The Awesome Sound Engineer, Sreejesh Nair, delivers an engaging session on Sound Engineering and Mixing to an enthralled audience

MASTERING SOUND ENGINEERING WITH THE AWESOME SOUND ENGINEER

*At the **PALM Expo Conference 2024** held in May this year, renowned sound engineer **SREEJESH NAIR** shared his experience on some of the most intricate technical aspects of sound engineering. With years of experience working on high-profile projects and learning from some of the best in the industry, Nair provided an engaging mix of humor, practical tips, and profound knowledge about the field of sound engineering. His session was not just a technical deep dive, but also a tribute to the many sound engineers he learned from. Our team at **PALM Expo Magazine** has captured the highlights of his session filled with insightful real-world applications and the invaluable lessons shared during the session. Peppered with witty one-liners and real-world lessons, read on to know more about the riveting session led by the Awesome Sound Engineer himself!*

A TRIBUTE TO SOUND ENGINEERING MENTORS

Kicking off his talk, Nair acknowledged the many sound engineers who have influenced his journey, noting that the title "Awesome Sound Engineer" was not a self-reference but rather a nod to those who paved the way for him. "This is actually also my tribute to the industry and the ones I've learned from," he said. Sharing anecdotes from industry stalwarts, Nair explained how their influence shaped his understanding of sound.

UNDERSTANDING THE LF PROBLEM: SIGNAL CANCELLATION EXPLAINED

One of the key issues Nair addressed was the challenge of managing low-frequency signals, particularly in immersive audio formats like Dolby Atmos or 5.1 surround sound. Nair explained that many engineers encounter a curious problem when working with LF channels: instead of hearing the LF, the signal sometimes seems to decrease. This phenomenon puzzled many until the root cause was understood: signal cancellation between the center channel and the LFE channel.

"As long as you have an LF, there is a very strange problem," Nair explained. "It takes a couple of listens for us to actually understand what that is." He illustrated this by showing how increasing the LF level in a mix could sometimes lead to a reduction in the perceived output, rather than an increase. "When you push up the signal on the LF, instead of hearing more LF, you actually hear it go down," he noted. The solution, Nair explained, is tied to the relationship between filters, phase shifts, and signal cancellation.

FILTERS AND PHASE SHIFTS: DEMYSTIFYING THE MATH

To help the audience understand why this cancellation occurs, Nair broke down the role of filters. Using simple analogies like coffee filters and throat filters, he made the complex subject of signal processing more approachable. "If your sample rate is 48 kHz, the maximum signal you can record is 24 kHz. That's called the **Nyquist frequency**," he explained. Nair emphasized that the critical point where the signal cancels is called the corner frequency, which is 3 dB lower than the input signal. "At the corner frequency, the signal drops by 3 dB—that's where things start to cancel." He elaborated further on how filters impact the phase of a signal. "Every time you have a 6 dB per octave filter applied, it will cause a 45° phase shift at that frequency," Nair said. When these phase shifts add up to 180°, signal cancellation occurs, which is why boosting LF signals can lead to reduced output.

THE IMPORTANCE OF DIFFERENT FILTERS

Nair then introduced the concept of feedback filters, a crucial component in understanding how certain frequencies cancel out. While feed-forward filters operate by feeding delayed signals forward, feedback filters, as the name suggests, involve feeding the signal back into the system. He explained the difference between **FIR (Finite Impulse Response)** and **IIR (Infinite Impulse Response)** filters, providing relatable examples to make the concepts clear. "Anyone who's stood in front of a speaker with a microphone knows what feedback is," he joked, underscoring that feedback filters can continue to operate indefinitely, whereas feed-forward filters eventually stop.

