



FERRO Solutions
ENERGY HARVESTERS AND SENSORS

**POWERING
YOUR
WIRELESS
SENSOR
NETWORK**



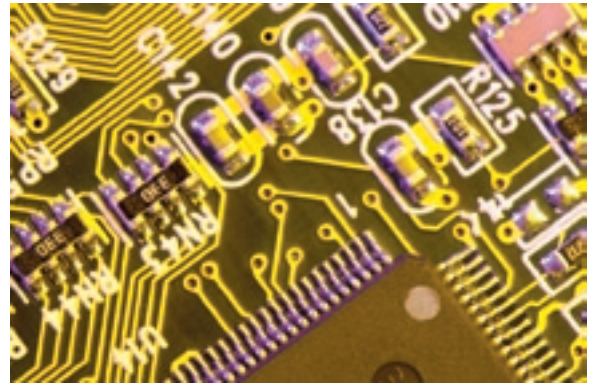
COMPANY CAPABILITIES



Objective

OBJECTIVE

FERRO Solutions is seeking partners and customers for their energy harvesting and hybrid sensor technologies. Does your company need independent, renewable, portable power systems for wireless sensor networks? Is replacing batteries uneconomical?



Sensors and Energy Harvesters



Or perhaps your company needs

- ▶ high-sensitivity and low-power magnetometers

- OR -

- ▶ high-sensitivity, low-power hybrid sensors to measure both acoustic and magnetic signals?

Then you are the ideal match for Ferro Solutions' technologies.

Core Competencies

COMPETENCIES

TECHNOLOGY



Q: What if you brought together experts in materials science and magnetic materials from MIT with top-notch electrical and mechanical engineers from MIT and Harvard?

A: You would get a blend of world-class scientists and engineers who are able to deliver solutions that work, and a company with the credentials to conceive and build the best performing energy harvesters and hybrid sensors.

RESEARCH & DEVELOPMENT

Ferro Solutions has worked closely with The Office of Naval Research, providing contract R&D since 2002.

Expertise with magnetic materials is one of our core competencies. It is the common thread between our sensor development and our energy harvester development.

Since our founding in 2002, Ferro Solutions has completed work on multiple SBIR and STTR Phase I and Phase II projects. Goals were met, on-time and on-budget.

Mission

MISSION



WE WORK ETHICALLY,
PROVIDE OUTSTANDING SERVICE,
AND RESPECT OUR CUSTOMERS
AND EMPLOYEES.

Ferro Solutions pioneered the development of novel energy harvesters and sensors based on magnetic materials. These provide our customers with low-cost, low-power devices that in essence produce “perpetual power”, like batteries that never need to be replaced. Our hybrid sensor solutions allow for the collection of both acoustic and magnetic field data through a single, low-power sensor.

An expanding portfolio of patents, supported by our relationship with MIT’s School of Engineering, enables us to provide novel power generation and sensing solutions. These can be used in transportation, industrial monitoring, military, and utilities applications.

Ferro Solutions is committed to commercializing our technology for both military and non-military customers.

Products

SENSORS

Designed for underwater use by the Navy, the current hybrid sensor is an example of sensor fusion. It delivers data from both acoustic and magnetic field signals. The device can also be used solely as a magnetometer.

- ▶ Hybrid acoustic and magnetic field sensors that require low input power.
- ▶ Extremely sensitive magnetic field sensors that require low or no power. Their sensitivity is greater than Hall Effect sensors and flux gate magnetometers.

ENERGY HARVESTERS

Ferro Solutions has developed two advanced energy harvesting technologies: **Inductive** and **PME**.

Inductive vibration energy harvesters use the common Faraday principle in an uncommon way. These devices generate power for wireless devices and sensors in all types of environments with vibration, ranging from HVAC equipment to boiler feed pumps, and from rail cars to jet engines, even ship propellers.

Our piezo-based PME energy harvesters can be configured for use in environments with vibrations or changing magnetic fields. Combining piezoelectric materials with other magnetic materials, these devices generate more power than straight piezoelectric harvesters. This technology is well suited for high-frequency environments and settings with a changing magnetic field, such as embedded in equipment with moving magnets.

WIRELESS SENSOR NETWORK



PRODUCTS

Applications

APPLICATIONS

Ferro Solutions technologies deliver great returns in many military and industrial applications.

Sensors are designed for underwater applications, especially detection for military and scientific purposes in littoral regions.

Energy Harvesters are designed for environments with vibration or other movement, to power CBM and other wireless sensor networks.



INDUSTRIAL & PROCESS AUTOMATION AND UTILITIES

- Power Plant
- HVAC Equipment
- Oil Refinery
- Power Distribution
- Chemical Plant
- Sub-Metering

FREIGHT TRANSPORTATION TRACKING AND MONITORING

- Automobiles
- Airplanes
- Helicopters
- Trucks
- Ships
- Trains

Ferro Solutions is establishing partnerships with leading wireless sensor networking companies and billion dollar companies that will incorporate Ferro Solutions devices into their final sensing and monitoring systems.

OUR LATEST CLIENTS INCLUDE:

- A diversified industrial manufacturer.
- A global process management company.
- A Japanese manufacturer and tier-1 auto supplier.

Management

JIANKANG HUANG

President, Co-Founder

Since founding Ferro Solutions in 2002, Huang has led the magnetic sensor and vibration energy harvester technology development at Ferro Solutions. He is currently the Principal Investigator for SBIR programs to develop sensors and vibration energy harvesters. Huang was in charge of magnetic sensor materials development at Corning Applied Technologies from 1998 to 2001. Prior to Corning, he was a visiting scientist at MIT from 1995 to 1998 where his research led to a new generation of smart materials: Ferromagnetic Shape Memory Alloys (FSMA). Huang received his Bachelors and Masters degrees in Physics from Beijing University, China.

DR. ROBERT O'HANDLEY

Chief Scientist, Co-Founder

Dr. O'Handley performed research for 9 years at government and industrial labs including IBM's Watson Research Center, before joining MIT in 1981. His research activities have mainly focused on magnetic materials and devices. Dr. O'Handley has published one textbook (*Modern Magnetic Materials; Principles and Applications*, 2001), over 220 technical articles, and been granted 18 US and foreign patents.

Dr. O'Handley has been a consultant to IBM, DEC, Applied Magnetics, Quantum, Seagate, and Tyco/Sensormatic among others. In addition to Ferro Solutions, his research has been the basis for two high-tech startups, Spinix and AdaptaMat. Beyond his undergraduate and graduate teaching responsibilities at MIT, O'Handley has managed a group numbering up to 13 students and researchers funded by industrial and government research grants, most recently leading a 5-University Navy grant to develop a new class of magneto-elastic materials for Navy and commercial applications. Dr. O'Handley received his B.A. from Marist College and his M.S. and Ph.D. degrees in Physics from Polytechnic University.

KEVIN O'HANDLEY

VP, Business Development

Kevin O'Handley joined Ferro Solutions in 2003 after receiving his MBA from the Wharton School of Business at the University of Pennsylvania. Before Wharton, he worked for Sensitech, a venture funded cold chain monitoring company serving the food, pharmaceutical and logistics industries. Here, he performed sales, marketing, and consulting functions, doubling the size of key food and pharmaceutical accounts. Kevin O'Handley received a B.A. from the University of Massachusetts at Amherst.

Contact

The nature of our energy harvesting and sensing technology allows us to quickly and easily customize our solutions for your particular application. If you are ready to integrate our cost-saving energy harvesters or hybrid sensors into your systems, or to become a development partner, contact us today.



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BUSINESS DEVELOPMENT

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