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OSHA: Hear & Now – Noise Safety Challenge
U.S. Department of Labor
OSHA Office of Communications
Washington, DC

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BACKGROUND

EERS is a Montreal based company dedicated to ending noise-induced hearing loss (NIHL) through protecting and enhancing the hearing of those most at risk. The company has been developing in-ear products and investing in an Industrial Research Chair in In-Ear Auditory Technologies at ÉTS-Université du Québec since 2010. Its most notable inventions include the world's first instant custom fitting hearing protection device, commercialized as SONOMAX and the F-MIRE measurement system, developed in early 2000 and commercialized globally as SonoPass™. In 2009, 3M Corporation acquired the source code of SonoPass™ and commercialized E-A-Rfit™. In 2015 E-A-Rfit™ won the Occupational Health & Safety New Product of the Year Award. The use of Field Attenuation Estimation Systems (FAES) is now increasingly accepted in hearing loss prevention programs, and the OSHA-NHCA-NIOSH Alliance has identified individual fit-testing as an emerging trend and best practice [1].

OVERVIEW

EERS and its Industrial Research partner now set their aim on developing and bringing to market the next generation of protection devices comprised of marrying hardware, software and connectivity into one affordable protection communication device. A worker should never need to choose between either staying protected and safe or being effective at their job because protection devices are impeding their hearing. Our solution provides the worker the one device that continuously allows them to stay protected, communicate effectively and be alerted to risks. This vision shares the common goal of enhancing worker safety, productivity and ease of use with an overarching goal of partnering with Government and industry to end noise-induced hearing loss the most common occupational illness in the North America.

COST

The human and social cost of hearing loss in the workplace is unacceptable. In financial terms, hearing disability costs businesses in the US, an estimated $242 million annually in workers' compensation. In Canada, the figures are even more troubling when scaled per capita, with Ontario alone spending $50M per year in registered payouts. (1.1)

OUR PROPOSED SOLUTION

Our HEARABLE device plans to solve real-world communication and protection challenges by combining proprietary hardware and software technology into a single patented platform which includes:

- Instant custom-fitted earpieces for enhanced all day comfort and performance
- Combination of passive and active hearing protection
- In-ear microphone with smart filtering algorithms for high noise 2-way communication
- Cloud-based performance analytics with continuous fit-testing to enhance safety
- Designed to be affordable and sold as a monthly service
- Connects to smartphone or works independently
- In-ear biometrics such as heart beat and temperature

OUR TEAM

Nick Laperle, LL. B.

- President & Chief Hearing Evangelist at EERS
- 20 years in hearing industry including retail, clinical, industrial, technology
- Multiple start-ups & public company experience
- Life's work is around hearing healthcare and developing technologies to prevent NIHL

Dr. Jérémie Voix, P. Eng., Ph. D.

- Professor at ÉTS, the second largest university in Canada for engineering
- Chairholder of NSERC-EERS Industrial Research Chair in In-Ear Technologies funded by EERS and the National Science and Engineering Research Council of Canada
- Leads a team of 20 undergraduates, Masters, Ph.Ds. and Post Doctorates
- Over 125 publications (including 2 recent book chapters on the AEHA Noise Manual)
- 16 Patents (Granted & Pending)
- 15 Keynotes (including MIT & Stanford)

A multidisciplinary team of over 30 people including scientists, hardware and software engineers, developers and health professionals have teamed up to bring Bionic EERS™ to market. We believe that the combination of business and academia is able to deliver a 360-degree solution for workers, employers, safety professionals, insurance underwriters and worker's compensation boards around the world.

THE NEXT FRONTIER: The Dose-Response Relationship

The objective of our second 5-year term EERS/NSERC Industrial Research Chair program is to further enhance the performance of the Bionic EERS™ solution so that it can comfortably protect the worker and continuously measure both the actual noise dose received and the induced auditory fatigue, taking into account the worker's own susceptibility to develop NIHL. To achieve these goals, 3 preliminary technologies have been developed:

i) A patent pending "dosimetric earplug" capable of monitoring the noise dose and warning both the user and his supervisor when the daily dose is about to be reached [2–4].
ii) A patent pending "Otoacoustic emissions monitoring earplug" will monitor cochlear responses and detect, for a given user, slight drifts in hearing levels much sooner than standard audiometric methods [5–9].
iii) Continuous fit-testing integrated system for all day peace of mind

This proposed research program is backed by the Natural Science and Engineering Research Council of Canada (NSERC) and leads to the development of a very unique hearing-health monitoring platform to be manufactured by EERS.

