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Nanotech could put a new spin on sports

By Kevin Maney

Sometime in 2005, start-up company NanoDynamics plans to sell a nanotech golf ball that promises to dramatically reduce hooks and slices for even the most frustrated of weekend golfers.

That will be a hint of the future of sports.

NanoDynamics says it's figured out how to alter the materials in a golf ball at the molecular level so the weight inside shifts less as the ball spins. The less it shifts, the straighter even a badly hit ball will go.

"It's all about controlling the physics of how the ball spins," says CEO Keith Blakely.

Nanotechnology — engineering on a scale of individual atoms — is a way to make new materials, or to improve properties of existing materials. Its uses range from medical devices to car paint. And in the past, any shift in materials science has eventually altered sports.

Think of tennis rackets. Until a few decades ago, they were made of wood. Wilson figured out how to make a metal racket and in 1967 introduced the breakthrough T2000. By 1980, high-end rackets were made of graphite. As the materials got stiffer and lighter, the game began to favor speed and power serves.

Think, too, of aluminum baseball bats, composite skis, plastic (instead of leather) football helmets and AstroTurf. All emerged from new materials and changed their games.

Now it's nanotech's turn. The science is still young, and so far only a few nanotech-based sports products have hit the market. A Japanese company makes a bowling ball that supposedly won't get surface nicks yet sticks to the center of the lane the same as traditional balls. Wilson uses nanotech to make tennis balls that deflate less quickly, and several companies are working on nanotech golf clubs. A French company makes a nano-engineered tennis racket.

Much more will come.

Nanotechnology can make material stronger and lighter than ever — "and sporting goods is all about 'stronger and lighter,' " says Bob Thurman, director of research for Wilson Global Golf. Nanotech will eventually make better-performing yacht racing masts, hockey sticks, vaulting poles, softball bats, golf clubs and tennis rackets. The technology will help make lighter racing bikes and Indy cars.

Eventually, nanotech could produce some truly exotic sports products. Nanosys, one of the most successful nanotech companies, has come up with a nano-engineered coating far slicker than Teflon. Water literally bounces off it. Today, Nanosys is working only on industrial uses for the coating. But if the coating could be made to cover one of those all-body swimsuits, a swimmer might practically skim across the pool.

Nanotechnology comes of age

Nanotechnology has been an area of serious research in university and industrial labs for more than a decade. Over the past few years, nanotech start-ups have begun to dot the business landscape. Some of the first products have reached the market — mostly industrial uses, such as car paint that adheres better.

Like "atomic" in the 1950s, "micro" in the 1980s and the ".com" suffix in the 1990s, "nano" is becoming a hot new label. Companies use it in their names — Nanosys, NanoDynamics. Marketers are starting to throw it on products.

It's a broad term. Nanotech can refer to anything engineered down to the nanometer. A nanometer is one-billionth of a meter, which is only three to five atoms across.

Nanotech is being used to make tiny lenses in optical switches to redirect light from one fiber-optic cable into another. It's emerging as a way to make solar panels that are far more efficient than any current technology. One company, Nano-Tex, has engineered cotton fibers so they resist water yet still feel like cotton. Eddie Bauer now sells the company's Nano-Care khakis.

Sports gear could be four times better

Sports seems to be nanotech's next frontier. One hot area of interest is in carbon nanotubes — an engineered matrix of carbon molecules that creates a substance up to 100 times stronger than steel, at one-

sixth the weight. Nanotubes are the next leap up the trajectory that went from wood to metal or fiberglass and then to graphite — every step getting lighter, stronger and less likely to break.

"It's amazing in sports how much just incremental increases in performance can mean," says Jim Von Ehr, CEO of nanotech company Zyvex. Sports equipment makers are happy when a product is 10% to 20% better; nano-materials can make some items perhaps four times better, he says.

That might not sit well with sports governing bodies, which in the past have restricted some new technologies because of concerns about how the sport and its records might be altered. For instance, Major League Baseball doesn't allow aluminum bats.

Some tennis experts, such as former star John McEnroe, argue that modern rackets have ruined the game by making men's serves almost impossible to return.

Sporting goods experts say a carbon nanotube racket could boost serve speeds significantly higher yet.

