



## The genesis of the M series

Genelec's latest M030 and M040 monitors are targeted at the music creation market and employ some technological and ecological firsts. Genelec's R&D director **AKI MÄKIVIRTA** explains how it has been done.

**T**he key to high quality recording is the monitoring of your audio through high quality monitoring loudspeakers. The often less-than-optimal acoustical treatment of personal studio monitoring spaces places special demands on the monitoring loudspeaker. Headphones may be used to eliminate room acoustics but headphones cannot render a reliable representation of the stereo imaging or the acoustic space. Monitors used today are predominantly active designs because this ensures better quality of the audio reproduced by the loudspeaker. A bi-amplified active monitor is a two-way loudspeaker with a tweeter and a woofer. The input sound signal is divided into two frequency ranges by active crossover electronics and both frequency ranges are amplified with separate power amplifiers. Bi-amplification is used because a cleaner overall sound reproduction can be obtained, since signals are easier to process before power amplification.

Genelec maintains a leading position in professional audio monitoring and wants to exceed expectations in all its aspects. With the new M series we're offering our 35 years of heritage and experience in professional studio monitor loudspeaker development to music creation customers.

In 2008 Genelec decided as a company that environmental values are of equal importance to profitability. The conservation of natural resources and efficient use of material and energy in all levels of manufacturing, shipping, and during a product's lifetime are essential to us. For example, Genelec's factory heating was changed from oil to using renewable energy and we continue to manufacture all products under the same roof in Iisalmi, Finland, avoiding unnecessary shipping. We choose to use environmentally efficient solutions — in our professional two-way monitoring products we use recycled aluminium. In 2003 we participated in a university research project on the use of wood composites for injection moulding. In 2006 we moulded our first exploratory loudspeaker enclosures in a wood-based natural composite material and finally in 2009 we started

a programme to develop loudspeaker enclosures containing one half of wood fibres for products intended for the music creation market. This initiative has resulted in the M series loudspeaker enclosures, which have several benefits over conventional enclosure technologies and are the first to use our environmentally friendly NCE, Natural Composite Enclosure, material.

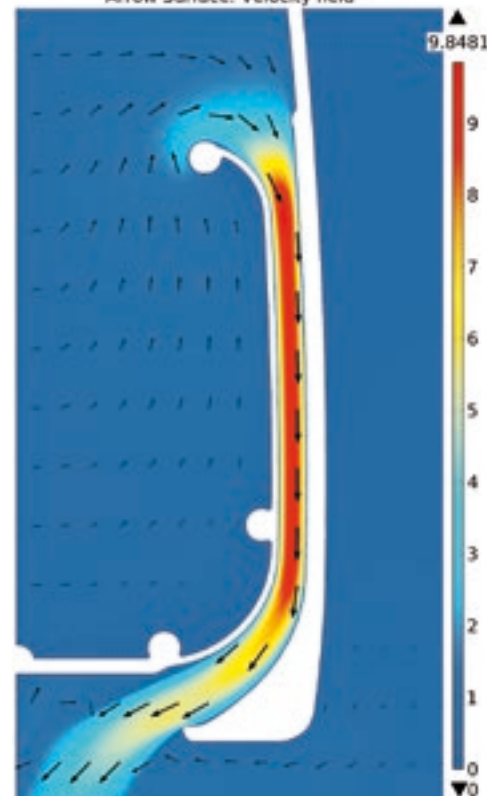
The enclosures enjoy the benefits of wood as a well-established material for loudspeaker enclosures and hazardous chemicals have been eliminated in the product and in the production process. For example, no painting of the enclosure is needed as they come straight out of the manufacturing process, with minimal processing steps, close to the final assembly site in Genelec's Iisalmi manufacturing plant. Finland is a country rich in the wood that we use as the raw material for the M series enclosures. All the materials are recyclable but conserving natural resources does not stop at using recyclable natural materials: the packing for the M series products is made of recyclable cardboard; shock absorber linings inside the packing are made of recycled paper pulp; and the transportation of goods and materials has been minimised.

In the professional audio segment, Genelec products have a reputation for being good investments with excellent quality and long-life. With the M030 and M040 products designed especially for the music creation market the aim was to provide a set of features that matches perfectly the needs of the users without compromising our pursuit of the highest quality of audio possible. Genelec wants to maintain its position as the leading monitoring manufacturer with uncompromised sonic quality working hand in hand with environmentally sustainable products and production processes.

