



Innovative Partnerships Program

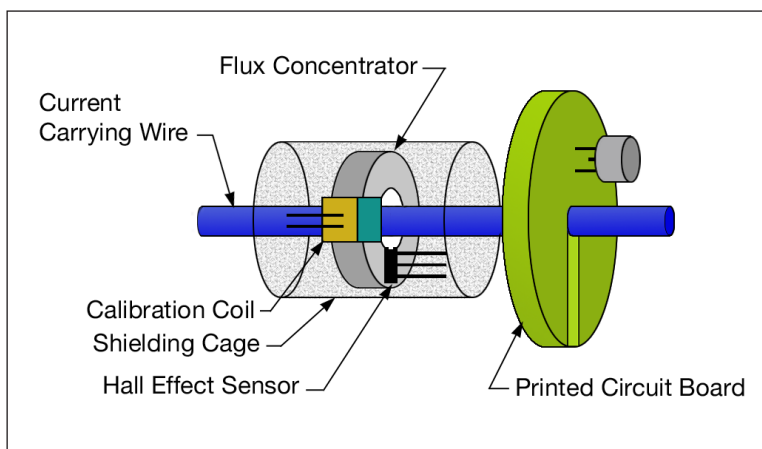
Smart Current Signature Sensor

Objective

The Smart Current Signature Sensor and software were designed and developed to be utilized on any application using solenoid valves. The system monitors the electrical and mechanical health of solenoids by comparing the electrical current profile of each solenoid actuation to a typical current profile and reporting deviation from its learned behavior. The objective of the partnership between NASA and Graftel Inc. is to develop the technology into a handheld testing device for their customer base in the nuclear power industry. Initially, under an exclusive license agreement, Graftel will develop several working units to present to customers. The device will be used to perform diagnostic testing on electromechanical valves used in nuclear power plants.

Technology Advantages

The Smart Current Signature Sensor learns from good solenoid valves and reports deviation from its learned behavior. Software running in the microprocessor analyzes the incoming data (recorded valve current signature) and determines the state of the valve: energized, de-energized, or transitioning. It is primarily during the transition phase when the software identifies key features in the current signature and determines the “health” of the valve. Innovative software techniques are used to identify the following features: the time the valve began transitioning, the time of maximum change in current inrush or outrush, the time poppet movement begins, the amplitude of the current required to initiate poppet movement, the time required for the poppet to travel to and seat in its final position, the time energizing current reaches steady state, the amplitude of the energizing current, the minimum required holding current before the poppet unseats, and the time required for the poppet to unseat. From this data, the general health of the valve can be determined.



Commercial Partner

Graftel Inc. is an engineering firm providing support, instrumentation, and calibration services to the nuclear community and private sector for over 10 years. For the nuclear power industry, Graftel designs, manufactures, and calibrates a full line of testing instrumentation. Graftel's smart sensors have been in use in the United States since 1993 and have proven to decrease set-up time and test durations.

Approach

Under an exclusive field-of-use license, Graftel will identify a specific customer base for application of the products made using the Smart Current Signature Sensor technology. They will develop handheld sensor units and demonstrate their effectiveness to customers in the nuclear power industry. Upon acceptance, the products and/or testing services using the products will be sold to the customers, allowing them to validate that valves in their power plants are open or closed and operating correctly.

NASA Benefits

- The Smart Current Signature Sensor was designed and developed to be utilized by the Space Shuttle program on its ground support equipment and vehicle valves.
- The sensor was designed with such flexibility that it could be utilized on any application using solenoid valves.
- The system learns from good solenoid valves and reports deviation from its learned behavior. Therefore, it is suitable for any aerospace application.

IPP Role

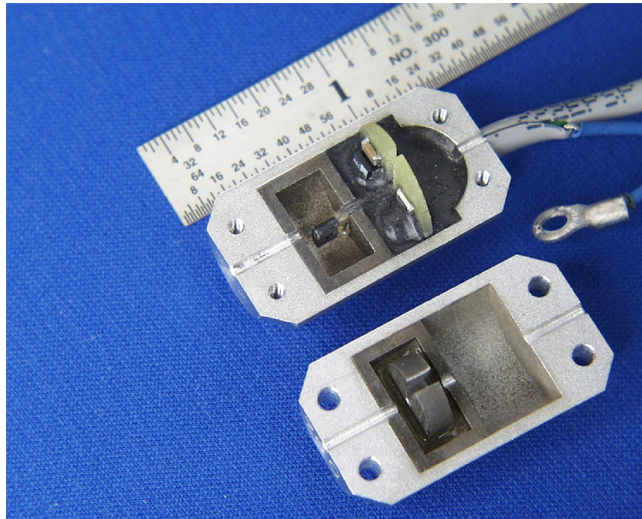
- NASA /KSC IPP applied for a U.S. Patent on the Smart Current Signature Sensor.
- Innovators presented the technology at the Sensors Symposium in 2002.
- NASA/KSC IPP marketed the technology to industry in 2003.
- Graftel contacted NASA/KSC IPP to discuss the possibility of licensing the Smart Current Signature Sensor but was unable to pursue in 2003.
- Graftel contacted NASA/KSC IPP in 2008 with renewed interest in licensing the technology for use in the nuclear power industry and submitted an application.
- An exclusive license was signed with Graftel for marketing the technology to the nuclear power industry.

Status

Exclusive Field-of-Use License (Nuclear Industry)

Point of Contact

Jim Nichols
Innovative Partnerships Program
Mail Code: KT-A2
Kennedy Space Center, FL 32899
Telephone: 321.867.6384
Fax: 321.867.2050
E-mail: James.D.Nichols@nasa.gov
Web Site: <http://technology.ksc.nasa.gov>



National Aeronautics and Space Administration
John F. Kennedy Space Center, FL

www.ksc.nasa.gov