

Part 1: Technologic Innovation

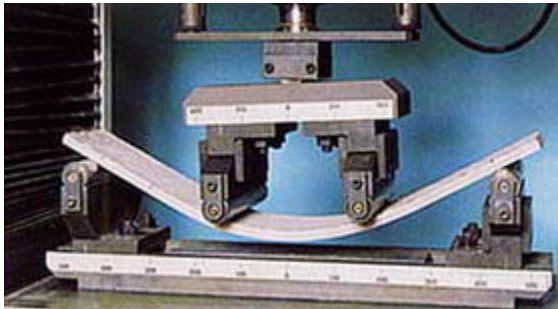
This article will be delivered to you in three parts primarily due to its length, but also for its proper digestion and assimilation. I think the educational term is reflection.

Part 1: Technological Innovation-The Article

Part 2: The Current Situation in Michigan

Part 3: The Big Picture: Time for a Change

Researchers make bendable concrete



A new type of fiber-reinforced bendable concrete will be used for the first time in Michigan this summer- and University of Michigan scientists hope that their new material will find widespread use across the country.

The new concrete looks like regular concrete, but is 500 times more resistant to cracking and 40 percent lighter in weight. Tiny fibers that comprise about 2 percent of the mixture's volume partly account for its performance. Also, the materials in the concrete itself are designed for maximum flexibility. Because of its long life, the Engineered Cement Composites (ECC) are expected to cost less in the long run, as well.

U-M's ECC technology has been used already on projects in Japan, Korea, Switzerland and Australia, but has had relatively slow adoption in the United States, said engineering professor Victor Li, whose team is developing the engineered cement composites. That's despite traditional concrete's many problems: lack of durability and sustainability; failure under severe loading; and the resulting expenses of repair.

Li, who holds appointments in the departments of civil and environmental engineering and materials science and engineering, believes ECC addresses most of those problems. The ductile, or bendable, concrete is made mainly of the same ingredients in regular concrete minus the coarse aggregate, Li said. It looks exactly like regular concrete, but under excessive strain, the ECC concrete

gives because the specially coated network of fibers veining the cement is allowed to slide within the cement, thus avoiding the inflexibility that causes brittleness and breakage, Li said.

Fiber-reinforced concrete is not new, but Li believes that U-M's ECC—under development for the past 10 years—is vastly superior to other fiber-reinforced concretes in development today. The key is that ECC is engineered, Li said, which means that in addition to reinforcing the concrete with microscale fibers that act as ligaments to bond the concrete more tightly, scientists design the ingredients in the concrete itself to make it more flexible. The U-M holds four patents with three pending on ECC technologies, Li said.

"The broad field of micromechanics has tried to understand how composite materials behave," Li said. "We went one step further and used the understanding as a material design approach in the development of ECC."

This summer in Ypsilanti, Mich. the Michigan Department of Transportation will use the ECC to retrofit a section of the Grove Street bridge deck over I-94. An ECC slab will replace the expansion joint and link the adjacent concrete slabs to form a continuous deck. An expansion joint is a section with interlocking steel teeth that lets the concrete deck move as a result of temperature variations, but major problems occur when joints jam frequently, and scientists expect significant savings by using ECC. Li said state suppliers are being trained to make the ECC concrete now.

"The ECC material has promise for solving some of the deck durability issues we face, such as premature cracking," said Steve Kahl, supervisor, experimental studies group, with MDOT's construction and technology division. "We're hoping the ECC will work well, and possibly lower the cost when experience is gained on large scale production."

Long-term performance of ECC has been established by a patch repair placed on the Curtis Road bridge over M-14 in Ann Arbor in October 2002. The patch, which has experienced three winters of freezing and thawing cycles, has much better crack control than the normal concrete patch placed adjacent to the ECC one day earlier, Li said.

While long-term studies are still needed, comparison studies by the School of Natural Resources and Environment's Center for Sustainable Systems, in conjunction with Li's group, show that over 60 years of service on a bridge deck, the ECC is 37 percent less expensive, consumes 40 percent less energy, and produces 39 percent less carbon dioxide (a major cause of global warming) than regular concrete. The study notes that the findings are based on the assumption that ECC lasts twice as long as regular concrete, a reasonable assumption given the known information, but it must be confirmed through further study.