Big impact in sports still a ways off

There hasn't yet been a flood of nanotech sports products because the technology is still expensive and difficult. Plus, sports marketers are still trying to figure out how to pitch nanotech products and how much demand there will be from sports enthusiasts.

"Nanotech's now just not sexy enough," says Wilson's Thurman. A nanotech club or racket probably wouldn't look much different from ones made of graphite. "Going from a wood racket to metal — that's sexy," Thurman adds. "Visible technology is key in sporting goods."

The size of the nanotech sports product market so far is negligible — so small that none of the better-known nanotech watchers have bothered to measure it. Nanotech in general is just emerging as an industrial force. In 2004, \$13 billion worth of products will incorporate nanotechnology, less than 0.1% of global output, according to the NanoBusiness Alliance trade group. But by 2014, that figure is expected to rise to \$2.6 trillion, or 15% of that year's manufacturing output.

Yet at this early stage, a number of nanotech sports products are poking into the market.

•**Golf.** Wilson is using a nano-composite material to replace the titanium crown on the Wilson Staff Driver. That makes the top part of the driver lighter, lowering the center of gravity — which helps the golfer achieve more power and accuracy, Wilson says. The company is also using nanotech to strengthen golf shafts, but, "The problem is, it's extremely expensive to manufacture nanotech shafts," Thurman says.

AccuFlex, which makes only shafts, in August introduced its Evolution nanotech golf club shaft.

Next could come nano golf balls. NanoDynamics, based in Buffalo, won't divulge many details about its upcoming ball. Until now, it hasn't publicly revealed anything about the ball, which the company plans to make and sell for \$7 to \$8 apiece. The most expensive ball on the market today is about \$5. Most golfers pay \$1 to \$2 a ball.

But the company says the balls could make such a difference — and, for instance, result in fewer lost balls — that golfers would pay the steep price. NanoDynamics says it's working with the U.S. Golf Association to make sure the balls are legal.

Wilson and other companies are also adding nanotech substances to golf ball cores, though they don't claim the makeover promised by NanoDynamics.

•**Tennis.** Wilson earlier this month introduced its nCode racket, which uses nanotubes. French company Babolat is selling a \$180 nano-racket that it claims is five times stiffer than carbon rackets.

Wilson and New Jersey-based InMat say they've used nanotech to improve the tennis ball. Based on research at Cornell University, InMat's technology forces 1-micron balls of butyl rubber to mix and bond with clay particles. It creates a coating that's flexible but nearly airtight. That means tennis balls can keep their bounce longer once the can is opened.

•**Biking.** Easton Sports and Zyvex are working together to put carbon nanotubes into bicycle parts. So far, they have used them only in handlebars, making them stronger and lighter. The material, says Zyvex CEO Von Ehr, "is very difficult to process." But it can shave 15% to 20% off the weight — a big deal to a pro bike racer.

•**Bowling.** Japanese company Nanodesu (which, translated, means "It's nano!") is using a nanotech material called fullerenes as a super-hard coating on bowling balls. The company says it prevents chipping and cracking but performs like a typical polyurethane ball.

Say goodbye to smelly gym clothes?

Few other nanotech sports products have yet come to market — other than peripheral products, such as nanotech-enhanced ski wax, sunglasses and sun block.

People in the sporting goods and nanotech industries, though, are constantly knocking around ideas for using nanotech in sports. Zyvex says it's talking "to every conceivable sporting goods company" about products such as hockey sticks, helmets and racing yacht masts.

Wilson only recently started selling all-graphite softball bats for \$200 to \$300. It's interested in using nanotech to make those bats lighter and stronger — and perhaps pricier.

Just about anything is possible. In fact, nanotech will probably be used to solve one of the oldest problems in sports: smelly equipment and clothing.

NanoHorizons of State College, Pa., this fall said it developed silver nano-particles that can mesh with the cotton, plastic or nylon material in shoes, pads, jerseys, helmets, socks or other pieces of sports equipment. The metals kill the bacteria and microbes that cause odors.

"I know a whole lot of moms who would love to see this incorporated into hockey gear, which gets pretty ripe," says Blakely, a hockey dad as well as a nanotech CEO.