Gene Kirila

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TIME

The Revolution in a Box

By FRANK GIBNEY JR./LITTLE FALLS TIME Magazine Monday, June 31, 2000

Next time you have to wait six weeks for the kitchen door or lawn furniture you ordered, think of Gene Kirila. He would have you order your custom whatever at a store register, then direct you to drive around back, where--Presto! Out it would pop from a portable minifactory.

Kirila has devised a system that will make almost any product, anywhere, anytime. Well, at least anything that can be molded--which is just about everything we touch these days. Kirila's Virtual Engineered Composites (VEC) process is a factory in a box. The box can be as small as a mop basin or as big (so far) as a 40-ft. freight container. Plopped down in the middle of Azerbaijan or Arizona or Angola, it could start pushing out toilet seats one day and pipeline sections the next.

VEC's big secret: a digitally controlled chemical molding system that can be operated on site or, via the Internet, from thousands of miles away. Says the peripatetic entrepreneur: "It's like a 3-D fax machine."

The VEC process is to manufacturing what DOS was to the personal-computer business in its early days. If it proves itself, it will lead the way toward an entirely new system of manufacture in which we can make things digitally. "If operating systems could run computers, they should be able to run a factory," Kirila says. "My big question was this: How do you leverage everything that is happening in the information age and use it to build tangible products?"

Another big question: How does the box work?

Say you want to introduce the Jacuzzi to newly affluent Chinese peasants. Instead of shipping the tubs from California, you simply ship the VEC unit, or cell. To make the tubs, two composite skins are draped over a foam model, and a thermochemical reaction causes them to harden into shape. (Because no metal bending is involved and the "thermoset" process uses chemistry, not immense heat, the molds cost a fraction of the conventional version.) The skins are then attached to a universal frame. The cell is closed and filled with pressurized water, which braces the skins together. Then composite materials are injected into the mold and catalyzed, causing the materials to harden. Unlike injection molding, a common manufacturing process, VEC's "floating mold" uses an operating system that constantly adjusts the water pressure and chemical balance. It sounds simple. But when you consider that there are up to 800 variables in the process--and thus 800 things that can go wrong--the complexity is astounding.

Since the entire unit is virtually self-contained, it can be assembled and running anywhere in a matter of days. If the market in baths dries up, you can switch the mold

skins to make another product within an hour. Labor? O.K., you have to add hardware or electrical wiring to the finished product. But the VEC cell requires three people and very little technical expertise--as long as there is a link to the mother node.

The man who started this revolution is a beefy football jock who dropped out of college because he didn't think he was learning enough. Kirila grew up working the family farm in the shadow of the struggling steel mills of Pennsylvania's Shenango Valley, 60 miles north of Pittsburgh. He was as fascinated by manufacturing as some teenagers are by cars. In high school he was devising weight machines for his football teammates. An injury sidelined him in 1984, and he dropped out of Youngstown State University to get into the fitness-machine business. With a $500 deposit from a customer, he and a friend started Pyramid Fitness Machines in a barn. By 1993 it was a $44 million company.

Kirila, 35, is the kind of guy who sleeps only because he's dog tired, and then he's likely to bolt out of bed and down to the office with a new idea about moving molecules. On business trips to Tokyo (Japanese firms were his biggest customers), he would get his distributor to arrange access for him to factories. He spent two nights prowling the catwalks above a Nissan Maxima assembly line, studying every human and robotic move below. Obsessed? He dragged his wife on a factory tour of China and Japan during their honeymoon.

In 1993, Kirila sold his company to fitness giant Cybex and started Pyramid Operating Systems. That's when he and his engineering chief, Bob McCollum, devised a software program to control each step in the manufacturing process. A company offered them a lucrative contract to build storm drains, but Pyramid didn't have the $2 million needed to fashion or tool the proper steel mold to shape the pipe. That's when McCollum came up with a startlingly simple--and cheap--idea. Instead of a metal mold, why not fashion two pieces of composite in the shape of the product, inject the resin into the cell and brace the flimsy mold with pressurized water?

It took months of hair-pulling setbacks, but they figured out how to digitally control the chemicals, water pressure and the mold itself, and began fabricating larger and larger products, from pipe to custom boat hulls. The average cost to tool a mold: a mere $25,000, nearly a 99% cost reduction. "Once we had the floating mold," says McCollum, recalling their excitement, "we wanted a whole factory in a box."

Pittsburgh venture capitalists wanted nothing to do with it. Despite Kirila's charisma and his successful start-up, they saw in him a college dropout from a depressed steel valley. He faced an age-old paradox: his idea was too big to get funded, but he couldn't prove its worth unless he had the millions to start building stuff.

Enter Irwin Jacobs, the Minneapolis-based financier whose takeover antics in the 1980s struck fear into the hearts of companies like ITT and Disney. Jacobs, a reformed predator, now runs Genmar Holdings, a remnant of his buccaneering days and a company whose principal business is building pleasure boats. Boatbuilding is messy, environmentally hazardous and so unpleasant a job that Genmar has a hard time getting workers to do it. Pyramid built a few test hulls for Genmar, but Kirila's system wasn't refined enough for Jacobs' engineers. "They were 90% there, and we needed 100%," says Jacobs. "So it represented a multimillion-dollar leap of faith."

