OSU wins start-up grant for industrial sensors lab

Research center expected to help with productivity

By David Lore
Dispatch Science Reporter

The federal government has given Ohio State University the green light to open a new $4.8 million industrial sensors research lab.

Sponsors, academic and industrial, say the lab will bring new talent to the campus and emerge as a unique, national center for improving productivity in industries such as auto, aerospace, metal processing and power production.

Sheikh Akbar, OSU professor of material sciences, said university officials were notified Monday of approval of a four-year, $1.2 million start-up grant by the National Science Foundation.

The state had earlier pledged $1.2 million for the project through the Edison technology centers program, he said.

The remaining $2.4 million is expected to come from industrial sponsors.

Richard Schorr, general manager of the Orton Ceramic Foundation in Westerville and chairman of the center advisory board, said a dozen participating companies have pledged $300,000 to the effort so far.

"By the end of 1996, I think we'll have 50 companies," he said. Industrial support, he said, could reach $1 million a year.

Beyond this basic funding, $3 million is being sought from the Ohio Board of Regents to build a testing facility at OSU and set up satellite labs at the University of Cincinnati, Ohio University and Case Western Reserve University, Akbar said.

The OSU center, he said, is tackling an important problem: how to accurately monitor conditions inside superheated equipment where ordinary sensors can't survive.

It's like trying to bake a pie when you're not sure whether the oven temperature is 300 or 350 degrees or somewhere in between, he said. "If you have a better sensor, you can operate right at 326 degrees and get a more consistent product."

Large industrial furnaces, boilers and heat-treating equipment, however, destroy today's best electronic sensors or distort their accuracy, he said.

This reduces the quality of products while increasing scrap and energy demands.

"There is no focused effort anywhere in the United States on this topic, although there may be research by individual companies," Schorr said.

John Easton, president of Sensotec Inc., said there are more than 20 companies now in central Ohio producing sensors.

It's an industry that nobody cared about 20 years ago, but now ranks near the top in terms of federal support for research and development, he said.

Akbar will be director of the new Center for Industrial Sensors and Measurements. The associate director will be Chung-Chium Liu from Case Western.

Researchers will be drawn from a number of disciplines, including engineering, physics and chemistry.

In addition, a tenured professorship in sensor materials has been approved and 14 graduate students are being recruited, Akbar said.

The center will open early next year in either Watts Hall or MacQuigg Lab on the central campus, he said.
Research lab opening at OSU next year

By Sam Bagby
Lantern staff writer

Environmental purity and industrial efficiency are two goals which may have been thought incompatible, but both will be pursued by the university's Center for Industrial Sensors and Measurements, a new industrial sensors research lab to be opened early next year.

Sheikh Akbar, the center's director and professor of material sciences at Ohio State, said the lab will concentrate its research in three areas: work on the basic science of sensor materials, development of specific sensors for specific industries, such as the automotive and aerospace industries, and develop and test prototypes (automotive engines, utility boilers, etc.).

The Columbus Dispatch reported that the lab will cost about $4.8 million. Funding will come from a variety of sources, including a four-year, $1.2 million grant from the National Science Foundation, $1.2 million from the state's Edison technology centers program and $2.4 million to be donated by corporate sponsors.

The university is asking the Ohio Board of Regents for $3 million to build a testing facility at OSU.

In any industrial process, the combustion that occurs produces some amount of noxious deadly gases like carbon monoxide, nitrous oxide and hydrocarbons, which pollute the earth in forms like acid rain and smog, he said.

However, developing better industrial sensors can effectively reduce the amount of gases released into the atmosphere, he said.

Sensors monitor which gaseous materials are produced and in what amounts, as well as what materials have not been used. They also monitor the temperatures at which a reaction occurs, Akbar said.

The engineer can take the sensor measurements and change the ratio of the reactants and temperature to create a more complete combustion. This reduces the level of poisonous gases released. The role of the sensor is as an "essential feedback control," he said.

