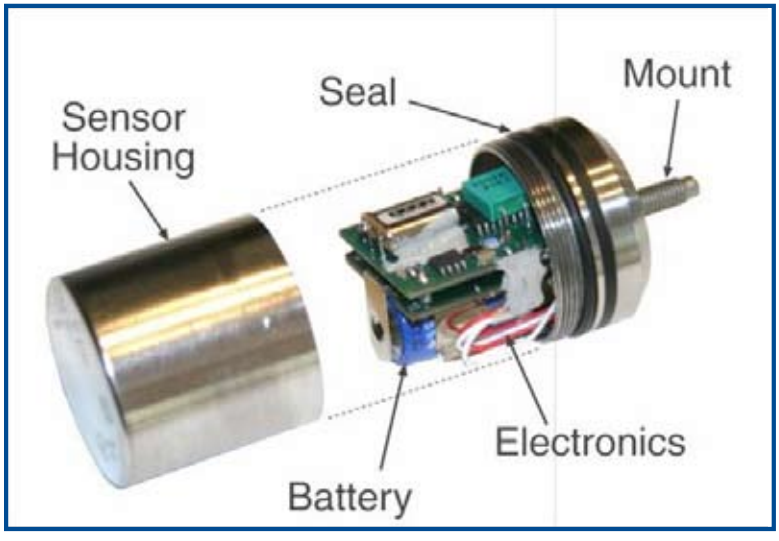
Distributed Wireless Multisensor Technologies

A Novel Approach to Reducing Motor Energy Usage

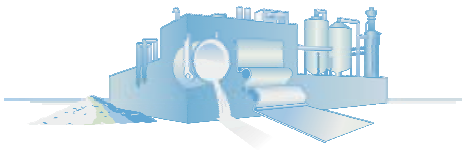
Motors consume an estimated 63% of all electricity used in industry. In an effort to reduce plant power consumption, sensors are often used to monitor the efficiency of motors used in industrial applications. Because sensors can constantly observe factors such as motor current, vibration, and temperature, they can quickly detect any degradation of performance and energy efficiency. This allows plants to quickly repair motors and benefit from a reduction in motor energy use.

However, deploying these sensors on electric motors is costly; therefore only critical or large motors (more than 1,000 hp) are currently worth outfitting with the technology. As a result, smaller motors are typically inspected manually and only periodically, if at all. This project, headed by GE Global Research, seeks to bring the benefits of continuous monitoring to smaller motors through the development of low-cost, distributed, multi-measurand, wireless sensors. By reducing the cost and complexity of sensor deployment, they anticipate that continuous monitoring will become pervasive, allowing industries to better maintain and improve the efficiency of their electric motor assets.

Key objectives of the effort include creating a reliable, robust wireless communications system and establishing a long-lasting device that can be obtained at a reasonable cost. In addition, researchers will examine issues that could prevent plant managers from adopting sensor technology, so that they can develop a wireless sensor platform that can be easily deployed and adopted by the customer. Project goals will be accomplished through a combination of site measurements and experiments, followed by statistical system performance modeling. Once the system is developed, researchers will assess its performance with on-site field testing.



Exploded view of a wireless sensor shows the compact electronics used to monitor motor performance indicators such as vibration and temperature.



Applications and Benefits

The establishment of this reliable, robust, and affordable wireless sensor technology is expected to:

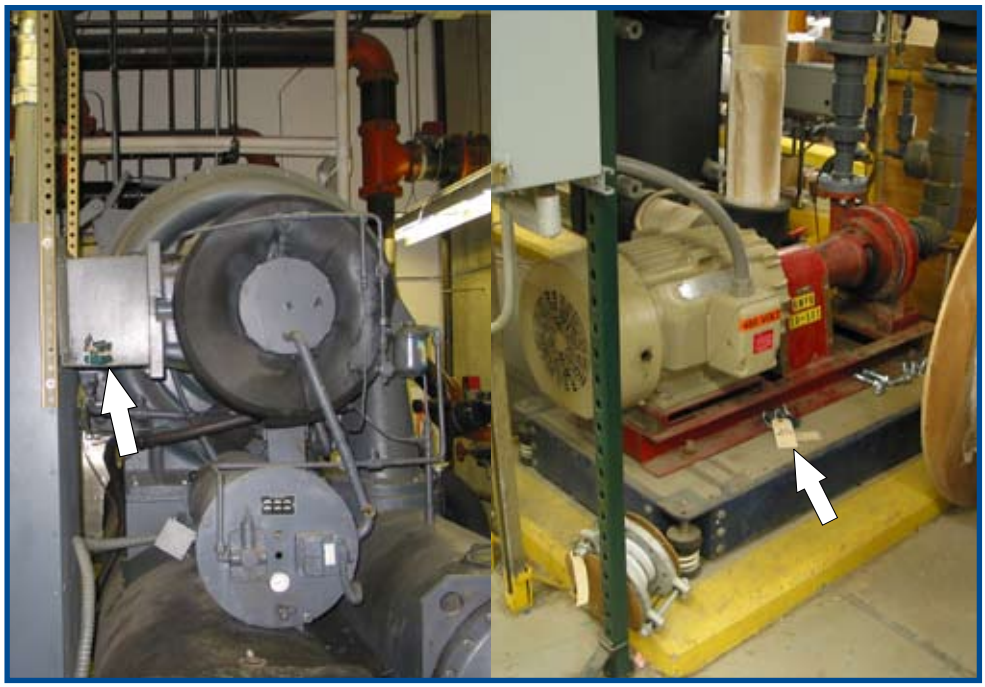
- Save an estimated 122 trillion Btu by 2020.
- Allow for continuous motor monitoring.
- Make practical the monitoring of smaller motors that have traditionally been overlooked.
- Allow industries to better maintain and improve the efficiency of their electric motor assets.

Project Plans and Progress

Project History: This project was awarded under the Sensors, Controls, and Automation Crosscutting Technologies solicitation. The award was signed in the spring of 2004.

The primary goal of this project is to develop an accurate, low-cost, and easy-to-install wireless sensor suite for motor monitoring. The first phases of this project are complete. The wireless technology has been demonstrated under controlled industrial conditions and further field testing is underway.

- Phase I: Researchers investigated high-risk aspects of the project and developed the technology required to reduce those risks.
- Phase II: The primary components were developed during this phase. They were integrated, tested, validated, and demonstrated in a controlled laboratory environment.
- Phase III: During this final phase, the project will focus on gaining field experience and supporting standards efforts required to promote large-scale adoption of the technology.



Prototype wireless sensors deployed on an industrial chiller (left) and pump (right). The sensors constantly monitor the equipment for motor faults that increase energy consumption.

Project Partners

GE Global Research (Lead organization)

Sensicast Systems, Inc.

Rensselaer Polytechnic Institute

Chevron Corporation

U.S. Department of Energy

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Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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