



Professional Engineers  
Ontario

# ENGINEERING DIMENSIONS

NOVEMBER/DECEMBER 2015

## Materials Engineering

The basis of...everything

PM 40063309

# MATERIALS OPTIMIZATION

## THE ESSENCE OF

## INTEGRAN'S WORK

**M**ississauga-based Integran Technologies Inc. has won numerous awards and patents since its founding in 1999 for its many contributions to the advancement of materials science and engineering in Canada.

Most of the new materials it has brought to market over the last 16 years benefit the aerospace, nuclear and defence industries, but it's the company's work with a new-generation hockey stick that is bringing it more recent attention.

In an application of its patented Nanovate technology, which serves to make composite parts stronger and more durable, Integran was instrumental in developing the new Colt brand hockey stick now used by some elite National Hockey League players.



Although not a part of its core business line, the stronger, more durable Colt hockey stick developed by Integran Technologies demonstrates many of the product enhancements made possible with its patented Nanovate technology.

Incorporating greater strength and energy into the stick shaft, the Colt gives hockey players more speed and power in their shooting—all the while reducing the chance of a dreaded mid-shaft breakage that occurs with other composite hockey sticks.

Earlier, Integran applied its Nanovate technology to the production of hybrid golf club shafts, which, like hockey sticks, put more energy into a golfer's swing.

Though it's a small part of Integran's extensive line of commercial products, the hockey stick and golf club experiences demonstrate the tremendous versatility inherent in materials engineering.

"It's all about materials optimization and development of hybrid structures," says Integran President and CEO Gino Palumbo, PhD, a graduate of U of T's materials science and engineering program.

"Effective materials engineering can only be executed using a multi-disciplinary approach involving a broad range of engineering, such as chemical, mechanical, metallurgical, industrial and electrical, and by involving such areas as solid state physics, electro-chemistry, business and related disciplines."

Armed with his materials engineering training, and 20 years' experience in the nuclear side of the former Ontario Hydro (now Ontario Power Generation), Palumbo saw Integran as an opportunity to take the benefits of materials development in multiple new directions.

Integran bills itself as a metallurgical nanotechnology company whose technologies focus on the engineering of the internal structure

of materials on a near-atomic scale to yield "super materials" that meet exacting performance requirements of new products.

The company's core technologies grew from innovative multi-disciplinary research and development carried out at Ontario Hydro's research division in the 1990s. This research was conducted in collaboration with researchers at Queen's University and U of T. The company to this day maintains its strong collaboration with U of T.

In many ways, Palumbo and Integran represent the best of materials engineering and its impact on the development of stronger, more resilient and generally enhanced products across a wide spectrum.

A small souvenir Integran staff offer to guests and visitors—a ping pong ball coated with the company's high-strength Nanovate material (thus rendering it practically indestructible)—makes a simple but convincing statement as to what can be achieved by the careful selection and manipulation of materials.

"One of our core competencies is our ability to design, engineer and manufacture ground-breaking new products based on combining very high strength (nano) metals with polymers and carbon fibre composite materials," says Jonathan McCrea, PhD, P.Eng., Integran's vice president of technology. "These hybrid structures deliver unique properties not achievable with monolithic designs. A good example of this is the Colt hockey stick."

Integran holds one of the first patents in nanotechnology with its work on the Electrosleeve process for repairing CANDU reactors and is now widely used to extend the life span of generators in nuclear power plants.

Because much of Integran's core business involves defense and military industries, the company is limited in how it describes its unique technology. Despite the confidential nature of some of its processes, however, Integran is quite open about its position as a leader in metallurgical nanotechnologies. It is motivated to continually develop lighter, better and cheaper products based on its Nanovate nano-crystalline metal platform.

Not surprisingly, the company's archives are filled with reports of its successes in materials innovation. "We're not a commodity materials producer or supplier, but rather a true materials engineering company," McCrea adds. "We serve leading organizations where advanced materials drive competitive advantage or where existing material solutions fall short. Global 500 companies in aerospace, defense, biomedical and heavy industries turn to us for materials innovations. Our collaborations deliver value by enabling new products, weight savings, cost competitiveness and reduced environmental footprints." Σ