One project will be the development of an onboard sensor in automobiles, which measures the level of noxious exhaust fumes from a car. If the sensors detect a high level of poisonous gas, they will alert the driver to a problem with the catalytic converter, which changes exhaust gases to less harmful substances, Akbar said.

The university is asking the Ohio Board of Regents for $3 million to build a testing facility at OSU.

The location of the new lab will be either in Watts Hall or MacQuigg Laboratory, he said.
Embargoed for release until Monday, April 1 (LO)

NSF NAMES OHIO STATE AS SITE FOR NEW CENTER TO STUDY SENSORS

COLUMBUS -- The Ohio State University has been selected as
the site for a new $5 million research center to study industrial
sensors. The center will be one of only three in the nation
formed this year under the National Science Foundation’s
State/Industry/University Cooperative Research Center program.

The NSF will give Ohio State $1.2 million over five years,
which must be matched by $1.2 million each from the state and
industry. State funding will come from the Ohio Department of
Development, the Ohio Board of Regents and the Edison Materials
Technology Center.

The university will work with researchers at Case Western
Reserve University in Cleveland on parts of the project, which
has already received $2.6 million in funds, equipment and
services from local and national companies.

"Partnerships such as these are an investment in our economy
and our country," said President E. Gordon Gee. "There is no
question that industry, the university, and the state of Ohio

--more--
will need to work together to meet the challenges of the future. And NSF support helps us do just that.”

The Center for Industrial Sensors and Measurements will officially open April 1, although research is already underway, said Sheikh Akbar, an associate professor of materials science and engineering and director of the new center. C.C. Liu, professor of chemical engineering at Case Western, will act as the center’s associate director.

“We will do research on sensors that could be used in hostile environments, such as industrial furnaces where temperatures exceed 1000 degrees Celsius,” he said. “This is an area that hasn’t been studied enough.”

About 15-20 percent of the research activity will be done at a facility at Case Western. Equipment there will allow researchers to fabricate certain types of sensor devices.

The bulk of the work will be done at Ohio State, including the study of sensors to detect a variety of substances that may be hazardous in an industrial environment, or which may cause equipment to run inefficiently. Sensors would detect the presence of carbon monoxide, oxygen, hydrocarbons, nitrogen oxide or other gases.

The center will also conduct laboratory and field tests of these sensors.

“We will study these sensors from the development stage to the actual application of the devices,” Akbar said.
Ohio State is one of three universities in the country to receive an NSF Cooperative Research Center grant. Also selected were the University of Arizona and the University of Southern Illinois. The addition of these NSF centers brings the total to 13 in the nation, each focusing on a different but critical technology.

The new center will include faculty members from each of several departments, including physics, chemistry, electrical and mechanical engineering, and materials science and engineering. In addition, 13 graduate students and three post-doctoral researchers will work with the center.

Another researcher will be hired with funding from a grant from Ohio State’s Center for Materials Research through the CMR Scholars II program.

Research will be done in labs in different departments, although the university will provide a central headquarters for the center.

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Contact: Sheikh Akbar, (614) 292-6725
Written by Kelli Whitlock, (614) 292-9475
CISM, a National Science Foundation State-Industry-University Cooperative Research Center for Industrial Sensors and Measurements is a one-of-a-kind national facility created to satisfy the need for continuing sensor research in industrial processes. In partnership with the National Science Foundation, Ohio Department of Development, Ohio Board of Regents, Edison Materials Technology Center, Ohio Aerospace Institute, Edison Sensor Technology Center, Case Western Reserve University, Ohio State University College of Engineering, College of Mathematical and Physical Sciences, Department of Chemistry, Department of Physics, Department of Materials Science and Engineering, Electrical Engineering, Mechanical Engineering, Aerospace Engineering, Chemical Engineering and industry, we enthusiastically anticipate forthcoming projects and proposals that meet industry needs through development and application of new sensor technologies.