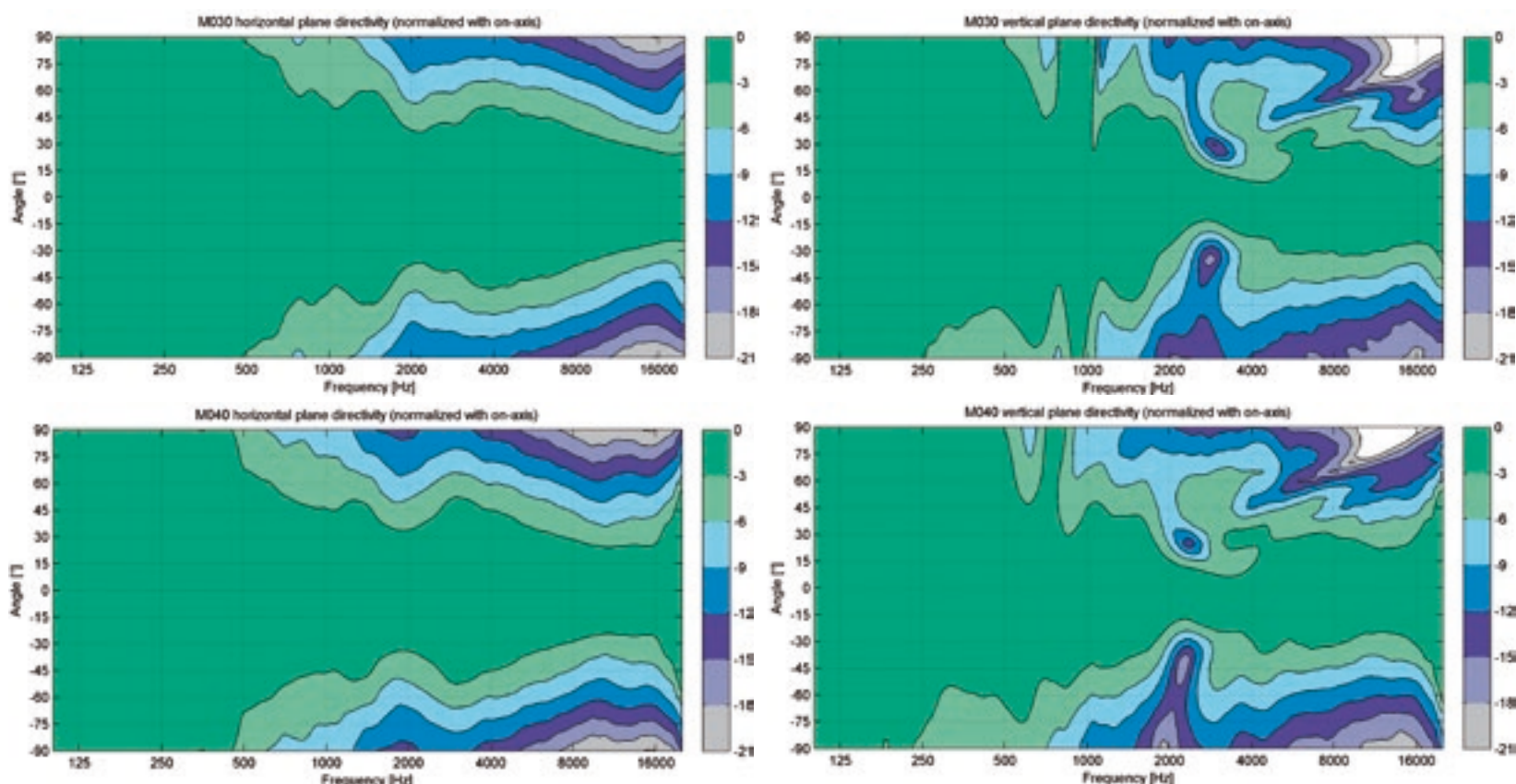
The M030 and M040 are bi-amplified active monitoring loudspeakers and share our new technology platform, with green power saving electronics, Intelligent Signal Sensing (ISS) power management, linear and clean class D power amplifier designs in the tweeter and woofer channels, and an easy-to-use room correction feature set. These are also the first Genelec products to use Laminar Integral Ports (LIP) as the bass reflex system and these are fully integrated into the enclosure structure.

