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Researcher Develops Tools for Operational Excellence in Alberta's Key Industries.

Provincial, federal and industry funding combined to support research in computer process control.

Calgary, Alberta – \$2.5M in funding announced today recognizes the continued success of Dr Sirish Shah, NSERC-Matrikon-Suncor-iCORE Senior Industrial Research Chair in Computer Process Control. With process control performance becoming a cornerstone of operational excellence in Canada's refining, petrochemicals, pulp and paper and mineral processing industry, Dr Shah's research has had a direct and widespread impact on monitoring and maintenance applications in industry.

In Alberta, Dr Shah has been able to find in an environment that is a model for successful technology transfer and development – a unique tri-partite partnership between industry, university, and application developers working synergistically to deliver solutions to specific industrial problems.

Along with funding from iCORE and NSERC, and the research environment at the University of Alberta, Dr Shah is able to leverage two industrial partners, Suncor and Matrikon. The systems and methods used by Suncor provide ongoing and interactive access to process data analysis challenges, while Matrikon will partner to commercialize the information-based, decision support system. In addition, Dr Shah's research will train many graduate students - highly qualified people needed for university research and Alberta industry.

"Few organizations or institutions are able to fully utilize the information that is embedded in the data that they save and archive each day. Yet they have invested millions to measure and archive this data. The tools that our research has developed, and continues to develop allow one to convert data into useful information easily," explains Dr Shah. "It is futile to swim in an ocean of data without proper floatation aids. You can easily get overwhelmed by the torrent of data that comes like a tidal wave. The solution is to be armed with tools that can sort and facilitate the data mining exercise."

The new investment in Dr Shah's research and development will continue the work supported by NSERC, Matrikon and the Alberta Science and Research Authority (ASRA) since 2001. In the renewed phase of the industrial research chair program, Dr Shah has received \$1M from NSERC, \$1M from industry partners and \$0.5M from iCORE. In addition to funding dollars, substantial in-kind contributions will be made to the project by various partners and the University of Alberta.

For more information, visit www.icore.ca

- 30 -

Editor's Note: See attached backgrounder for more information.

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Dr Sirish Shah

Computer Process Control

Research Program Overview

Process control performance is a cornerstone of operational excellence in Canada's refining, petrochemicals, pulp and paper and mineral processing industry. Control performance assessment and monitoring applications have become mainstream in these industries and are changing the maintenance methodology surrounding control assets from predictive to condition based. The large numbers of these assets on most sites compared to the number of maintenance and control personnel have made monitoring and diagnosing control problems challenging. Identifying specific control issues on a plant-wide basis and their root-causes is analogous to looking for a needle in a haystack. In the typical process industry, operators are responsible for monitoring several hundreds or even thousands of control loops. With such a wide span-of-control, operator responsibility forces them to work in an "alarm-driven" mode, principally depending on computerized systems to inform them of problems when or after they occur. A majority of such unexpected disruptions are due to common faults such as sensor/actuator failures, sticky control valves, plugged lines, compressor imbalance, fouled heat exchangers etc. Such common faults render the most sophisticated advanced control strategies useless with the result that benefits due to reduced energy expenditure and reduced quality variance may not accrue.

The main objective in this NSERC-Matrikon-Suncor- iCORE supported Industrial Research Chair project is to continue the development and evaluation of tools, based on fundamental multivariate statistical techniques in the temporal and spectral domains, for effective process and performance monitoring strategies. An equally important objective is to demonstrate the utility of these tools in the Canadian process industry. The end goal is to develop practical tools that industrial personnel can use for knowledge discovery from process data and use them effectively towards process and performance monitoring. The support from our industrial partners, Matrikon and Suncor, is the key towards demonstrating the utility and practicality of the tools that we have developed and are planning to develop.

The underlying philosophy in data mining is based on the following reasoning: through analytical relationships (e.g. material and energy balances) as well as often unknown or non-analytical relationships and physical redundancies in process design (e.g. through duplication of sensors) all pertinent data is somehow correlated. The natural question that arises is the following: Can the correlation structure between different variables be identified and then used to discern the relationships (static and/or dynamic) that exists between sensor-based and/or computed data and thus provide a valuable insight in the workings of a process? More specifically, can the data be used for fault detection and isolation? Can the data be used to 'map' a dynamic or steady state model of the process? Can this information be used for detecting abnormal operating conditions (i.e. fault detection and isolation).

