CASE STUDY: MEDICAL IMPLANTS

CELTRO 3D-Printed Battery-Less Cardiac Implant

CLIENT PROFILE

CELTRO is a startup company (founded in late 2019) comprised of heart rhythm medical doctors and semiconductor industry engineers/executives. Their premise is that there's a better way for implants to integrate seamlessly with the human body – that in-body electronics do not need an outside energy source (body has internal capability to generate sufficient capability to harvest power from biological cells and maintain implant devices). Their first project is to develop an additively manufacturing electronic battery-free pacemaker implant prototype.

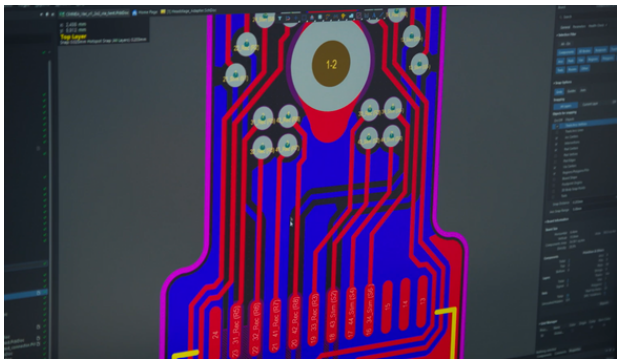
www.celtro.de

BACKGROUND

Until today all medical electronic devices operate on batteries or external energy transfer. Autonomously driven energy self-sustaining medical electronics do not exist. Current technology of energy supply limits implantable electronic lifetime, it necessitates secondary replacement surgery with associated costs and risks, and it restricts functionalities of advanced biological signal monitoring to guide patient management and digital health.
Implantable cardiac electronics are further limited through typical out-of-organ implant sites which necessitate long insulated wires to connect to cardiac tissue. These so-called 'leads' carry a significant risk of insulation defects, wire break, infection, and other vascular damage. With limited connection points to the target organ, this technology contains further unmet risks of patient harm, repetitive surgeries, and incremental healthcare costs.

CHALLENGE

In-body electronics require new integrated packaging for different components (heterogenous integration) in exceedingly small form factors (e.g., pacemaker needs to go through an endoscopic pathway for catheter deployment and is only 4mm in diameter (need small, durable packaging that can fit all components inside).



Source: CELTRO BioChips Harvest Cellular Electrical Energy

SOLUTION

Nano Dimension's Additively Manufactured Electronics (AME) technology enables CELTRO to gain flexible production technology that allows for optimal small packages. Characteristics of their new devices: no batteries, no leads, nano watt power footprint, no need for additional surgeries.

NANODIMENSION
Electrifying Additive Manufacturing®

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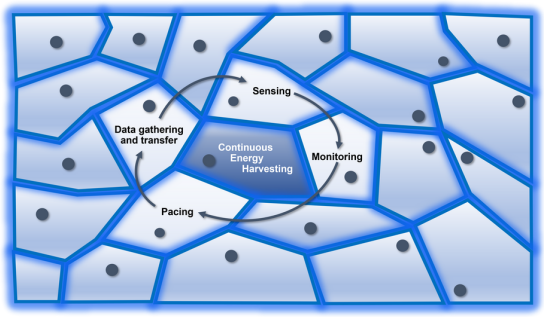
Today, the battery of pacemaker needs to be replaced every 5-7 years which requires surgery and involves patient risk and inconvenience. Imagine a world where there's sensors on many parts of the body allowing predictive maintenance instead of breakdown. Planning to offer a platform on in-body electronics. CELTRO is currently in the stage of proof of concept of their technology platform.

BENEFIT OF AME

AME enables CELTRO to prototype, iterate and receive fast feedback on the results. The implantable cardiac parts are exceedingly small, and AME is affordable and provides advantages in speed and flexibility. By leveraging AME, CELTRO will benefit from 3D electronics, rapid prototyping, time-to-market reduction, heterogeneous integration, miniaturization, and new production processes.



WHAT'S NEXT

The next step is to demonstrate that the device can pace a heart continuously without foreign energy. Then it will need to be successfully deployed through a catheter and show that it can run for longer. And then the product phase will start with a series of milestones in certification.

We are extremely excited by the progress we've made in the development and testing of our battery-free cardiac implant that has been enhanced using Nano Dimension's AME technology. We are optimistic in the prospects of creating a platform of next-generation in-body electronics that will help shape the future of the medical implant industry.

Dr.-Ing. Gerd Teepe
CELTRO Co-Founder & CEO