



newsletter

Featuring innovation steps in technology from around the world

EDITORIAL



Dear Readers,

Behind every great innovation...is a great innovator.

This i-Step issue features engineer extraordinaire, Dean Kamen, who continually innovates – time and again – products and solutions in which the bottom line is to simply help people. A self-taught physicist with more than 150 patents, many of Kamen's ideas are generated from observing people and understanding their problems. Kamen's 6-wheel IBOT mobility chair idea was sparked when he watched a man in a wheelchair trying to get over a curb.

ifm's team of engineers follows the same philosophy by responding to our customers' needs. Our core value and guiding principle in designing our products is to apply practical innovation to simplify processes and technology.

People can be the inspiration for many great innovations; and the people who innovate are an inspiration to all of us.

Enjoy the issue! Send feedback to www.ifmefector.com/response.

Sincerely,

Lizanne Dathe

Editor, i-Step newsletter

TECHNOLOGY NEWS

Innovator of the Year



Photo courtesy of DEKA research.

R&D Magazine's Innovator of the Year Dean Kamen with his Slingshot water vapor distillation system (left) and the Stirling cycle-based 1-kW electric generator (right).

Mega-inventor Dean Kamen has two simple goals: to improve children's interest in science and technology, and to raise the standard of living for the world's poor. "If I'm awake, I'm working," says Type A engineer Kamen of the way that he interprets his lifestyle and work regimen.

Kamen is President of DEKA Research and Development Corp., Manchester, N.H., and founder of FIRST (For Inspiration and Recognition of Science and Technology). Kamen is also the

inventor and developer of the Segway HT (human transport) system—the two-wheeled self-balancing system that police tool around on at airports or the staff at Disneyworld zip around on from one pavilion to another.

But Kamen is much more than just the developer of the Segway. Kamen is an engineer, an inventor, and an entrepreneur who has been working hard and successfully to help people lead better lives for more than a quarter of a century. Triggered by his brother's experiences while a medical student in the 1970s, Kamen

"You have teenagers thinking they're going to make millions as NBA stars when that's not realistic for even 1% of them. Becoming a scientist or engineer is."

– Dean Kamen

invented the first portable infusion pump for reliably delivering drugs to patients. Notably, many of his inventions that followed were related to healthcare and life science problems. And with his current interests in bringing clean water and cheap power to individuals in third world countries, he has further expanded his view of personal responsibility to include humanity as a whole. Kamen's latest endeavors involve bringing clean drinking water and cheap

KNOW HOW

Solar skin make buildings power-ready

Solar start-up Heliovolt is one of several companies seeking to come up with cheaper ways to build material that can convert light to electricity. Most solar photovoltaic cells are made of silicon, but a shortage of silicon, coupled with the maturity of the traditional solar industry, has made it difficult to lower the price of solar panels, according to experts.

The new process involves printing a fine layer of semiconductor directly onto glass, metal and other building materials so that new skyscrapers can go up solar power-ready from day one. Heliovolt specializes in copper indium gallium selenium, or CIGS, solar technology, which proponents say can be as durable and efficient as silicon cells but can be manufactured for less money. Heliovolt considers its thin-film solar coating a "platform technology" that can be used in a range of applications, including replacements for silicon in solar panels. Heliovolt's solar material will be available in 2008.

IFM PRODUCT

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Continuous vibration monitoring improves reliability on lift system

efector Octavis vibration sensor offers permanent condition monitoring to detect machine failure in advance



Vibration analysis is a specific method in assessing the condition of machines in a plant. For almost 40 years now, vibration sensing technology has increasingly proved to be an indispensable aid. Yet, it is still true today that noisy does not equal bad and quiet does not necessarily suggest that all is well, but rather, it is about the existence of specific sounds of vibrations.

In Sölden, Austria, the Langeggbahn chairlift powertrain applied the ifm efector Octavis vibration sensor to monitor the speed and corresponding vibration levels of the bearings in the motor, primary shaft and gearing mechanism.

In the past, a Langeggbahn plant manager would perform a zero measurement on delivery of a new drive. Over time, he would then compare these original values during maintenance to learn if the levels had changed and if there were any early signs of possible damage. The

problem with this method is that it yields only a selective picture at the time of maintenance.