Source: University of Michigan *This news is brought to you by PhysOrg.com.*

Part 2: The Current Situation in Michigan

Implications, Opportunities and Comments:

I sent *The Future Gist: Part 1* with the article on bendable concrete to our Workforce Development, but I thought I would share my thoughts about the bigger picture in this edition of *The Future Gist: Part 2*. **Note: Some of my comments and opinions may sound sarcastic or disrespectful. My intent is to be neither. I intend only to point out the ironies I see in the face of the big picture and if I have my facts wrong or have wandered a bit far, I invite your opinions and opposing viewpoints.**

I thought about sending the article, "[Researchers make bendable concrete](#)," to the MDOT. Now that Lansing has begun multiple road construction projects, it would be an opportune time to test this material. Of course in my opinion, Michigan's plan has always been to make roads that self destruct so that workers can be rehired to do the same thing over again every 3-5 years. Europe doesn't do it this way. (See [Reynolds Road Packer](#) or [International Technology Scanning Program: Bringing Global Innovations to U.S. Highways, 2002](#).) European roads last much longer than ours.

On the subject of roads, it is also interesting that Michigan is repairing roads not only to provide employment but also to improve travel and tourism within a state where workers build SUV's for the general public that in turn are not buying them (SUV's.) At GM, rumors of bankruptcy abound as consumers "just say no" to the SUV's that they can no longer afford to drive either due to increasing fuel prices or due to the fact that they are laid-off from the automakers who made too many SUV's.

I believe, in part, the goal of the road improvement plan is to improve tourism and this is a noble economic goal. However, if you plan to travel this summer, you may be stuck in one-lane traffic just about anywhere you go in Michigan (and of course burn more fuel than you can afford just by idling.) This in turn will cause more Ozone Alert Days which the EPA will discover and impose fines on Michigan or it's industries, even though it has been shown that much of the pollution comes from the West side of Lake Michigan.

My advice is to stay home. This of course is easier for me to say since I live in one of the vacation lands that less people will come to this summer.

Simplistic? Yes, but there has to be some truth in what I just said. At least one can see the cyclic nature of the problem in which Michigan is mired. A major economic paradigm shift is needed that transcends the way we educate, train, work and live.

Part 3: The Big Picture: Time for a Change

So, where are we?

- A. We live in a world where technological advance and innovation is occurring at an increasing, yet nonlinear speed. By that I mean or I think I mean to say that we are not moving forward quickly in one direction, but in multiple directions simultaneously. If you want confirmation of this visit Physorg.com.
- B. Michigan is **stuck** in an economic crisis gridlocked by its dependence on automobile manufacturing and its related industries. For example, take these excerpts from the *May 2005 Economic Overview*, published by The Right Place:

Many recent gatherings around water coolers, coffee pots, and round tables of opinions bring up Michigan's recent standing in the unemployment rate rankings—**dead last! 50th!** In March Michigan had a **7.6%** not seasonally adjusted unemployment rate, below Alaska's 7.4%. **How can this be?**

The Federal Reserve Bank of Chicago conducted a series of conferences in 2003-04 with the goal of understanding "recent poor performance of the manufacturing sector in the Midwest and the nation." The Chicago Fed then addresses the Midwest's, and especially Michigan's dilemma, in two *Chicago Fed Letter* 2005 articles, "**Caution ahead—Challenges to the Midwest's role in the auto industry,**" and "**Challenges and prospects for Midwest manufacturing,**" that can be obtained from www.chicagofed.org.

Auto Industry Shifts

The spotlight begins on the **auto industry** and especially "the recent break in the relationship between motor vehicle production and the auto region's employment, particularly the impact of the **decline in Big Three market share.**"

Michigan, Indiana, and Ohio were home to the majority of the auto industry jobs, until the end of 1996. "From 1996 until the second half of 2002, auto industry employment was pretty evenly divided between the three core auto States and the rest of the country," reports the *Chicago Fed Letter*. After that point, however, the auto industry employment in states of

Michigan, Indiana, Ohio, Illinois, and Wisconsin were hit hard, but the three core auto Midwest states are realizing a steeper decline, even though light vehicle production remained stable.

