Students monitor Syncrude system via smartphones

By Dave Cooper, Edmonton Journal May 22, 2012

Queen's University student Ed Koush holds one of the sensor nodes. The iPhone display shows the condition of each node, and can be viewed on a secure website.

Photograph by: John Lucas, Edmonton Journal, Edmonton Journal

A new system for detecting wear in Syncrude Canada's tungsten-topped vibrating screens - critical to the transport of raw oilsands in a slurry system called hydrotransport - could save the firm millions of dollars in premature replacements and shutdowns.

But the clever technology, in which nodes the size of a quarter are combined with specially designed plug-in sensors that measure thickness and then communicate as a network, has a lot of potential in a wide variety of other areas, everything from wildlife studies to forest-fire tracking and smart grid electricity monitoring.

"Most of the work is not to build this little thing (the node), but the communication between all these little nodes and the (computer) brain, and how it would work in harsh environments," said Khaled Obaia, head of Syncrude's condition monitoring project.

Obaia went in search of a solution four years ago, and presented the challenge to contacts at Queen's University in Kingston, Ont., where an international team of PhD-candidate engineers was considering job options.

Syncrude's laboratory in Edmonton's Research Park is a major funder of oilsands-related research in many Canadian universities, and even some in other countries.

"We had the problems and the money, they have the resources and the brains, so I thought let's marry them together," Obaia added.

The result was a four-year-long project supported by $300,000 from Syncrude and almost $400,000 in federal research funding. And enough challenging work for six PhD students at Queen's.

Last week, Abdulmonem Rashwan, originally from Kuwait University, and Ed Koush, originally from the University of Florida, were put-ting the finishing touches on their equipment before heading back to Ontario.

"I wanted to do work on equipment for harsh environments, and I never even knew about the oilsands and had never been to Canada before," Koush said.

But his PhD supervisor had contacts at Queen's and learned of the Syncrude project. Koush designed and manufactured the sensor nodes that obtain the ultrasound readings from the steel and tungsten - data that are sent wirelessly to Rashwan's computer, a base station in a weatherproof container.

"My work in robotics has been a real benefit in the network part of this project," said Rashwan, who receives and stores data from the sensors, where they can be plotted and displayed as a graphical interface.

This can be viewed from a web-site designed for viewing by mobile devices.

So the duo and the rest of the team will be watching from Ontario on their smartphones or iPads this month when Syncrude goes live with its new monitoring system on the array of 24 screens.

Each unit ensures only ore chunks of a certain size are sent into Syn-crude's hydrotransport system. The screens, worth about $25,000 each, wear at different rates. And a shutdown, which can last all day, is needed to inspect the screens.

Units are often replaced prematurely as a precaution to avoid the chance of an unplanned shutdown. The students say the key to the new system is routing where information hops between sensors. And if one fails, the information finds a new route around the gap.

With a range of 400 metres, they could be used throughout forests, for example, and be connected to temperature, flame or light sensors, providing immediate and accurate information about the progression of a fire or pre-fire conditions, for example.

Used with smart grids, they can measure voltage on various electrical lines. And in wildlife studies, the tiny sensors could allow scientists to follow small animals the way they now follow large ones - such as bears and caribou, which can carry the large units now used.

"This technology has a lot of potential in many areas," Obaia said.