

Column of Oct 25, 2013. Editor's Headline: "UW Work Impacts World"

Halfway between Laramie and Cheyenne live two inventive individuals, Georgia Gayle and Steven Turner. They spend their working hours (and much of their after-hours time) trying out ideas on their 10-acre research ranch and in their "ideas-incubator" office in Laramie. Having worked together since 1993 in Guernsey, thirteen years later they chose that location in the Wyoming Technology Business Center for its reputation as "technology business incubator": the Center is operated by the University of Wyoming in cooperation with the Wyoming Business Council. Engineer Kevin Luke, Cheyenne-born local boy made good, has worked with the couple ever since his 2004 senior design project caught their eye.

The three spend hours, days, sometimes months of reading, discussing, deliberating, analyzing, appraising, and generally mulling over this or that possibility. Sometimes an insight arrives out of the blue like the proverbial stroke of genius, though it's a given that dormancy preceded the flash. They specialize in equipment for harsh operating environments, and they rely on computer modeling for wind and solar equipment, computational fluid dynamics, thermodynamics, and aerodynamic design.

Once an idea has been developed, sketched out, and judged viable, a funding source must be identified. Now the business part of the project kicks into gear: grant applications are put together, reviewed, rewritten, sent off. If the couple is successful in rousing other people's enthusiasm for the idea, they're off and running—though it may take years of tedium, trying out various ways to bring a concept into reality.

Take the notion that a wind turbine would be ideal in remote rural corners of the world, drawing water or performing other essential functions. What if the wind doesn't blow during the hours of need? Solution: store excess energy, produced during peak wind, in a tank as compressed air, to be released during windless hours. Hence, the two prodigies (neighbors describe them as "fantastically smart") set to work on a compressed-air, water-pumping project, currently in the final stages of testing.

What of ranchers hiking in howling winter winds, axes slung over their shoulders, to hack holes into the frozen surface of a stock tank so their cattle may have water? Why not develop a solar collector system that thaws the ice, even if only a little bit of sunshine is available? The U.S. Department of Agriculture (USDA) was a "natural" to sponsor the project.

Occasionally a business entity will commission the couple to work out a solution to a problem it has identified. Such was the case when a pipeline testing company asked them to develop a means to detect cracks in pipes positioned on the ocean floor. Previously, to inspect the pipes meant to drain them of their content and bring them up to the surface and test by hand. The company sea-mailed the couple two gigantic samples of used pipe pieces, an inch thick and nearly two feet in diameter, to show the pits and dents induced by the stresses of the ocean's force. Thanks to Steven's long years of defect assessment in high-stress railroad tracks via ultrasonic testing, both in the U.S. and in his native Australia, the company will have the means to examine the pipes while on the ocean floor.

This project was developed within their company, Analogic Engineering, Inc., and it entails development of an ultrasonic transducer, built into a piece of equipment for crack detection and stress measurement. The link to the entity with its project description is http://analogicengineering.com/emat_crack_detection.html. Since it is meant for experts, the description is technically complex; still, it's gratifying to know that in our sparsely populated state great intelligences are at work to address the conundrums of modern society.

"It pleases me to be part of the solution," says Ms. Gayle. "It's good to know, our work reduces the human footprint on the planet."

Kevin Luke in 2007 designed and tested a set of blades tailored to automatically control the speed of a wind turbine without having to furl out of the wind or rely on brakes.

"Furling is when the turbine turns away from the wind. Most small wind turbines use furling to prevent the generator from spinning too fast," explains Ms. Gayle. "In the 'furled' position. Productivity is reduced, for the turbine no longer generates electricity. The goal for our blades is to allow the turbine to spin and produce electricity even when the wind speed is very high, by manufacturing a prescribed degree of bend and twist into the blades to maintain optimal generator speed."

This project was developed via Z4 Energy Systems, LLC. Its website, <http://z4energy.com/> provides information about the trio's current endeavors. On each project's page is a link to each grant agency funding the work, and agency websites where project abstracts have been published. At tradeshows and other public events the couple provide handouts describing the products that resulted from their experiments.

They have collaborated with UW students on a number of projects. For example, during January through June 2012, Josh Lowe, MBA Student, researched and prepared a Distribution Strategy for livestock water de-icing applications for the Solar Stock Tank Heater. During September through December 2012, Anne Lawrence, MBA Student, researched and prepared a Market Study on alternate markets for solar de-icing applications. And in 2010-2011, the UW College of Engineering Senior Design Team built the first wind-powered racer, which was awarded "Best in Show" at the 2011 Celebration of Wind Race.

"Kevin's experience motivates UW engineering students to do great things with their senior design projects," says Ms. Gayle. "These school projects can have big impacts on the environment."

Georgia Gayle and Steven Turner have obtained Small Business Innovation Research (SBIR) grants from the National Science Foundation, the U.S. Department of Agriculture, and the State of Wyoming's SBIR/STTR Initiative (WSSI).