THE REAL-WORLD IMPACT: HOW IT AFFECTS YOUR MIXES

After explaining the theory, Nair shifted focus to how these principles affect real-world sound mixing, especially when working with loudness standards like ITU 1770-4. "For anyone who's done YouTube, Atmos mixes, or OTT projects, getting to -18 LUFS is crucial," he said. He emphasized that sample rates have a significant impact on these values, and engineers need to be aware of how their filters and sample rates interact to avoid unwanted cancellations in their mixes. He also provided a solution for dealing with problematic low frequencies: subharmonic enhancers. "There's no way you'll get a signal to cancel if it's not coherent," he explained, advocating for tools like the **Avid Pro Subharmonic** to ensure clean, punchy mixes. For those keen to delve deeper into the world of sound engineering, Nair also recommended checking out **Sudeep Audio's YouTube channel**, which offers a wealth of knowledge through interviews and tutorials. "There's a ton of interesting one-liners over there," he added with a smile, encouraging everyone to continue learning and pushing the boundaries of sound.

THE AVID MTRX 2 IO: ADVANCED AUDIO CONVERSION TECHNOLOGY

A focal point of Nair's talk was the **Avid MTRX 2**, an IO device known for its advanced audio conversion and routing capabilities. "It has one of the best converters because of this little thing: the sampling resolution is a 5-bit Sigma-Delta converter running at 5.645 MHz or 6.144 MHz, giving you a 24-bit PCM," Nair explained. While this level of technical detail may seem daunting to some, Nair broke it down further, helping the audience understand how this improves sound quality by minimizing conversion noise.

"When you convert analogue to digital, you will always lose something; digital is not entirely accurate," he said, explaining that digital conversion is essentially a compromise. "But as you increase the bits, you reduce the error, and for every bit you increase, you reduce the noise by 6 dB." This reduction in noise translates into greater headroom, which allows engineers to work with more dynamic range, a crucial factor in professional sound production.

DEBUNKING MISCONCEPTIONS AROUND BIT DEPTH

Nair also addressed a common misconception: that a higher bit depth means louder recordings. "If I ask you which one records louder, 16-bit or 24-bit, some would say 24-bit," Nair noted. "But neither of them records louder. To record louder, you would need more voltage, which would fry your IO. What

the higher bit depth allows you to do is record softer with more precision." This nuanced understanding of bit depth helps clarify why engineers prefer higher bit depths for professional recordings, not for loudness, but for the detail they preserve in quieter passages.

DELTA SIGMA CONVERSION: A TECHNICAL DEEP DIVE

Nair then shifted his focus to the Delta Sigma conversion process, using an unexpected analogy with the Gregorian calendar to explain how noise shaping works. "This is how a Delta Sigma converter works," he began. "In the Julian calendar, a leap year was introduced every four years to account for the Earth's rotation. But in the Gregorian calendar, adjustments were made to fine-tune this even further, removing one day every 100 years to maintain accuracy."

He likened this process to how audio converters handle quantization errors. "Quantization errors are like the extra day we need to manage in our calendar. By spreading out these errors across time, we shape the noise and reduce it in the frequency range we can hear." Nair explained that in high-end converters like the 5-bit Delta Sigma ADC used in the Avid MTRX 2, oversampling techniques help minimize this noise further. "It's a 128 times oversampling converter, which gives you an output at 24-bit PCM," he added, illustrating how oversampling increases audio accuracy by distributing noise more evenly across the frequency spectrum.

THE IMPORTANCE OF CONTROL SURFACES IN MODERN SOUND ENGINEERING

Moving beyond the technical aspects, Nair emphasized the importance of understanding and investing in your audio equipment. "If you don't invest in yourself, why would anyone else?" he asked. While many sound engineers rely on traditional mouse and keyboard setups, Nair encouraged the use of control surfaces for more efficient mixing. "A lot of us are still mouse-and-keyboard guys, but if you want to drop down eight faders, you'll have to do it eight times. With a control surface, you can do it in less than runtime," he explained.

Control surfaces allow for greater precision and faster workflow, especially in film mixing, a field Nair is intimately familiar with. "As a film mixer, you can even premix a reel in less time than its runtime using a control surface," he shared, demonstrating how investing in the right tools can significantly enhance productivity.

TRUE PEAK: WHAT YOU HEAR VERSUS WHAT YOU SEE

Nair also touched on the concept of True Peak, an often-misunderstood aspect of digital audio. He highlighted how audio signals that appear to be fine on a **digital audio workstation (DAW)** can still clip when converted back into analogue. "Your DAW will only know the value at specific sample points, but in between those points, the signal could be clipping," Nair warned. He explained that this phenomenon led to the development of True Peak limiters, which analyze the audio at higher sample rates (such as 192 kHz) to ensure there's no clipping in the final output.

