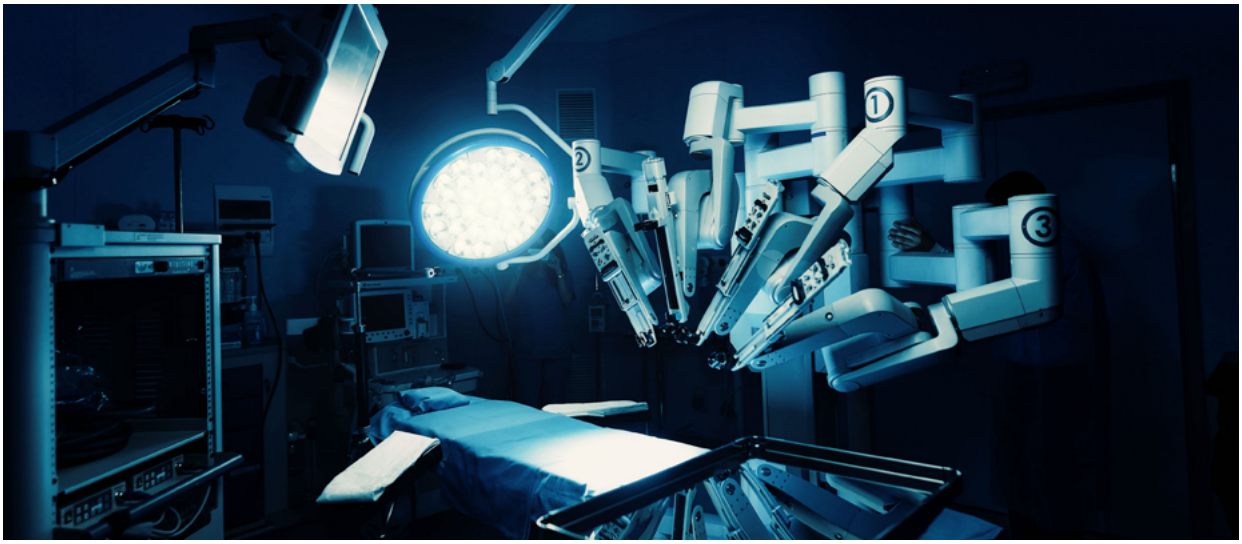
NANODIMENSION
Electrifying Additive Manufacturing®

CASE STUDY: MEDICAL

PIEZOSKIN – CUSTOMIZED 3D-PRINTED MEMS PACKAGE WITH ELECTRIC PADS

Innovative prototyping method enables lighter, smaller, more affordable MEMS



CLIENT PROFILE

Piezoskin is a startup based in Lecce and established as a spin-off from the Center of Biomolecular Nanotechnologies (CBN) of the Istituto Italiano di Tecnologia (IIT). Over the last five years, the CBN has developed technologies for harvesting energy and sensing from mechanical sources (such as vibrations and fluid flows) and human body movements. To this aim, Piezoskin has developed a consolidated fabrication protocol for soft piezoelectric transducers, from a customizable design to device production, characterization, and testing.

www.piezoskin.com

CHALLENGE

The devices created by Piezoskin are based on a polymeric substrate and a highly flexible thin-film structure, comprised of Aluminum Nitride as a piezoelectric layer and Molybdenum as an electrode. The extremely low thickness of the whole structure makes the product the thinnest piezoelectric transducer on the market today, ideal for the wearable transducers and next-generation micro-electro-mechanical systems (MEMS) used in multiple applications — especially biomedical.

In manufacturing ohmic-contact MEMS, the metal contact is one of the most crucial parts, as it determines the device's performance and reliability. This issue is especially important in the manufacture of devices that are soft and flexible, as producing electrical connections becomes difficult due to the technical constraints involved. Piezoskin therefore turned to Nano Dimension, requesting a solution that would optimize the process.

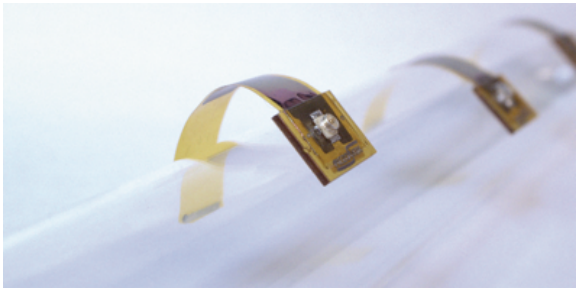
NANODIMENSION
Electrifying Additive Manufacturing®

SOLUTION

To solve the limitations inherent in approaches used until now, and help boost Piezoskin to the next level, Nano Dimension suggested its DragonFly LDM™ additive manufacturing system for the embedding of piezoelectric transducers into a light, compact and robust package. Inside, the electrical pads would be directly printed on the device's metal layers, where an RF connector would be soldered.

The DragonFly's multi-material inkjet deposition system, with two different kinds of ink — conductive silver nanoparticle ink (metal) and insulating ink (dielectric) — was used to embed the sensors via a layer-by-layer fabrication process.

Using the Nano Dimension solution, Piezoskin was able to avoid injection molding processes which was a significant advantage over traditional production methods, as it eliminated a great deal of both human-machine interface and hardware normally used. It also enabled the ultimate manufacturing of a package that was more cost effective, not to mention much smaller and far lighter than otherwise would have been possible.



"Nano Dimension's AME technology helped us to achieve an original product prototype, in which wires and connectors were eliminated and the package was minimized, to obtain an optimal user experience. It simplified the manufacturing process, as compared to traditional manufacturing methods."

Dr. Francesco Guido,
CTO Piezoskin S.R.L.