In the loop

Evolution has come to the induction loop market thanks to Williams Sound and its work with Glenn Leembruggen. **Richard Lawn** reports

MANUFACTURERS NO LONGER LAUNCH A product and congratulate themselves by counting the boxes leaving the loading dock. Developing an idea or a blueprint before thoroughly Beta testing a design to become a marketable asset represents a base camp level of achievement. It's only when those products are used, abused and adopted in a multitude of diverse applications that the real analysis can be made. In addition to the personal critiques received, the more savvy producers will scour their social media and websites for end-user comments and log them all. When the time is right, anything from a simple upgrade to a complete overhaul will be unveiled and the cycle will be renewed. So, when assistive listening manufacturer Williams Sound was directed to independent analysis undertaken by Australian consultant Glenn Leembruggen, they were all ears so to speak.

Following a long absence from the loop induction market, Williams Sound president and CEO Paul Ingebrigtsen was surprised by the fact that the technology had hardly evolved for years, if not decades. 'If you look at the current amplifiers with integrated DSP capabilities that can be remotely accessed and controlled, it was striking to note that no one had leveraged this new technology in an induction loop product,' explains Mr Ingebrigtsen. 'Induction loops were generally still basic and had been left behind in the 90s, so I challenged our engineers to deliver a solution that would bring them up to date.'

Launched in 2014, the first Digi-Loop amplifier broke new ground by integrating a Class-D amplifier together with network-control capability into its design to provide seamless, remote system set-up, operation and monitoring via laptop or tablet. The DSP audio processing offers software control of mixing, equalisation, compression, metal-loss compensation and other parameters. The design offers either single or dual 9.5A RMS loop outputs for perimeter loops, single arrays, dual loop or phased-array configuration. A 70V to 100V input also provides connection to a distributed speaker/paging system, ensuring announcements are heard by loop users. 'Our R&D team saw these modernisation opportunities and Digi-Loop technology brought it up to date, whilst making it easier to install and monitor.'

Williams Sound CTO Gregg Abram

Installing the Digi-Loop 210

Led by Williams Sound CTO Gregg Abram, the entire project took around two years to develop in total. Although the hardware development was quite rapid, the software platform took considerable time to create so that it could support all of the Digi-Loop amplifier models. Having witnessed the rapid adoption of the Dante platform throughout the industry, Williams Sound included a Dante input as an option – an industry first for an induction loop amplifier. Following a positive reaction to the launch, the Minneapolis-based manufacturer was confident that its ground-breaking design would transform the lives of individuals struggling with hearing impediments. As such, it was receptive and open to adding further enhanced features to the design. Following feedback from customers, a second generation flagship amplifier and two mid-sized models followed in addition to downloadable software updates.

Having represented Williams Sound since 2011 as the exclusive distributor for Australia and New Zealand, Hills has enjoyed a close working relationship with its supplier. This was further extended in November 2015, when Hills' newly appointed consultant support manager, Bryan Davidson, visited the manufacturer for the first time. 'When I was introduced to Digi-Loop, I realised that the product would be greatly enhanced with the integration of 3D predictive software created by Acoustic Directions consultant Glenn Leembruggen,' he suggests. 'I've known and worked with Glenn for years and have used this software for projects in the past.' Receptive to Mr Davidson's advice, Mr Leembruggen visited the technical team at the Williams Sound HQ in April 2016.

'I was delighted to work with a manufacturer that is extremely serious about doing things in the right manner, such as providing proper DSP filters and voltage capacity with a networkable audio input,' Mr Leembruggen states. 'Other well-known brands use agricultural,

GLENN LEEMBRUGGEN IN PROFILE

GLENN LEEMBRUGGEN is arguably one of the most accomplished electroacoustic consultant designers in the Asian Pacific region. His approach to acoustic and electroacoustic design is almost unique, as he combines a knowledge of music, high-level acoustic and electrical theory, practical application and measurement skills with a high listening acuity. He has been responsible for the design of sound systems in many high profile applications, including the New Zealand Parliament, New Zealand Supreme Court, Brisbane Airport Link tunnel, St Andrews and St Pauls Cathedrals, Sydney's Central station, the two Houses and the Great Hall of the Federal Parliament of Australia, NSW Legislative Assembly, and the High Court of Australia. He is a member of the Maintenance Team for the STI standard 60268-16 and a Fellow of the Institute of Acoustics.

