innovations: the manufacturer's view

Passion, Physics and Perseverance:

EHRLUND EHR MICROPHONE LINE

BY GÖRAN EHRLUND

As far back as microphone history goes, a round membrane has primarily been used in microphone capsules to capture sound. Picture a miniature gong inside the microphone—a round, thin membrane that reacts to vibrations and transfers them to a series of amplifiers to reproduce the sound. While some microphones color the sound they reproduce in pleasing ways, most microphone manufacturers seek to produce the most natural and transparent sound reproduction possible.

Ever since designing my first microphone as a young middle-school boy in Sweden, I've been driven to find the best way to capture and reproduce sound. The triangular membrane idea came from experimenting with contact pickup designs using various geometrical shapes, which led me to believe that perhaps a round membrane wasn't the best shape for capturing sound.

In principle, sound is composed of short impulses that make up a more complex sound. If we look at how a sound system works, we can characterize it by its impulse response. If an impulse is introduced into a system, the system will react and then stabilize over time. Since a round membrane produces a long impulse response, or decay, it will take longer to stabilize. Think of a gong and how long it vibrates. A triangular membrane, on the other hand, will decay four times faster and therefore has a relatively short impulse response.

When sound impulses hit a round membrane with a long decay in rapid succession, the membrane cannot stabilize before the next impulse hits, and the impulses combine and build up, resulting in a "thick" or "muddy" sound. When those same impulses hit a triangular membrane with a shorter decay, the membrane stabilizes four times faster, resulting in less buildup of impulses. This produces a clearer sound and higher frequency response that is not possible with a round membrane.

Not only does a triangular membrane produce a more transparent sound, but it has less distortion. Imagine peering into a pool of water at your reflection. Drop a pebble into the water and your reflection is distorted. Drop another pebble into the water before the ripples have subsided and your reflection is further distorted. The triangular membrane stabilizes 400 percent faster than conventional round membranes, producing less distortion and a truer sonic image.

While I knew from a physics perspective that a triangular membrane is a superior shape to accurately reproduce sound, the path to Ehrlund Microphones as it is today was not a simple one. I approached Sven Åke Eriksson at Research Electronics to assist with the electronics and engineering aspects of creating a line of microphones. The ultimate goals were low noise from the amplification process, low distortion, low power use and a strong signal output utilizing this new concept of a triangular membrane. We began a research and development process that would take over 10 years to yield our current product line.

Now that we had a better membrane design, we needed to take a fresh look at the electronics needed to amplify the sound. The electronics in Ehrlund microphones also represent a completely new way of thinking and are very different from anything on the market. The low noise, energy efficient, phantom-powered amplifier has a frequency range that matches the bandwidth of Ehrlund's triangular microphone membrane. Furthermore, we have designed it to have as little phase shift as possible in order to reproduce transients in a natural way. A low level of phase shift is synonymous with low dispersion. In turn, this means that complex signals are reproduced as they "really are," as the integral signals are not shifted relative to each other during their passage through our electronics. Phase shift and the accompanying dispersion is part of the reason why two systems with apparently equal frequency response can sound entirely different when you listen to them. This is why it is desirable to have as little phase shift as possible in the amplifier in order to get as "natural" a sound as possible. It's also the reason why one Ehrlund microphone will sound virtually identical to the next, eliminating the need for matched pairs.

The Ehrlund EHR-M studio condenser microphone. INSET: A closer look at the Ehrlund Triangular Membrane.

Once we had developed and successfully integrated the triangular membrane into a capsule and the correct electronics, we were free to develop a line of microphones that would complement various studio and stage applications for producers, engineers and musicians. Our current line of microphones includes the EHR-M studio condenser microphone, EHR-T dual-capsule studio condenser microphone, EHR-M1 small studio condenser microphone, EHR-D drum microphone, EHR-E high-SPL condenser microphone, EHR-H handheld condenser microphone and EAP pickup system based on the original triangular design.

While real innovations in microphone design do not come along often, we believe our years of research and development leading to the triangular membrane will change the shape of microphone technology now and in the years ahead.

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Ehrlund Microphones
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