“In Michigan, 36% of manufacturing employment is in automotive, while in Indiana and Ohio, the share is 15% to 16%. Within 400 miles of Detroit (one day’s drive), 58% of the nation’s assembly plants can be found, along with 84% of those major supplier plants owned by auto assembly companies (“captives”), and two-thirds of the major non-captive “tier one” supplier plants,” according to the *Chicago Fed Letter*.

In the Grand Rapids area, the decline in manufacturing is not only automobile- related, but furniture related. If one looks at the number of workers employed in both durable and nondurable goods in this area since 2001, you will strain to find a manufacturer that has not decreased its workforce.

Why? In many cases it is not even lost market share, many of GR’s manufacturers are economically sound and very successful. For many, productivity is at an all time high. Some have moved their operations “off-shore,” but this does not get to the heart of what is happening in manufacturing. Simply put, in the future it will continue to take fewer workers to produce more stuff. (Please refer to the example given us by the farming industry at the turn of the century, 1900.)

- C. Unless Michigan changes its economic focus quickly, we will continue to see a downward economic spiral, with high unemployment and a decreasing tax base for all public education. This may sound fatalistic, but based on “knowable” data which creates this forecast for the “knowable” future I can see few other outcomes. **However, I do see an opportunity for Grand Rapids and the surrounding area to lead an educational and economic paradigm shift through the education of the knowledge worker and the creation of the knowledge economy.**

The Big Picture

Reflecting on both the article in Part 1 and my data and comments in Part 2, I do believe that Michigan is missing the big picture. For when I look at that picture, I draw the conclusion that Michigan is (re-)building the wrong road. The Internet and its applications is the economic highway of our future and it needs much work. The Internet will carry the ideas, innovations, and information that are needed to transform the industrial economy into a knowledge economy. As I reviewed the scanning information for 200-05 and condense what GR’s successful companies say they have done to weather the storm and come out on top, very few said that it was the quality products that they made, their increase

in productivity, or their decision to stay or move operations. What they said was, the knowledge, creative ideas, and innovation coming from their employees made them a sterling company. So if we want to be part of the new knowledge economy we must put our arms around the 21st century citizen and worker and start to mold him/her for what will be and not what was.

Opportunities Abound

Better yet, if Michigan would put more money into becoming a leader in alternative fuels, rather than into preserving the status quo, we might even create a new industry that would re-hire people and at the same time make it cheaper to travel. This in turn would improve our tourism economy and Michigan's tax base. (Note: To General Motor's credit, they are one of America's leaders in alternative fuel and nano-material research. However, we need to go much further.)

What are the opportunities?

- ✚ Nanotechnology is no longer hype. First materials, then more. (See Physorg.com)
- ✚ Bio-technology despite its ethical and moral issues will continue to grow.
- ✚ Alternative energy including solar, geo-thermo, (see Iceland) wind and hydrogen.
- ✚ Consumer electronics and the smart home.
- ✚ Information Systems Analysts and Cybersecurity
- ✚ Bio-metrics and other security devices.
- ✚ Quantum computing
- ✚ Micro Electro-Mechanical Systems

Am I making sense here or just rambling? You decide. The real question is how does GRCC fit in the big picture? How can we make a difference and still remain the "community college for the times?"

First, what I have said or some vision of the future that is not a rerun of the past must become real to you. You must feel it, see it, and know it is coming. If this new future is real to you, you will act because that is the only way to create a preferred future.

Second, we must start educating learners who embrace these new areas. The silos of academic disciplines must be removed so that the relationship of biology to philosophy, physics/engineering to entrepreneurship, and chemistry to the humanities are explored. This is when new knowledge and creativity will start to thrive.

The above opinions and conclusions are summarized by the information and data collected over a 9 month scan which continues. Your comments are welcome.