Constant monitoring offers the clear advantage of continuously scanning for possible vibration changes in bearings or gearing mechanisms during operation.

The efector octavis sensor with its integrated frequency-selective diagnosis capability can detect the early stages of a developing mechanical breakdown resulting from an unbalanced condition, rolling bearing defects or alignment errors.

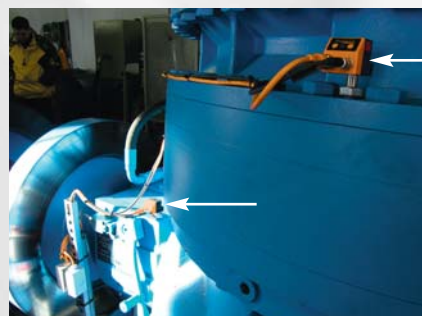
In the case of the Langeggbahn lift, a new chairlift displayed an irregular vibration condition in one of its electric machines. However, this irregularity was difficult to pinpoint, even for the manufacturer's vibration technicians. Therefore, sensors were installed in the powertrain to find the error through long-term measurements. It was determined that the "new" motor was delivered with a

defect – a crooked motor shaft – that apparently had even been corrected. The problem rested in the brake disk condition which was not 100% firmly seated on the shaft. As a result, the "damage" occurred only intermittently because the seat was not formfitting as is required and allowed for slight movement. Because of the thermal factor, the brake disk was at times in the proper position and at other times in the wrong position. Thanks to the octavis sensors, this defect was found.

Permanent monitoring by the octavis sensors opens the possibility of sending messages – including SMS – to a technician in charge and/or plant management, who will then review the increased level values of that particular plant and will be able to respond.

Signs of developing or occurring damage will not dictate the immediate shutdown of a plant. However, early detection is important because it encourages the repair of emerging damage and can help prevent extended downtime.

For more information, visit www.ifmefector.com/octavis.



Two vibration sensors monitor the enormous gearing mechanism.



Sensors monitor the speed and vibration level of the bearings on the Langeggbahn powertrain.



TECHNOLOGY NEWS

Zero ink printing technology

Zink Imaging has unveiled a new way for consumers to print full color images without the need for ink cartridges or ribbons. Zink's patented technology is a totally inkless system. The key to the Zink process is the paper in which colorless dye crystals are embedded and activated by heat.

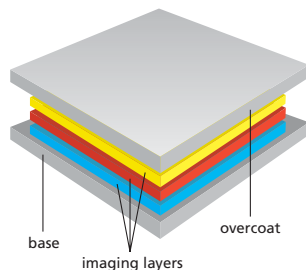
The company uses a novel type of photo paper that changes color when heat is applied, says Steve Herchen, chief technology officer at ZINK. "It's the first new printing technology for digital printing that's come along in more than a decade," he says. People would still need to buy special photo paper, but the goal is to make this paper, which is expected to cost 20 to 25 cents per sheet, ubiquitous.

To make ZINK photo paper, which Herchen says feels exactly like regular photo paper, the researchers start with a white plastic sheet as a base material, then add very thin layers of dye crystals. The dye molecules that make up these crystals are structured in such a way that the crystal is transparent. When heat is applied, the molecules change their physical orientation from a crystal to an amorphous glass, a process that releases color.

The configuration of the crystal layers – yellow on top, magenta in the middle, and cyan on the bottom – is a crucial element in the printing process. When

these layers pass through the thermal printhead, says Herchen, they are heated by 300 tiny heaters per square inch. And in order to bring out the appropriate color at each pixel, the temperature and amount of time each heater is on is precisely controlled. The crystals in the yellow top layer require the highest temperature to show their color but the shortest amount of time. To turn on the cyan bottom layer, the heaters operate at their lowest temperature for the longest amount of time. Bringing color out of the magenta middle layer requires heating times and temperatures somewhere in between.

Zink plans to partner with electronics makers that would build the technology into handheld printers. Or some partners may make a new hybrid digital camera that has the printer already integrated, the way Polaroid did with film.



