Aspirations in Colorado to Be a New Motor City

Fort Collins, Colo.

IN the world of computers, Silicon Valley is recognized as the spawning ground of technology start-ups. For financial institutions, Lower Manhattan has long been the place to set up shop.

And of course Detroit has historically served as the epicenter of American automaking, evolving in recent times from a manufacturing center to a headquarters city. Still, there is no guaranty that its dominance is permanent.

Among the places vying to become a nexus of automotive development is this college town of 140,000 at the foot of...
the Rocky Mountains, some 1,300 miles from the Motor
City. Already it has earned a reputation as one of the country’s leading engine and
transportation research centers, digging into the dirty business of Civilizing some of the
industry’s biggest and least sophisticated engines.

The Engines and Energy Conversion Laboratory here, part of Colorado State University’s
school of mechanical engineering, was founded 20 years ago by Bryan Willson. The results
of its work, especially in fuel injection and ignition systems, have been adopted by major
industry suppliers like Delphi, Bosch and Eaton, component providers to auto, truck and
industrial engine makers.

Work at the laboratory also involves emerging technologies — smart grids, electric vehicle
components, alternative fuels and new twists on conventional drivetrains — that will be
vital for transportation systems of the future.

Bringing this work to market will require a new approach. “With such a diversity of new
technologies, you are starting to see expertise emerge and new businesses form in places
like Silicon Valley, Austin and Colorado,” Dr. Willson said. “I expect much of this will not
happen in Detroit.”

Many start-ups, hoping to commercialize these new technologies, have already formed or
been drawn to the area as a result of programs sponsored by the city of Fort Collins in
collaboration with local companies. The goal, according to Josh Birks, the city’s economic
adviser, is to build a critical mass of clean tech and transportation-related businesses.

This transformation started with a competition. In 1990, General Motors, with the Energy
Department as a co-sponsor, challenged 25 engineering schools around the country in a
program that converted GMC 2500 Sierra pickups to run on natural gas. Though the
Colorado State University team did not win the competition, placing second, the
technology it developed proved useful for a fleet of natural gas hybrid buses operating in
Denver.

From that experience, Dr. Willson took away a guiding principle that would inform his
future work. “We didn’t want to just conduct experiments or write papers and have them
sit on a shelf,” he said. “We wanted to have impact, so what we do here is the messy work
to make sure these innovations actually become products.”

The lab’s messy work was evident on a tour through the facility. In one corner sat an
enormous 140-liter natural gas-powered engine that once turned a compressor used on
natural gas pipelines. Over the years, Dr. Willson and his students have pioneered several
improvements to a computer-controlled fuel delivery system that greatly reduces the
engine’s nitrogen oxide emissions.

Today the technology can be found on almost every gas pipeline engine in the country,
and it has helped establish a national reputation for the laboratory. Enginuity, a start-up
working here, commercialized much of this technology and in 2008 was acquired by
Dresser-Rand, which supplies equipment to the oil and gas industry.

Nearby, a team of graduate students huddled around a large engine connected to a bank
of diagnostic machines by a tangle of wires. A test of a laser ignition system, in which light
rather than electric current runs over fiber-optic cables to optical spark plugs, was under
way.

“If you look at the future of automotive engines,” Dr. Willson explained, “you are going to
see higher levels of exhaust gas recirculation and a much more difficult ignition problem, one that we are looking to lasers to solve."

Exhaust gas recirculation directs some of the engine's exhaust back to the cylinders, where it combines with the air-fuel mix to help reduce nitrogen oxide emissions. Many automotive engines depend on this technology to meet emissions standards.

In the building's basement is a small-scale electricity grid where, among other projects, students study the impact that a growing population of electric vehicles may have on the power distribution network. Behind the building, a company co-founded by Dr. Willson, Solix Biofuels, is developing a low-cost system for producing fuels from algae. Solix intends to license the technology to large energy producers.

In the far corner of the building was a Cummins diesel engine owned by VanDyne SuperTurbo, a spinoff from Woodward Governor, a large Fort Collins-based energy management company. VanDyne pays to use the laboratory's resources, including several students, to conduct durability and emissions testing on its SuperTurbo technology, a device that adds a two-way mechanical drive to a turbocharger.

In this wrinkle on conventional turbocharger design, the engine can drive the turbo directly, and the turbo can push power back into the engine through a direct mechanical link, a system known as turbocompounding. Testing suggests that the technology could offer fuel efficiency gains and carbon-dioxide-emission reductions of 30 percent, enabling automakers to use smaller engines.

VanDyne is in its second round of venture financing and talking to several truck and auto diesel engine manufacturers, according to its chief executive, Ed VanDyne. It recently signed a deal with the Army, which will test the SuperTurbo on its tanks and heavy vehicles.

For its first three years, VanDyne occupied space at the Rocky Mountain Innosphere in Fort Collins, a nonprofit business incubation program started in 2007 and supported by the university, local businesses and the city. Since then, the program has created 27 companies that now employ 133 high-tech workers, according to Mike Freeman, who serves as chairman of the Innosphere board.

Mr. Birks, the Fort Collins economic adviser, said the Innosphere was emblematic of the city's commitment to what he called "the front end of business formation." Through this program, VanDyne received low-cost office space and free access to patent lawyers and accountants, as well as help developing business plans and raising financing.

High-tech businesses in the area can also participate in one of the local innovation clusters where local start-ups and established companies in related industries work together, with help from the university and city on marketing and skill-building. Initiatives typically involve projects in the community that allow member companies to showcase their capabilities.

Once these start-ups can stand on their own through the efforts of Innosphere or one of the cluster programs, most are choosing to stay in the area, Mr. Birks said. "What we are seeing is that corporate headquarters, research and development and the prototyping all stay fairly close to where the company was incubated and founded," he said.

Other companies are choosing to move to the area. One, Czero, is working with the engines laboratory to develop a hydraulic hybrid kit that recovers energy when a vehicle is
braking and is particularly suited for vehicles that make frequent stops.

“We moved our company from Colorado Springs to Fort Collins because the university and the city have created an amazing atmosphere here, very pro-business and pro-innovation,” said Guy Babbit, chief executive of Czero and director of the newly formed Colorado Engine and Transportation Innovation Cluster.

Because demands on the university’s engine research are increasing, it is planning a large addition, expected to begin construction next year. Dr. Willson has been approved by the city’s planning commission to rebuild the original smoke stacks on the historic Art Deco-style building. But he plans to replace them with wind turbines to generate electricity for the laboratory.

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