Glenn Leembruggen

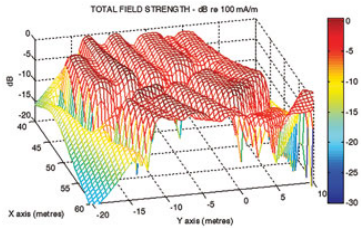
highly-variable, coarse potentiometers and inadequate filters to setup the loop drive and frequency, and this opens the way for loop systems to become completely uncalibrated, but Williams Sound amplifiers are much more sophisticated and tamper proof.

'Historically, induction loops have been badly engineered and commissioned, so many loops in the field are either not working as they've been switched off or the amplifiers have blown,' he continues. 'The combination of Williams Sound hardware and software now provides a way to change that culture. Systems integrators and operators can feel more confident with a Digi-Loop system as the amps provide a fault repair trigger with a remote status indicator or a fault signal over the network via an e-mail or message to a PC or mobile phone.'

In 2010, Mr Leembruggen conducted a design study for the then NSW RailCorp to better understand the electromagnetic implications of providing hearing loops on station platforms. That study was intended to inform RailCorp's response to Australia's Disability Discrimination Act, which requires that hearing impaired listeners also receive satisfactory speech intelligibility. This study included software developed by Mr Leembruggen and colleague David Connor to predict the electromagnetic field produced by the hearing loop systems in 3D.

'The British code of practice BS7594-2011 provides excellent theoretical guidance on the behaviour and design of loop systems, but only works in 2D and its equations are restricted to rectangular loops,' explains Mr Leembruggen. 'We therefore needed a much more comprehensive tool for that study, so we built

Paul Ingebrigtsen and Glenn Leembruggen



The software allows for 3D mapping of the electromagnetic field

it ourselves. The resultant software predictions were then validated using a series of test loops and a highly accurate, current probe with a frequency response from DC to daylight for measuring loop current. This validation included carefully mapping the frequency response and levels of the magnetic field over the loop area and comparing the levels with predictions. The software is so accurate that we now calibrate our field-strength receiver using a test loop and known current.'

Although other manufacturers also incorporate their own prediction software, Mr Leembruggen believes they do not properly address the electrical domain of AFIL systems. 'Our software encompasses amplifier requirements for the spectrum and crest-factor dynamics of speech and music signals, the required short and long-term levels and the frequency dependence of metal losses. By developing a process to accurately commission AFIL systems, we can measure the loops' electromagnetic transfer function at each frequency using mapped field-strength data. This allows us to accurately determine the required equalisation filters and the overall current level with speech so that the loop system meets international standards with the required crest factor.' Mr Leembruggen and Williams Sound are now exploring ways to include this in the Williams arsenal.

The Williams Sound design team overlaid Mr Leembruggen's simulations and looked at the resultant layout. 'The prediction software works and allows you to judge if the proposed loop layout will meet the standards required,' Mr Ingebrigtsen offers. 'The loop system is a big portion of the installation cost and discrete systems sometimes cannot use a loop system owing to excessive metal loss or budget constraints. That's when alternative wireless technologies have their place. The simulation and software lets us determine this.'

Having developed a relationship with Glenn Leembruggen, Williams Sound's induction loop designs are now charting a new course of development. 'The industry requires accurate predictive software to give them confidence and a level of credibility by depicting a complete picture,' concludes Mr Ingebrigtsen. 'Having created a sophisticated range of induction loop amplifiers, the introduction of Glenn's software has placed us in a more competitive arena. Our mission is to help people hear and understand speech and announcements in their everyday lives. There are noisy environments, acoustic challenges and different languages to overcome for example. We're keenly interested in growing our business with the help of friends like Glenn and by utilising new technology.'

For this receptive, passionate manufacturer trying to create a better world, nothing will replace real-world feedback as the best possible testing environment.

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