"When **Netflix** says you need to have -2dB True Peak, this is what they are referring to," Nair clarified. "True Peak measures the actual peak values after upsampling, ensuring that the audio will sound clean on all playback systems."

THE ADVENT OF AI - NAVIGATING THE CHALLENGES OF ARTIFICIAL INTELLIGENCE

As many in the industry grapple with the rapid advancements in technology, Nair emphasized the importance of understanding AI, particularly generative AI and large language models, which have become integral to the creative process.

Nair stated, "AI is only as good as the data it receives." He elaborated on how the AI integrated into **Avid Sibelius**, a popular music notation software, functions by analyzing chord progressions and generating musical suggestions based on learned data. This AI capability allows composers to explore new creative avenues, offering not just suggestions but also insights into why certain chords may work better than others. Importantly, he highlighted that the AI operates locally on users' systems, underscoring the concept of responsible AI and the significance of data privacy in today's digital landscape.

The conversation shifted to copyright issues surrounding AI-generated con-

tent. Nair referenced a landmark case involving a monkey named Naruto that had taken a selfie, raising the question: "Who gets the copyright—the photographer or the monkey?" This analogy underscored the ongoing debate in the industry regarding AI and copyright, emphasizing that human intervention is essential for determining ownership. "Copyright requires human intervention," he noted, stressing the complexities that arise when AI is involved in creative processes.

THE POWER OF AUTOMATION IN SOUND ENGINEERING

Automation tools have also revolutionized sound engineering, allowing professionals to maximize efficiency. Nair shared his experience with Soundflow, an automation tool that dramatically reduces the time spent on repetitive tasks. He explained, "Once I finish with my mix, I want to remove all of my inactive sends and plugins, it goes through my entire session and analyzes it." This feature has been invaluable in streamlining his workflow, enabling him to focus more on the creative aspects of sound engineering rather than getting bogged down in technical details.

Echoing this sentiment, he quoted **Pramod Chandorkar** who emphasized, "Do not become a slave to the machine. Use it and improve; it is a tool." Nair's practical application of automation tools exemplifies this philosophy, showcasing how technology can enhance, rather than hinder, creativity.

NAVIGATING THE CREATIVE PROCESS

As sound engineers, understanding the relationship between the composer and the execution of their vision is paramount. Nair quotes **K.J. Singh**, "A sound engineer has to get into the mind of the composer." This insight highlights the need for effective communication and collaboration throughout the production process. **Vijay Dayal** added, "As an engineer, you are the translator between art and execution," underscoring the vital role sound engineers play in bridging the gap between creative intent and technical realization.

Nair stressed the importance of delivering high-quality audio. He highlighted a common issue faced by sound engineers when exporting mixes, particularly in different codecs like MP3. "Imagine what this will do if your limiter was set to -0.1," he cautioned, explaining the potential pitfalls of audio compression and the intricacies involved in maintaining audio fidelity.

CLIENT MANAGEMENT - BUILDING BRIDGES BETWEEN EXPECTATIONS AND RESULTS

Navigating the complexities of client relationships is another crucial aspect of sound engineering. Nair urged attendees to "never say no" to clients, emphasizing the importance of flexibility and problem-solving. The ability to manage expectations and navigate egos in the industry is a skill that can set professionals apart. He explained, "Every situation has to be managed," highlighting that effective communication is vital in addressing the diverse personalities and opinions that often come into play in creative projects.

As Nair reflected on the journey of emerging sound engineers, he encouraged them to find their unique selling point in a competitive landscape. "If you are like everyone else, you are average," he stated. He advocated for starting from the ground up, assisting seasoned professionals to gain experience and insight into the challenges of the industry.

