



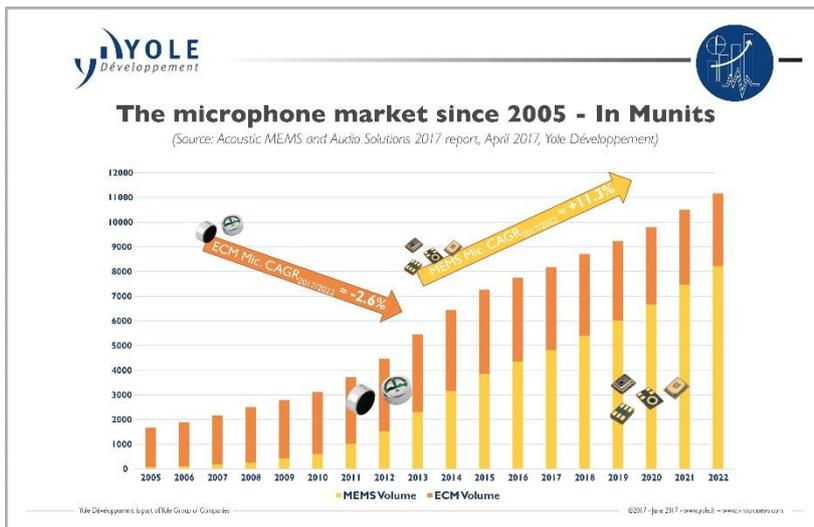
FOR IMMEDIATE RELEASE:

The audio world has stepped into another dimension

Acoustic MEMS and Audio Solutions 2017 – Vesper VM1000 Piezoelectric Microphone - Knowles MEMS Microphones in Apple iPhone 7 Plus Patent-to-Product Mapping 2017 – Reports from Yole Group of Companies

LYON, France – 8 June 2017: Market for MEMS¹ microphones and ECMs², micro-speakers and audio ICs³ will be worth US\$20 billion in 2022. Compared to 2006, the audio business is about to experience profound changes... When [Yole Développement](#) (Yole), part of Yole Group of Companies released its first microphone report in 2006, the MEMS microphone industry was at the early stage, with emerging players and applications. The “More than Moore” market research &

strategy consulting company was announcing a US\$116 million market for 260 million units. Today, market figures are at another scale. Therefore, 2017 volume will reach the 5 billion units milestone for a market value over US\$1 billion. Microphone has become a key technology for major MEMS and semiconductor companies. Knowles, Goertek, AAC as well as new comers such as Vesper are part of today’s landscape.

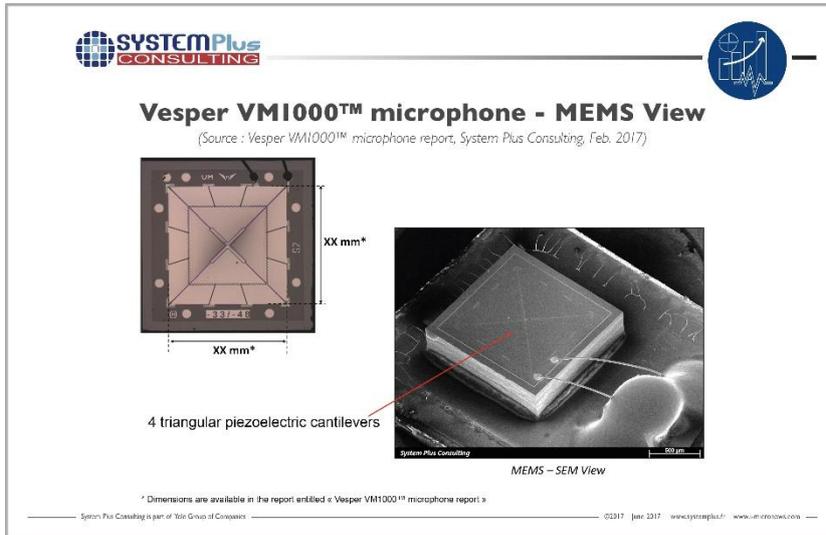


Yole Group of Companies proposes a deep understanding of the audio industry with a collection of reports:

[Acoustic MEMS & Audio Solutions report](#) reviews the complete evolution of the audio world including MEMS microphones, ECMs, micro-speakers and audio ICs since 2010.