The natural composite material used permits the design of enclosures with a thinner wall thickness because of the injection moulding process and the high internal losses for vibration energy of the material itself contributes to the enclosure performance. The injection moulding allows the creation of acoustically optimised shapes and forms with internal support structures that further increase the enclosure stiffness while the internal volume can be maximised. A large internal enclosure volume is paramount to achieving high acoustic output at low frequencies.

v0(1)=0.3 Surface: Velocity magnitude (m/s)  
Arrow Surface: Velocity field



**Cross-section of the flow-optimised Laminar Integral Port in the Natural Composite Enclosure.**



Sample directivity plots of M series products show excellent horizontal (left) and vertical (right) directivity control, translating in neutral audio reproduction even in acoustically challenging rooms.

Flow-optimised bass reflex ports have been integrated as parts of the enclosure shape and the patented LIP is created as part of the enclosure moulding process. Most bass reflex ports work relatively well at low bass output levels but the differences between designs become evident at high output levels. Our Laminar Integral Ports has been flow-optimised for low distortion and high output even at very high audio levels. The cross-section plot demonstrates the efficient flow characteristics of the port and there are two of these ports in the enclosure. Because they have been integrated into the enclosure their shapes also increase the rigidity of the enclosure structure further and reduce the likelihood of vibrations. The ports open down under the loudspeaker and radiate into the open space under the product.

The M series on-axis response is flat within  $\pm 3\text{dB}$  — 100% of Genelec products are measured and calibrated for their frequency response. Genelec pioneered Directivity Control Waveguide (DCW) structures in 1985 to achieve controlled directivity and low driver distortion and this directivity control provides a smooth frequency response on-axis and off-axis. Controlled directivity is associated with a neutral uncoloured sound, particularly in acoustically compromised spaces. M series enclosures have DCWs integrated to the enclosure structure and the directivity characteristics have been matched between the two loudspeaker models, which results in very similar sounding neutral characteristics for both product sizes.

A significant part of the quality of the radiated sound is related to the smooth rounded shapes of an enclosure and the enclosure corner shapes of the M series minimise any sound-colouring diffraction from the edges and corners. This creates an enclosure capable of accurate stereo imaging.

When the audio feed to a monitor stops there should be silence. Resonating structures store mechanical energy and storage takes place when the monitor is producing audio. This energy will be slowly released at resonance frequencies after the audio feed stops so instead of silence this release of resonant energy can colour the audio we hear. A key to good loudspeaker performance is a resonance-free construction and the M series acoustical radiating system, consisting of the enclosure, drivers, and the bass reflex system, has been designed to minimise resonances.

Each driver is directly connected to a class D amplifier; class D technology uses the power transistors as switch devices so they are either on or off and this



The back of an M series product, showing the mains switch, two room response calibration switches, sensitivity selection switch, mains input, and the two audio input connectors.

has benefits. If the transistors are off (not conducting current) there cannot be any power loss in the transistors. On the other hand, when a transistor is fully on, it does not hinder the flow of the current resulting in virtually no power loss while the transistor is conducting. Class D technology provides an amplifier with small loss of power and high efficiency; it's more than 90% in the M series amplifiers.

M series products have automatic mains voltage sensing but also have Intelligent Signal-Sensing (ISS) power management with an electronic activity detection circuitry built in. The ISS circuitry listens to the inputs and if it cannot detect audio on the input for a period of time, it puts the M monitor to a low-power state where it consumes less than 0.5W of power. When an audio signal is detected on the input, the product turns itself on silently in less than 0.5s.

The products have new driver designs with the moving mass of the woofers minimised using light paper cones and aluminium formers, while force is maximised with generously sized magnet circuits. The tweeters are metal dome and have been optimised for low distortion with the aid of the DCW.

Connections are on XLR combo and phono. Genelec has put room calibration capability in all its products since 1970s and on the M series they are provided on toggle switches. The Bass Level control

compensates for bass boost from nearby walls, Bass EQ can reduce the gain caused by wall reflections in the mid-bass frequency range, Tabletop EQ reduces low-mid range boost when the monitor is placed on a table, and System Level selects the input sensitivity.

The M series acoustic design provides a combination of high linearity, low distortion, and clean and neutral audio reproduction while respecting sustainability and environmental values. They even automatically save power for you. These new monitors put Genelec's 35 years of design experience to the service of the music creation world and offer reproduction of 'the truth and nothing but the truth' about a home or project recording. ■