EXPECTED OUTCOMES

FOR WORKERS

1. EERS will be comfortable to use all day long;
2. EERS will alert me and/or my safety teams when hearing protection is not blocking enough noise to prevent hearing loss;
3. EERS will allow me to hear important alerts, warning signals or human voices while remaining protected from harmful noise; and
4. My interchangeable batteries mean I can work 12hrs and always be protected.

FOR EMPLOYERS

1. For the first time, through monitoring and reporting, it is possible to be constantly aware of the use and performance of protection devices;
2. The EERS App aims to enhance Hearing Loss Prevention Programs, training and improve effective use of hearing protection;
3. EERS will be an integrated platform solution that will provide important hearing health data to workers, safety teams, management, workers' comp regulators and insurance companies; and
4. This platform technology will have the potential to be a worker gateway for all other personal protective equipment.

REFERENCES

[1] N. Alliance, Best Practice Bulletin: Hearing Protection - Emerging Trends: Individual Fit Testing. OSHA, 2008.

[1.1] Ontario goes 'scientific' with new construction noise rules, "Ontario's Workers Health and Safety Centre (WHSC) indicates that over the five-year period ending in 2013, the cost for noise-induced hearing loss claims for all sectors in Ontario exceeded $50 million per year", http://dailycommercialnews.com/OHS/News/2016/7/Ontario-goes-scientific-with-new-construction-noise-rules-1017472W/

[2] K. Mazur and J. Voix, "Implementing 24-hour in-ear dosimetry with recovery," in Proceedings of Meetings on Acoustics, Montreal (QC), Canada, 2013, vol. 19, p. 40016. pdf

[3] K. Mazur and J. Voix, "A case-study on the continuous use of an in-ear dosimetric device," presented at the ICA 2013, Montreal (QC), Canada, 02-Jun-2013.

[4] K. Mazur and J. Voix, "Development of an Individual Dosimetric Hearing Protection Device," presented at the Inter-Noise 2012 : The 41th International Congress and Exposition on Noise Control Engineering, New York, NY, USA, 2012, p. 20 p.

[5] Vincent Nadon, Annelies Bockstael, Dick Botteldooren, and Jérémie Voix, "Pilot study on individual dose-response relationship evaluated through otoacoustic emission measurements in controlled noise exposure: influence of circadian rhythm," in Canadian Acoustical Week, Canadian Acoustics, Canadian Acoustics, 2016, vol. Vol. 44 No. 3, pp. 162–163.

[6] Vincent Nadon, Annelies Bockstael, Dick Botteldooren, and Jérémie Voix, "Assessment of otoacoustic emission probe fit at the workfloor," in Proceedings of Euronoise 2015, Maastricht, Netherlands, 2015, pp. 1955–1960.

[7] Vincent Nadon, Annelies Bockstael, Dick Botteldooren, and Jérémie Voix, "Signal processing techniques for continuous monitoring of otoacoustic emissions in industrial environnement," in Abstract Forum Acousticum 2014, Krakow, Poland, 2014.

[8] V. Nadon, A. Bockstael, H. Keppler, D. Botteldooren, J.-M. Lina, and J. Voix, "Use of passive hearing protectors and adaptive noise reduction for field recording of otoacoustic emissions in industrial noise," in Proceedings of Meetings on Acoustics, Montreal (QC), Canada, 2013, vol. 19, p. 40019.

[9] Vincent Nadon, Annelies Bockstael, Dick Botteldooren, Jean-Marc Lina, and Jérémie Voix, "Individual monitoring of hearing status: development and validation of advanced techniques to measure otoacoustic emissions in suboptimal test conditions," Appl. Acoustic., vol. APAC5425, pp. 78–87, Mar. 2015.

[10] Vincent Nadon, Annelies Bockstael, Dick Botteldooren, and Jérémie Voix, "Individual dose-response relationship evaluated through otoacoustic emission measurements in controlled noise exposure: a pilot study.," presented at the XXXIII World Congress of Audiology, Vancouver, BC, Canada, 18-Sep-2016.