Higher level control is not the only vehicle for improving plant productivity and reducing operational costs. A recent study conducted in the US indicates that unexpected disruptions to normal operations are estimated to cost the U.S. economy at least \$20 Billion per year in the petrochemical industry alone. These problems do not only afflict the petrochemical industry. They are prevalent in a broad spectrum of process industries ranging from pulp and paper to the metallurgical operations. For example, in the pulp and paper industry, sheet breaks occur frequently as a result of common faults. More often than not such faults can be avoided if preventative and early fault detection and diagnosis systems, such as the ones being conceived and developed in this research, are implemented. Few organizations or institutions are able to fully utilize the information that is embedded in the data that they save and archive each day. Yet they have invested millions to measure and archive this data. The tools that our research has developed and continues to develop allow one to convert data into useful information easily.

Biographical Information

Dr Shah completed his undergraduate and master's work in the UK, prior to completing his PhD at the University of Alberta. Since his appointment in 2001, Dr Shah has worked to establish a centre of research excellence in Intelligent Systems and Control. He has held visiting appointments at Oxford University and Balliol College as a SERC fellow in 1985-86 and at Kumamoto University, Japan as a senior research fellow of the Japan Society for the Promotion of Science (JSPS) in 1994, and at the University of Newcastle, Australia in 2004. Dr Shah has also held consulting appointments with a wide variety of process Industries and has also taught many industrial courses.

About iCORE (Informatics Circle of Research Excellence)

iCORE invests in people – the highest caliber research scientists who work on fundamental and applied problems in informatics. It operates several grant programs to develop iCORE Chairs at Alberta universities, around which world-class research teams are developed. Since its inception, more than 20 research chairs have been established to focus on emerging areas such as wireless communications, artificial intelligence, and quantum and nanocomputing. For more information, visit www.icore.ca

About NSERC (Natural Sciences and Engineering Research Council of Canada)

NSERC is a federal agency whose role is to make investments in people, discovery and innovation for the benefit of all Canadians. The agency supports some 22,000 university students and postdoctoral fellows in their advanced studies. NSERC promotes discovery by funding more than 10,000 university professors every year and fosters innovation by encouraging more than 800 Canadian companies to participate and invest in university research projects. For more information, visit www.nserc.gc.ca

About University of Alberta

The University of Alberta's Faculty of Engineering is among North America's leading engineering research and teaching centres with 4,300 students, 30 research chairs, \$73 million in annual research activity, over 120 new professors, several new buildings, and outstanding facilities. Visit www.engineering.ualberta.ca for further information.

About Suncor

Suncor Energy Inc. is an integrated energy company headquartered in Calgary, Alberta. Suncor's oil sands business, located near Fort McMurray, Alberta, extracts and upgrades oil sands and markets refinery feedstock and diesel fuel, while operations throughout western Canada produce natural gas. Suncor operates a refining and marketing business in Ontario with retail distribution under the Sunoco brand. U.S.A. downstream assets include pipeline and refining operations in Colorado and Wyoming and retail sales in the Denver area under the Phillips 66® brand. Suncor's common shares (symbol: SU) are listed on the Toronto and New York stock exchanges.

Suncor Energy (U.S.A.) Inc. is an authorized licensee of the Phillips 66® brand and marks in the state of Colorado. Sunoco in Canada is separate and unrelated to Sunoco in the United States, which is owned by Sunoco, Inc. of Philadelphia.

For more information, visit www.suncor.com

About Matrikon

Matrikon is a leading provider of industrial intelligence solutions that enable manufacturing plants to achieve operational excellence by transforming production data into knowledge to predict and prevent problems and optimize operations. Matrikon's customers achieve agile operations through the combination of external market and plant data to make informed, intelligent decisions in real-time. With offices in major cities throughout North America, Australia, Europe and the Middle East and a global client base including industry leaders in a wide range of process industries, Matrikon's reach is global. For more information, visit www.matrikon.ca