In parallel, [System Plus Consulting](#) and [KnowMade](#) combine their expertise to perform dedicated reports focused on leading microphone companies, Vesper and Knowles: the [Vesper VM1000™ microphone report](#) is a reverse engineering & costing analysis highlighting the innovative piezoelectric technology developed by Vesper. Indeed the company has developed the first piezoelectric MEMS technology microphone. “This innovation reshuffles the cards of the microphone industry, mainly based on capacitive silicon MEMS

¹ MEMS: Micro Electro Mechanical Systems
² ECM: Electret Condenser Microphone
³ IC: Integrated Circuit



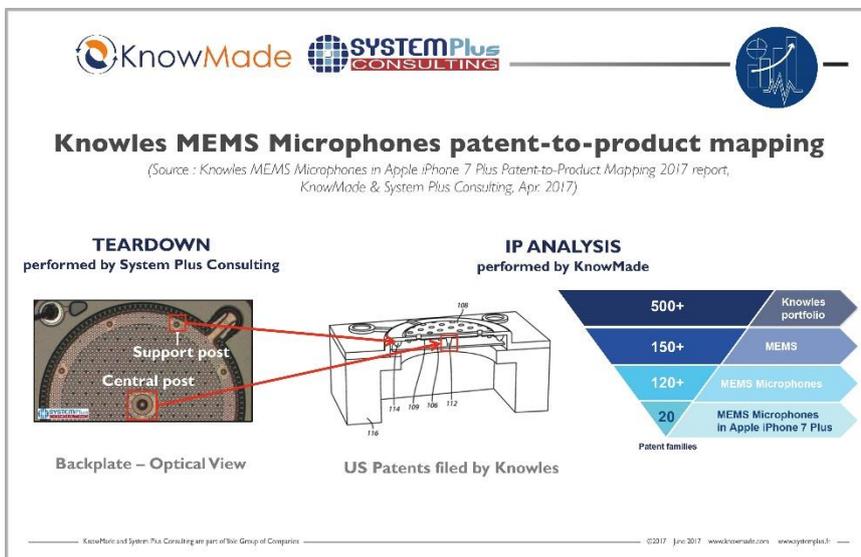
technologies until now”, comments **Romain Fraux**, **System Plus Consulting’s CTO**.

Under competitive conditions, Yole’s analysts interviewed **Vesper’s CEO, Matt Crowley** to understand Vesper’s strategy and learn more about its latest device. With this disruptive solution, Vesper starts playing the big league with leading companies such

as Knowles, Goertek... Full interview: [The future is voice-powered⁴](#). The [Knowles MEMS Microphones patent-to-product mapping](#) details the main patented features of Knowles’ device embedded in iPhone 7 Plus™. Mixing data from System Plus Consulting’s teardown and KnowMade’s IP analysis, this report makes the connection between the features of Knowles technologies and its patent portfolio. The report also reviews Knowles’s patent landscape and the IP litigations

involving patents identified in the Patent-to-Product mapping analysis.

“The technology developed by Knowles in the early 2000s has strongly impacted the audio landscape triggering an unprecedented revolution,” asserts **Coralie Legreneur**, **KnowMade’s IP analyst**. Knowles never stopped improving its solution and today, within a very intense and competitive global market, the company is showing strong IP activities...



Audio is becoming a key function of multiple existing and new products that increasingly has to be analysed as a complete landscape compared to independent devices. “From mobile phones to cars, from home assistants to drones, audio products like microphones, speakers and audio ICs are essential for all the new systems driving consumer electronic

⁴ Source : [i-micronews.com, MEMS & Sensors news section](#), May 2017

markets”, comments **Guillaume Girardin Technology & Market Analyst, MEMS & Sensors at Yole.**

The total audio business was worth more than US\$15 billion in 2016. Moreover, Yole announces today a CAGR⁵ close to 6%, in 2022. The audio device market will become a key feature in all the applications it is involved in. According to the Acoustic MEMS & Audio Solutions report, there is clearly room for more benefits in the audio supply and value chain, as well as other significant changes.

At the device level, the MEMS microphone market has almost reached the US\$1 billion milestone, with a value of US\$ 993 million in 2016. Combined with the US\$700 million ECM market, now the acquisition of sound is almost a US\$2 billion value market.

The μ speaker market is estimated to be worth US\$8.7 billion.

In addition to these two visible elements of the audio chain, the audio IC market, which includes codecs, DSPs⁶ and amplifiers, should reach US\$4.3 billion in 2016...

Mobile remains the main market segment for microphones. This sector was very demanding in terms of volume but not so much in terms of performance: against two microphones per smartphone initially, mobile manufacturers developed solutions with more than five devices per system.

“We are today in a new phase. With innovative technologies, smarter software, more algorithms, we reach a new level of performances and see solutions with higher value”, asserts Guillaume Girardin from Yole.

These results are part of Yole Group of Companies reports. Detailed description of each analysis is available on i-micronews.com, [MEMS & Sensors reports section](#).

⁵ CAGR : Compound Annual Growth Rate

⁶ DSP : Digital Signal Processors

ABOUT THE REPORTS:

- [Acoustic MEMS and Audio Solutions 2017 report](#)

The market for MEMS microphones and ECMs, micro-speakers and audio ICs will be worth \$20B in 2022. – This report has been performed by Yole Développement, part of Yole Group of Companies.

Author: **Guillaume Girardin** works as a Market & Technology Analyst for MEMS devices and technologies at Yole Développement, the “More than Moore” market research and strategy consulting company. Guillaume holds a Ph.D. In Physics and Nanotechnology from Claude Bernard University Lyon I and a M.Sc. in Technology and Innovation Management from EM Lyon School of Business.