Zink technology embeds dye crystals in paper in layers of cyan, magenta and yellow to produce color printing.

MIND-BENDER

Answer our Mind-Bender:

Find the missing number:

March 16 = 38

May 11 = 32

August 5 = 26

September 3 = 24

December 12 = ?

What is the missing number for December?



The first 100 people who answer the puzzle correctly will win a silver desk watch. To enter your answer, log on to www.ifmefector.com/response. Closing date is April 30, 2007. The answer will be revealed in the next issue of *i-Step* newsletter.

January issue's mind-bender: On what day did I return? The answer was Tuesday.

IFM PRODUCT

Innovation steps simplify sensors and controls



ifm engineers are continually developing innovative technologies that will simplify sensors and controls. The i-Step logo is awarded to only those products that take an innovation step in technology and offer a direct value for our customers.

Listed below are products that have been awarded the i-Step logo for breakthrough innovations in the past two years. For more information on the following i-Step products, visit www.ifmefector.com/istep.

efector PMD laser sensor



Background suppression for long-range object detection. **Innovation:** smart pixel sensor element with "time-of-flight" measurement.

efector Octavis vibration sensor



Monitors critical bearings on equipment. **Innovation:** Integrated MEMS accelerometer measures vibration and interprets data.

PK electronic pressure switch



Compact alternative to mechanical piston pressure switches. **Innovation:** Strain gauge sensor element with rotating setup adjustment dials.

efector Metris sensor



Monitors compressed air usage on machines to reduce operating costs. **Innovation:** ceramic sensor element detects small leaks in pipes.

efector dualis object sensor



Reliable object recognition regardless of orientation and position. **Innovation:** CMOS image element, on-board software, and signal processor.



Innovator... from page 1

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electricity to those who don't have access to either. More than a billion people, or nearly 20% of the world's population don't have access to clean drinking water. And even more, 1.6 billion or about one out of every four people on this planet don't have electricity. Continuing his emphasis on healthcare, Kamen points out that with clean water, you can eliminate more than 75% of those people's health problems and diseases.

Kamen and DEKA envision a system of vapor compression, distillation water purifiers—code name Slingshot—that takes any type of water-based input, from sludge to urine, and purifies it into drinkable water—all in a small system that makes about 1,000 liters of potable water/day. The current design is about the size of a mini-refrigerator and only uses about 2% of the power required by traditional distillation systems.

Similarly, Kamen has developed and built a Stirling cycle-based 1-kW electrical generator that runs on any type of fuel source, including cow dung. The Stirling cycle has an inherently high thermodynamic efficiency, making it ideal for converting an energy source to electricity.



A chair that climbs stairs:

Kamen sits in an IBOT, a six-wheeled "mobility system" that allows people who are physically challenged to climb stairs and maneuver along uneven terrain.

About 20 DEKA Corp. engineers created a 21st century Stirling cycle engine that takes advantage of new materials, advanced coating systems, light, high-performance gases, and microprocessor based control systems. Kamen's Stirling-based power machines have already been field tested in Bangladesh, and a Cambridge, Mass., start-up, Emergence Energy, is looking to license it and produce it at a reasonable cost.

When asked what recommendations he would give to an engineer who might be developing a new product, Kamen is quick to have the engineer tell you if "his new product was really important." To make a difference and to be successful, the product has to have relevance and value to society. Too much time and energy is wasted, according to Kamen, on the design, development, production, distribution, sales, and marketing of products that don't have any inherent value to improving the standard of living of its consumers.

For more information, visit ifmefector.com



Kamen's Segway invention.

IFM NEWS

Upcoming tradeshows

ifm efector will be exhibiting in the following tradeshows. If you are attending any of the shows, please stop by our booth.

National Postal Forum

March 25-28, 2007

Washington, DC

PacEx International

May 8-10, 2007

Toronto, Canada



About this issue:

Authors of this issue: Innovator of the Year, Tim Studdt, *R&D Magazine*; Zero Ink Printing Technology, Kate Greene, *MIT magazine*; Heliovolt, Martin LaMonica, *CNET News.com*, image courtesy of Heliovolt; Continuous Vibration Monitor, *ifm electronic Austria*.

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