

# Nanoparticles Lead New Revolution

AREA HOPES TO BENEFIT FROM GROWTH

By Kim Souza April 10, 2011

Tiny particles generate gigantic expectations for the local high tech firm NanoMech, and with good reason. Economic leaders and academics say the nanorevolution could be the engine to propel the region's economic growth for the next decade.

Over the past year or so, a number of economic leaders closely evaluated areas for potential job growth in this region. Those recommendations included commercializing research and great ideas generated at the University of Arkansas, like NanoMech, said Mike Malone, CEO of the Northwest Arkansas Council.

He said high tech and better paying jobs like those at NanoMech are crucial to the region's growth.

Already home to a trucking giant, the world's largest retailer and a global meat titan, Northwest Arkansas' economic growth has largely been organic - spawned from local entrepreneurs with a vision for the future.

"We don't know exactly what industry will lead the region beyond retail, chicken and transport logistics, but the seeds have been sown and NanoMech is ahead of the curve," Malone said.

The newest crop of visionaries include a cadre of world-class scientists and problem solvers at NanoMech - including Ajay Malshe, Dmytro Demydov, Wenping Jiang,

Richard Tacker and Jim Phillips.

The company employs about 30, with an average salary exceeding \$65,000. But CEO Jim Phillips envisions 100 employees will be needed in the next couple of years as scientific research accelerates more products into the mainstream marketplace.

"Those jobs are rooted in university research and made possible because of financial support from local and state governments as well as investors. As a region, we must make sure the infrastructure and capital funding is in place to support their growth," Malone said. "We want those manufacturing jobs to locate here."

Nanotechnology, which involves reducing material to microscopic sizes, is rapidly expanding. In 2007, U.S. companies incorporated the science into \$59 billion of products, such as cell phones, cosmetics, sunscreens, eyeglasses and baseball bats. The market is expected to top \$1.08 trillion by 2015, according to NanoBusiness Alliance, an Illinois-based trade group.

"We would be happy with just 2 percent of that U.S. market share," Phillips said. "This is an exciting time, we are in a moon race with hundreds of other companies focusing on this technology."

He said NanoMech faces stiff competition with roughly 500 nanotechnology companies across the world in various stages of development. And converting the research into sellable products is the biggest



*Jim Phillips, Chairman and CEO of NanoMech, holds a bottle of nanogrease on Tuesday. Photo by J.T. Wampler*

industry challenge.

Other hurdles for nanoscience include possible government regulation. In 2006, the U.S. Food and Drug Administration put together a task force to develop guidance that addresses the benefits and risks of drugs and medical devices using nanotechnology.

Today the FDA and 22 other federal agencies are part of a National Nanotechnology Initiative, a federal program established to coordinate and regulate multiagency efforts using nanoscale applications.

NanoMech has formed four

business platforms that use nanotechnology, any of which could be worth millions in the next few years, Phillips said.

## Product Fast Track

NanoMech has moved from its decade-long research phase into full scale commercialization in the past few months to innovate products used by NASA, Ford, the U.S. Navy, General Electric, Caterpillar, Black & Decker and others.

See **REVOLUTION** on next page

“We are on the fast track and solely focused on taking products to market that enhance the quality and performance of systems already in place,” Phillips said. “Every week we get calls from foreign countries and top U.S. companies looking into products we already have patented or have a pending patent for. We are generating income and keen interest on the world stage.”

He said the company is not interested in niche markets but is looking to supply the manufacturing world with the most durable cutting tools, tested to last up to six times longer when they are coated with a patented TuffTek process.

The NanoMech scientists figured out how to coat cutting tools used to produce durable goods, such as automobiles, airplanes and farm equipment. The spray-on coating of cubic boron nitride is nearly as hard as diamonds and extends the life of manufacturing tools by up to six times, attracting the attention of Black and Decker, Honda and John Deere.

The technology used in TuffTek coating involves nanometers - about one billionth of a meter or the size of a DNA strand, completely invisible to the human eye.

“The science has been around for 50 years but NanoMech & UA researchers were the first to secure a patent for the spray-on application and get the product to market,” Phillips said.

In 2009 TuffTek was called the “Holy Grail” of cutting, by Cutting Tools magazine. The product is manufactured in Springdale and sold to two auto manufacturers.

NanoMech didn’t stop with the advent of TuffTek. The company recently launched NanoGlide, a lubricant that reduces friction, wear and tear

in gear shifts, valves and chains which is crucial to companies like General Electric.

NanoMech worked with General Electric as part of a federally funded consortium to benefit the Department of Energy, increasing the efficiency of wind turbines as much as 30 percent, GE scientist Nikhil Tambe wrote in the corporate blog.

“Nanotechnology is changing the entire thought process when it comes to systems design. We are collaborating with a world-class group of technologists from NanoMech, Inc. based out of Arkansas, who are inventors of NanoGlid™. With some of the very exciting research work that is taking place here at GE, it is evident that nanotechnology has arrived, and, it is here to stay,” Tambe wrote.

NanoMech also produces packaging under the trade name nGuard. This technology can extend the shelf life for fresh produce up to 10 days when the product is added to plastic wrap. The nGuard application also works as an antimicrobial to reduce Salmonella and other viruses in poultry houses, hospitals and body armor worn by U.S. soldiers in Afghanistan, according to Phillips.

In January, NanoMech acquired Canadian Nano Technologies and created the Element X trade name.

Phillips said the acquisition was key in the acceleration into new markets that use nanopowders such as electronics, agriculture and the aerospace industry.

The company recently built two nano-reactors in its Springdale plant and is making products for Cargill, Tyson Foods and Advanced Environmental Recycling Technologies, under the Element X trademark.

## Nano Science

Phillips said when certain materials are taken down to nanoscale, their properties change, for instance an aluminum fence won’t burn, but when the aluminum wire goes through one of the company’s patented reactors and is reduced to tiny particles it ignites faster and burns hotter and longer than jet fuel.

Applications include rocket fuel for NASA and the U.S. Military, both currently testing the product, according to Phillips.

Nanotechnology is the next material revolution to follow the information age. Much like Silicon Valley invented the micro computer chip, Google and eBay, nanoscience has the potential to change the world, according to Greg Salamo, physics professor and nanotechnology innovator at the University of Arkansas.

There’s no reason Arkansas can’t be the nanotechnology hub that rivals the success of Silicon Valley, Salamo said. The university will soon open the Regional Institute for Nanoscale Material Science and provide a fertile supply of talent and consultants needed to run

high tech businesses here, he said.

The university recently made a \$28 million investment, constructing the institute along Dickson Street. The building houses more than \$30 million in scientific equipment needed to conduct nanoscience.

Salamo and the other nanoscience professors will be moving into the new facility in the next month.

Phillips said the university remains an affiliate of NanoMech and receives royalties when certain products are sold, because the research was originally licensed there.

“More importantly, the university is a source of talent and a think tank for new ideas and applications of this evolving technology,” he said.

The microscopes needed to see nanoparticles cost millions, far too expensive for most small companies to purchase on their own, according to Salamo.

“The institute has one microscope that cost \$5 million,” he said.

“The possibilities are astounding in the new nano world. There has truly never been a better time to be a scientist.” ▀



*Nanoparticles are produced and harvested Monday in a reactor at Nanomech. Copper wire is fed into the reactor to make the nanoparticles that appear as wispy smoke in the reactor. Photo by [J.T. Wampler](#)*