Companies cited in the report:

AAC Technologies, AKM, ams AG, Analog Alchemy, Analog Devices, Apple, ARM, ASE, Asus, Audience, Audiopixel, Bosch Akustica, Bosch Sensortec, BSE, CEVA, Cirrus Logic, CSMC, CoolPad, Dell, Dialog, DSP Concept, DSP Group, ESS Technology, Foster, Fujitsu, Gettop, Gionee, Goertek, Google, GoPro, Harman, HiSilicon, Hong Hsing, Hosiden, HP, HTC, Huawei, Infineon, Intel, InvenSense, Jawbone, Knowles, Lenovo, Lingsen Precision Industries, Maxim Integrated, Mediatek, Meizu, MEMSensing, MEMSTech, Microchip, MicroLink SensTech, Motorola, NeoMEMS, Nokia, NXP, Omron, Oppo, Qualcomm, Realtek, Rohm, Samsung, SigmaTel, Sony, Sonion, STMicroelectronics, Suzhou Horn, TCL, TDK-EPC, Tensilica, Texas Instruments, Transound Electronics, TSMC, UMC, USound, VesperMEMS, Weifang XinGang, XFab, Xiaomi, Yamaha, ZTE... and more...

- [Vesper VM1000 Piezoelectric Microphone reverse engineering & costing report](#)

First piezoelectric MEMS microphone could disrupt consumer applications. This report has been performed by System Plus Consulting, part of Yole Group of Companies.

Authors:



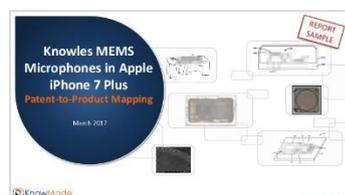
Sylvain Hallereau is in charge of costing analyses for IC, power and MEMS. He has more than 10 years of experience in power device manufacturing cost analysis and has studied a wide range of technologies.

Nicolas Radufe is in charge of physical analysis. He has a deep knowledge of chemical and physical analyses. He previously worked in microelectronics R&D for CEA/LETI in Grenoble and for STMicroelectronics in Crolles.

- [Knowles MEMS Microphones in Apple iPhone 7 Plus Patent-to-Product Mapping 2017 report](#)

What are the main patented features of Knowles' MEMS Microphones in the iPhone 7 Plus? This report has been performed by KnowMade, part of Yole Group of Companies.

Authors:



Coralie Le Greneur works for KnowMade in the field of Biotechnology and Life Sciences. She holds a PhD in Molecular Biology from the University of Nice Sophia-Antipolis, France. She also holds the International Industrial Studies Diploma in Patents from the CEIPI, Strasbourg, France.

Brice Sagot

Brice is COO and co-founder of KnowMade. He leads the Biotechnology and Life Sciences department. He holds a PhD in molecular biology from the University of Nice Sophia-Antipolis, France.

Romain Fraux

Romain is the CTO of System Plus Consulting. He is in charge of costing analyses for Advanced Packaging, MEMS and Integrated Circuits. He has published more than 50 Reverse Costing reports on various MEMS devices including inertial, pressure, microphones or RF sensors.

ABOUT YOLE GROUP OF COMPANIES

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product. System Plus Consulting engineers are experts in Integrated Circuits - Power Devices & Modules - MEMS & Sensors - Photonics – LED - Imaging – Display - Packaging - Electronic Boards & Systems.

Through hundreds of analyses performed each year, System Plus Consulting offers deep added-value reports to help its customers understand their production processes and determine production costs. Based on System Plus Consulting's results, manufacturers are able to compare their production costs to those of competitors.



Specialized in analysis of patents and scientific information, **KnowMade** provides Technology Intelligence and IP strategy consulting services. The company is supporting R&D organizations, industrial companies and investors worldwide in their business development by offering them a deep understanding of the technology trends and their IP environment. KnowMade operates in the following industrial sectors: Microelectronics & Optoelectronics, Compound Semiconductors, IC Manufacturing, Advanced Packaging, Power Electronics, RF Devices, MEMS Sensors & Actuators, Photonics, Micro & Nanotechnology, Biotechnology, Pharmaceuticals, Medical Devices and Agri-Food.

KnowMade performs prior art search, patent landscape analysis, scientific literature analysis, patent valuation and freedom-to-operate analysis. In parallel, the company proposes litigation/licensing support, technology scouting and IP watch service. KnowMade's analysts combine their technical and patent expertise by using powerful analytics tools and proprietary methodologies to deliver relevant patent analyses and scientific reviews.



Founded in 1998, **Yole Développement** has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole Développement group has expanded to include more than 50 collaborators worldwide covering MEMS, Compound Semiconductors, RF Electronics, LED, Displays, Image Sensors, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The "More than Moore" company Yole, along with its partners System Plus Consulting, PISEO, Blumorpho and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

- Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
- Reports: David Jourdan (jourdan@yole.fr)

Yole Group of Companies – Press contact: Sandrine Leroy (Leroy@yole.fr) Press Relations & Corporate Communication: Sandrine Leroy (Leroy@yole.fr)

###