Nair quoted **Avinash Oak** who states, "Engineers today record with their eyes and not their ears." He underscored the need for sound professionals to balance reliance on visual meters with the critical art of listening. He illustrated this point with the example of a 100 Hz square wave, explaining how digital-to-analogue converters (DACs) often employ filters to protect internal electronics. "If I take this 100 Hz signal and put a high-pass filter at 20 Hz, you might see a peak at -12 dB. But upon rendering, that peak can jump to -5.5 dB. You will never see this, but you will definitely hear it," he explained, warning against sending clipped outputs, especially on subwoofers.

UNDERSTANDING LOUDNESS MEASUREMENT

Nair highlighted a common misconception surrounding loudness measurement in audio production. Quoting his colleague **Baylon Fonseca**, he said, "We aren't launching a rocket into space. We are doing sound. It isn't complicated." This statement resonated with the audience as Nair broke down the complexities of audio meters and loudness measurement. He clarified that every channel in a 5.1 audio setup undergoes pre-filtering, impacting the final output. He

elaborated on how human perception, influenced by the **Fletcher-Munson curve**, affects our experience of sound. "We hear more in the high frequencies and less in the low frequencies, so you cut off the lows and boost the highs," he noted.

Nair then explained the significance of understanding both requirements and recommendations in audio specs from platforms like **Apple Music** and Netflix. "There are no rules, only guidelines," he stated, urging engineers to educate themselves on the fundamentals of sound engineering to navigate industry standards effectively. He reflected on his own journey, emphasizing that many foundational concepts in sound have remained unchanged for decades.

INNOVATIONS IN AUDIO TECHNOLOGY

During his presentation, Nair also introduced innovative tools and features that can enhance sound engineering workflows. He discussed advancements in software like AVID's memory location enhancements and the utility of track markers, which allow audio professionals to streamline their work. "With track markers, you can filter out what you want to see based on your role—whether you're a dialogue editor or a mix engineer," he explained.

Moreover, he highlighted the evolution of Dolby Atmos technology, differentiating between stereo mixes and direct stereo versions. "A 2.0 direct is a direct stereo version from the Atmos. It sounds very different and brilliant, especially in music," he emphasized, underscoring the ongoing developments in audio technology that continue to reshape the industry.

THE ROLE OF COMMUNITY IN SOUND ENGINEERING

Nair strongly believes in the importance of building a supportive community within the audio engineering field. "It is my responsibility to make sure that the people entering the industry stand on the shoulders of people like me," he asserted. He expressed the need for experienced engineers to mentor newcomers, fostering an environment of shared knowledge and collective growth.

He reflected on the collaborative spirit of the industry, noting, "An awesome sound engineer is not just an individual; it's the sum of all the awesome sound engineers they have met along their journey. And I hope that you take that along with you as well." This notion resonated throughout the conference, as attendees shared experiences and learned from each other.

CLOSING THOUGHTS- THE PHILOSOPHY OF AUDIO

In a lighter moment, Nair quoted fellow audio professional **Kunal Mehta**: "God said, 'Let there be light,' which means sound came before audio. That's why it's called audio-visual, not visual audio," he said, drawing laughter from the audience. His point was that audio is just as critical—if not more so—than visual elements in creating a compelling experience.

Nair wrapped up the session by encouraging engineers to trust their ears and invest in their skills. "Don't panic. The answer is 42," he quoted, leaving attendees with a nod to the importance of experimentation and curiosity in the ever-evolving world of sound engineering.

Nair's balanced approach, combining technical expertise with practical advice, served as a reminder that while technology evolves, the core of sound engineering remains a deep understanding of both the science and art of audio.

In closing, Nair encouraged attendees to embrace the learning process, framing it as a continuous journey rather than a destination. "What you do is secondary, and how you do it makes a difference," he reminded the audience, emphasizing that understanding sound engineering principles in a fun and engaging way is vital for professional growth.

His engaging presentation, filled with practical insights and relatable anecdotes, left attendees inspired to deepen their knowledge and foster a collaborative spirit within the sound engineering community. As Sreejesh Nair aptly summarized, the future of audio production lies in building connections and sharing experiences, ensuring that the industry thrives through collective effort.

To view the full conference session, visit the link –
https://www.youtube.com/watch?v=oNcQrDwV6ns
*Head to the **PALM Expo Official YouTube channel** for all conference videos on industry pathbreakers!*