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City scientist sheds new light on problem



A fibre optic probe carrying near infrared light is placed on a wire insulation to scan and identify the plastic material.

Hormoz Azizian is looking forward to the day when a simple household appliance will help control North America's widespread obesity problem. And the Mississauga entrepreneur intends to be instrumental in putting them there.

Azizian is the president of NIR Technologies Inc., which specializes in the non-destructive identification of materials and quality control using near infrared laser light technology. After working as a Senior Research Scientist at Ontario Power Generation Inc. (formerly Ontario Hydro) for 14 years, he struck out on his own early this year to pursue further research and develop commercial applications for near infrared laser light technology.

Azizian believes that if a simple and direct technique to determine accurately the fat content of the body was developed, the body fat content measurements could become routine tests in health clubs, fitness clubs, and sports. Doctors could also use the technique to control a patient's diet. Right now, he says, we can accurately determine the fat content of dairy products because we can adjust the fat content and conduct the measurements. The challenge for the body fat content measurements is to develop spectral models that closely resemble the fat content of the body and eliminate the impractical requirement of adjusting the body fat content. Azizian thinks that such a solution is well within our grasp.

"I wouldn't be surprised," he says, "if in the future, with the advancements in instrumentation and computers, that the NIR technology would become a household appliance just like microwaves to monitor the type of food you eat."

But NIR Technologies is about much more than replacing fat farms. A Ph.D. graduate in Organometallic chemistry in 1980 from Sussex University, U.K., the company's

founder has a track record of developing practical uses for innovative technologies. While at OPG, he was responsible, as project leader, for the development of several technologies including a non-destructive, portable and cost-effective cable insulation identification technology used in nuclear power plants and a Portable Moisture and Saturation Analyzer for insulating oils in electrical equipment. Prior to that, Azizian jointly developed a polymer modification process at the University of Waterloo with Professor Gary Rempel for Polysar Limited which was patented worldwide and received the gold award for innovation from the Government of Canada in 1987.

Azizian started his NIR research in 1994 when his nuclear customers at Ontario Hydro, Nuclear Services Division challenged him to undertake research in developing a non-destructive technique for the identification and monitoring of aging in cable insulation due to thermal and nuclear effects in nuclear power plants. In early 1999, a NIR spectral identification model using NIR technology was developed for use in the identification of over 10,000 cable insulation installations in several power plants. Significant savings in millions of dollars were attributed to the use of this technology.

What exactly is near infrared spectroscopy? In simple terms, a near infrared light is pointed at a sample using a fibre optic probe and the reflected signal is processed for absorption or reflectance characteristics. In other words, a chemical fingerprint is taken of a material using infrared light at a specific point in time. In spectroscopic terms, NIR means the measurement of the wavelength and intensities of the absorption of near infrared light by a sample. The absorption or reflectance spectrum is directly proportional to the chemical composition of the sample. In economical terms, near infrared means fast, accurate, reliable, cost-effective and non-destructive measurements for identification of materials and quality control.

NIR Technologies Inc. has extensive capabilities to help develop and implement research and development projects on a company's behalf. The experienced technical staff at NIR Technologies Inc. can work jointly with a corporation's scientists and engineers to develop and execute a complete research and development plan through its successive stages of planning, initiation, testing, experimentation and validation through to its final implementation.

NIR is also currently pursuing research and development activities on its own in several diverse fields:

- Herbal medicine - the identification of cholesterol reducing herbs and the investigation of the similarities in their chemical composition is one example of our current projects in this area.
- Petroleum products - the identification of different greases for quality control and commercial grade dedication at nuclear power plants.
- Cable condition monitoring - thermal and irradiation aging of cable insulation such as polyvinyl chloride(PVC), ethylene propylene rubber (EPR), cross linked polyethylene (XLPE).
- Development of new advanced fiber optic probes to be used in the identification of black materials.
- Development of an NIR plastics identification library.

Near infrared laser light technology can also be used for quality assurance and quality control in a variety of industries, and NIR Technology Inc. offers a technical consulting service to help customers maintain consistently high standards.

NIR's president is a firm believer in customer service values. He developed that belief

from his early days at University of Waterloo working on an industrial contract. "To be responsive to our customer's needs is our goal at NIR Technologies Inc.," says Azizian. "The size of our company reflects our ability to tune into the specific needs and concerns of our customers." He feels that this is the only way to solve their technological problems.

At the same time, the single father of two claims that the NIR technology is so simple that last year he helped his younger daughter, Nicole, scan two different plastic materials for her Brownie science badge. She was able to explain the differences in two materials shown by the NIR spectra.

The budding entrepreneur, who still plays soccer with his old colleagues in the OPG summer soccer league, is excited and enthusiastic about the future of NIR Technology. He believes it has an immense potential that could find applications across all industries - chemical, pharmaceutical, food, plastics and medical.

NIR has just completed an identification study of three non-metallic material (o-rings, greases, and cable insulation) to be presented at the Fifth CNS International Conference on CANDU Maintenance organized by Canadian Nuclear Society.

Two other research projects that are on the go include NIR spectral identification of hops used in beer manufacturing and the aforementioned non-destructive and direct measurements of body fat content.

And this is just the beginning, according to Azizian, who points to a medical article that recently appeared in The Daily Telegraph which refers to Dr. McCoy of the old Star Trek television series who is frequently seen waving a gadget over a prostate patient and instantly rendering a diagnosis.

Now, says the article, a medical physicist at University College London is actually developing such a device. Professor David Delpy says: "Given developments in computing, allied to the ability of near infrared light to distinguish the absorption arising from different molecules in the body, we may yet see the day when, like Dr. McCoy, the doctor merely waves a machine with flashing lights over the patient to make an instant diagnosis."

Hormoz Azizian and NIR Technologies Inc. intend to be at the forefront in making today's science fiction into reality.