solves virtually all of these issues to a much more refined level than such extreme devices could ever hope to achieve...and at a substantially reduced cost. The elegant solution it provides is nothing more than a proper application of the fundamental physics of acoustical science.

The result is that the waveguide virtually eliminates the most common forms of distortion – the worst offender being excess tweeter diaphragm excursion. It provides a rather large amount of acoustic “gain” at the lower frequency extreme of the tweeter’s operating range. This permits a very large reduction in drive current delivered to the tweeter while still maintaining a flat frequency response. As frequency is increased, the amount of gain provided by the waveguide continually decreases such that at approximately 5 kHz the gain is reduced to “unity.” This means that from 5 kHz on up to the upper limit of tweeter operation (25 kHz) there is no acoustic gain added to the tweeter’s nominal output. This sloping gain reduction eliminates the “honky” and irritating sound often associated with traditional horns. Simultaneously, the added gain of the waveguide permits a crossover frequency of 1.25 kHz, which is well below most traditional designs. Such a low crossover eliminates much of the undesirable “break-up modes” produced by woofer cones and in so doing, delivers unprecedented detail and resolution in the critical midrange frequencies.

Adding to this, the waveguide provides an elegant solution for three other common problems. Diffraction artifacts (a form of distortion) are essentially eliminated as a result of the gentle sloping nature of the waveguide flare and its transition to the front panel. Other designs employing foam or felt rings around the tweeter, faceted front baffles and/or pyramid shapes only offer a partial solution over a relatively narrow frequency range. The waveguide on the other hand, eliminates diffraction artifacts over the entire operating range of the tweeter.

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Time Domain distortion is reduced, as a natural byproduct of the tweeter “set-back” required by the waveguide. This setback reduces the amount of acoustic path-length difference from the woofer and the tweeter to the listener’s ears. Stepped or tilted tweeter baffles and such, along with their associated diffraction anomalies, are simply not needed.

The last major area of improved performance provided by the waveguide is that of controlled dispersion. Without some form of “wave-directing” device, virtually all tweeters will suffer from a somewhat random pattern of sound dispersion. A well-controlled and constant degree of dispersion is much more preferable, especially when real-world listening environments are considered. The NuForce S-9’s waveguide provides such dispersion control as a natural result of its physical geometry.

Aside from the waveguide, many other features need to be highlighted. The large excursion, aluminum cone woofers provide deep powerful bass without suffering from the effects of dynamic compression, as do most woofers. The aluminum cone acts as a type of “heat-sink” – keeping the voice-coil cooler under high power conditions and thereby reducing compression distortions. In addition, due to the rigid nature of aluminum, the woofers do not exhibit the normal cone flexing or “break-up modes” associated with other cone materials. They behave more as true “pistons” over their operating range and thereby eliminate much of the distortion produced by other typical devices constructed of less rigid materials.

The crossovers alignment is a true, fourth order, Linkwitz-Riley, “acoustic” design. This means that the actual acoustic slopes achieve the Linkwitz-Riley transfer function rather than just considering the electrical components in the crossover – as many do. The fourth order L-R alignment is well known for providing an ideal “in-phase” condition between the drivers at the crossover frequency (1.25 kHz). This condition optimizes vertical dispersion and provides for the widest possible vertical seating angles. Of course, quality polypropylene capacitors and air-core coils are used throughout. Adding to this, the crossover is implemented externally and thereby avoids the potential of micro-phonic distortions being induced by enclosure-born vibrations.

This leads to the last area of the NuForce S-9’s superior design – the enclosure. It is constructed with 23 layers of Baltic-Birch plywood, assembled in a “stacked” configuration. Each layer represents both the external and internal profile of the enclosure. Each layer is precision cut by a CNC routing/boring center and then glued together. The combination of using the material on its “end-grain” along with the large amount of adhesives required, results in an extremely rigid enclosure. Special internal chambers utilized to reduce internal acoustic standing waves, double in their duty by providing added structural cross bracing. The combination results in an extremely rigid construction of moderately low weight (i.e., less mass), which shifts the potential for enclosure-born vibrations to higher frequencies. The effect is to push these unwanted resonances out of the woofer “pass-band” and thereby minimizes the likelihood that the back-energy of the woofer will ever excite them into resonant vibration.

Although far from exhaustive, the above over-view should give the potential customer cause to take notice. It can be seen that clearly, the NuForce S-9 is not just another “me too” high-end loudspeaker. Much engineering and forethought has gone into the design and one would be hard pressed to find an equal at several times its price. Surely, it will be found to offer unprecedented levels of performance and value and will become a benchmark for others to follow.

— some technologies mentioned in this article are patent pending.