CISM exists to stimulate business development related to sensor manufacturing and process measurement applications by linking industry measurement needs with development and application of new sensor technologies, by expanding existing sensor technology through research addressing industry needs and by educating and preparing students for a workplace increasingly dependent on sensor technology.

CISM focuses on high-temperature ceramic sensors for in-situ monitoring of industrial processes and products, targeting research efforts toward specific ceramic-based sensors including high-temperature thermistors and gas sensors for the monitoring of carbon monoxide (CO), nitrogen oxides (NOx), hydrocarbons (HCs), carbon dioxide (CO2), hydrogen (H2) and oxygen. Extensive field tests of prototype CO and NOx sensors and thermistors are being conducted in automotive engines and in combustion burner rigs.

Research initiatives are guided by the Industrial Advisory Board (IAB): sponsors who financially support CISM. The IAB identifies application needs and requirements for sensor and measurement technology, with a focus on the generic requirements for industrial measurements.

The Technical Steering Committee consists of members of the IAB and representatives from NASA/ Lewis Research Center, Wright-Patterson Air Force Base, and the Ohio Aerospace Institute.

Research on ceramic sensors at OSU over the past several years represents a pioneering initiative and forms the foundation for future work. Efforts have resulted in the B.F. Goodrich Collegiate Inventors Award, a patent on carbon monoxide and hydrogen sensors, and a patent pending on a high-temperature thermistor for monitoring temperatures beyond the capabilities of present day thermocouples.

These technological breakthroughs have led to major multidisciplinary initiatives showing tremendous potential for growth. CISM's future research will expand into the areas of biosensors, magnetic sensors, mechanical and physical sensors, and optical sensors.

### Core Program Tasks

- **Fundamentals**
  - Novel Synthesis
  - Microstructure Characterization
  - Electrical Characterization/Modeling
  - Reaction Mechanism
- **Specific Sensors**
  - Gas sensors: CO, CO2, H2, NOx, O3, Hydrocarbons
  - Automotive/Heat-Treating/Utility/Aerospace/Glass/Primary Metal Processing
- **Device/Prototype**
  - High-Temperature Thermistor
  - Aerospace/Heat-Treating/Glass/Primary Metal Processing
  - Fabrication
  - Field Test

Opportunities exist for many other non-core sensor related R&D leading to technology development and commercialization. Non-core project contractual agreements provide proprietary data covenants and intellectual property considerations.
Responding To The Need

You’ve told us your sensor measurement needs should address manufacturing and product improvements. That you wanted higher productivity and reduced waste; improved process control and application of artificial intelligence. Moreover, you asked for energy efficiency and reduced pollutants, ruggedness and durability as well as affordable costs.

Participation by CISM members varies with the expectation that the benefits will encourage long-term participation. Some companies may be primarily interested in the application of sensor and measurement technology for industrial processing, or in improved monitoring of the performance of their products. Other participants are more interested in the development of new measurement or sensor products based on CISM emerging technologies.

CISM industry participants address these needs and others by becoming members of industry teams working with faculty responsible for core and non-core research projects. IAB companies participate in technology transfer establishing research direction and evaluating results. Faculty researchers work with sponsors at the industry location, resulting in better understanding of industrial sensing needs.

how may you benefit from . . .

- Direct access to CISM sensors and measurements data for industry applications
- Two quarterly sensor newsletters (CISM and Japanese)
- Relevant patent literature
- Pertinent sensor articles summary
- Core research project technical reports
- Annual conference
- Seminars and workshops organized around member interests
- Access to over $5M sensors research data performed under the core program
- Participation in commercialization of sensor technology developed within CISM
- Sponsor proprietary non-core research
- Networking with companies having similar interests
- Consultation visits and technical information including partnering for SBIR program
- Technical staff and facilities for solving sensor technology research problems in industrial processing applications
- Access to CISM research facilities

applying for membership!

developing sensors for tomorrow's technology

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