

3D Printed Embedded Sensor

Organization

University of Missouri-Kansas City

Industry:

Advanced Manufacturing
Aerospace
Medical

Researchers:

Travis Fields, PhD

Status of Intellectual Property:

Patent pending, lab
demonstrated

Next Steps:

Continue to work with aerospace
manufacturers to design and
employ 3D printed sensors

For more information contact:

Jim Baxendale
Whiteboard2Boardroom
baxendalej@umkc.edu

**Wanted**

Experienced leader to commercialize this invention.

Customer Problem

Using sensor data to monitor structural health status is crucial for safety and efficiency. Currently sensors are attached outside of the structure to be monitored and there are problems with movement of the sensor. If sensors are placed within a structure the methods to place them can weaken the structure to be monitored.

Potential Market Uses

There are a wealth of market uses for 3D printed sensors, including structural health monitoring. As more devices are constructed by 3D printing the internal sensing will be available to improve the decisions in the safety, repair and replacement of those structures.

Market Size:

According to the new market research report, *“Structural Health Monitoring Market by Solutions (Hardware: Sensors, Data Acquisition System; Software & Services), Technology (Wired and Wireless), End Users and Geography - Global Forecast to 2022”*, this market is expected to grow from \$701.4 million in 2015 to \$3407.7 million by 2022, at a CAGR of 24.99% between 2016 and 2022. The rapidly aging infrastructure in North America and Europe has promoted the adoption of structural health monitoring solutions for civil infrastructure such as bridges, dams and tunnels. The increasing usage of composites in manufacturing of aircraft airframe structures, and inability of current non-destructive testing (NDT) techniques in monitoring hazardous and inaccessible areas within structures such as nuclear power plants and offshore wind farms are the factors driving the growth of the structural health monitoring market.

Innovation

A process is described to design and build a strain gauge by 3D print within a 3D printed structure.

Stage of Development

- Have created over 100 gauge samples and evaluated with load frame
 - Created various geometries and construction techniques
- Developed predictive simulation and verified with the extensive sample set

Competitive Advantages

3D printed sensors are advantageous over current sensors in the ability to place them directly at the point of sensing and are able to shape to the confines of the structure or body. There are other attempts to print sensors, for example an ink in gel print sensor.

Related articles:

Embedded 3D Printing of Strain Sensors within Highly Stretchable Elastomers (Advanced Materials)

https://lewisgroup.seas.harvard.edu/files/lewisgroup/files/embedded_3d_printing_of_strain_sensors_within_highlystretchable_elastomers.pdf

Welsh Researchers Use Optomec Aerosol Jet Technology to 3D Print Hair-Sized Sensors (3Dprint.com)

<https://3dprint.com/106090/swansea-university-aerosol-jet/>.