Jacobs saw the potential--he hadn't forgotten everything he learned in the '80s--and offered an all-or-nothing deal to buy out Pyramid. It sounded like a deal with the devil. But Kirila knew he needed someone with deep pockets and a commitment to make VEC bigger.

By all accounts, the gamble has already proved worthwhile. For 25 years, the Genmar factory at Little Falls, Minn., has used the same caustic, grubby process to churn out Wellcraft and Glastron fiber-glass runabouts. Men and women in blue coveralls layer or spray fiber glass over each hull. Half-finished boats are scattered around the warehouse, overshadowed by stacks of used molds. The stench of styrene is overpowering. The manual layering process is so imprecise that each hull is different; imperfections have to be corrected by hand.

Next door, at a VEC test site that has produced 1,000 hulls in the past year, the air is clean. It's quiet. Three technicians in smart yellow shirts and blue jeans supervise two VEC cells. One man watches a monitor that shows injection flow, temperature and pressure levels. If something goes wrong, an alarm rings in Little Falls and at the VEC solutions center, 1,400 miles south. Kirila's experts regularly tap into the Little Falls plant via the Internet to adjust production settings and troubleshoot problems.

Every 35 min., each cell produces a new hull; next door it takes eight hours and at least twice as many people to finish one. Each completely recyclable plastic mold produces a dozen boats; next door it takes a mold per boat, and each year thousands of used molds have to be buried in landfills. Each VEC hull is so strong that Genmar has announced a lifetime warranty instead of the normal five years.

Next month Genmar will unveil the world's first automated boat plant at Little Falls, a sprawling 100,000-sq.-ft. facility that will turn out 10,000 boats a year. Jacobs has invested more than $30 million so far, but no matter. Says he: "This is game-changing technology, period." He and Kirila have been inundated with inquiries from competitors wanting a piece of the VEC action. Other calls have come from the likes of Ford, Volvo, Owens-Corning and Gulfstream. Household-products and construction-materials companies want in too. Elsewhere, advanced manufacturers like Rockwell are experimenting with remote engineering. Honeywell already offers remote monitoring for certain automated plants. Says Kirila: "VEC is just the first of many new operating systems to come."

The VEC process could reorder manufacturing because it allows low-volume manufacturers to cut retooling costs for new products. If the boatbuilding example is any indication, it could mean labor reductions of up to 50%. Most of all, it shows that intellectual capital can be transmitted anywhere to make anything.

"We've always had giant brick-and-mortar factories close to the source of raw materials or communication," says Richard Morley, one of America's leading manufacturing experts. "This kind of technology means we can manufacture at the point of consumption."

Although technically he works for Genmar, Kirila figures that at some point his company, now called VEC Technology Inc., will go public. For the present he has a mandate to spread the gospel of digital manufacturing and fund start-up companies that aim, as he puts it, "to raise the clock speed of manufacturing culture." Jacobs is planning to do what

Kirila originally intended: to lease the patented VEC system in the same way that Pitney Bowes used to lease stamp machines. "We're proving we can do it better, kinder, cleaner," says Jacobs, who has lost none of his salesmanship. "The world is going to come to us." And learn how to make things the new-economy way.

CNNMoney.com

FORTUNE

Heroes of U.S. Manufacturing American manufacturing is bigger than ever, thanks to innovators like the six honored by FORTUNE this year. Their achievements range from tiny new machining tolerances to better ways for whole industries to arrange production.

By Gene Bylinsky
March 20, 2000

FORTUNE

GENE KIRILA II

Company: Pyramid Operating Systems

Field: Production technology

Achievement: Developed a portable cell for molding composites

Hobbies: Boating, hunting, raising beef cattle on his farm

His Brainchild: Instant Mini-Factories

A cerebral 35-year-old college dropout is fanning the flames of an ongoing revolution on the plant floor: coupling digital information with manufacturing processes. Gene Kirila II has dreamed up a novel portable cell in which a computer runs the complex chemistry of making products from composites. Because the cell can be controlled from afar, it's also an example of Internet-assisted manufacturing.

Kirila's cell, expandable from its basic dimensions of 24 by 24 by 18 feet, can be used for the automated production of composites in low to medium volume, up to about 100,000 parts a year. Tooling, or making a mold for the cell, requires an investment of only $25,000, vs. some $1 million to $2 million for an existing technology that is its closest rival in quality of the finished product.

The cell uses a thermosetting technique, one of the two that dominate the making of composites. In thermosetting, liquid chemicals are mixed and allowed to solidify with the aid of liquid catalysts. The other technique is thermoforming, in which plastic pellets are melted and linked together with fiberglass and other reinforcing materials under high heat and pressure. Both those technologies, when used in the conventional manner, involve a lot of labor as well as capital. Unlike Kirila's cell, they are also dangerously polluting and require expensive equipment to control their exhausts.

Kirila, in short, has created the manufacturing counterpart of a McDonald's hamburger outlet. It serves up boats, truck parts, and even railroad cars with quality and precision, at low costs never before attained. A Kirila cell can be dropped into China or Minnesota, or any place that has electricity and compressed air. In three days the customer has a humming little factory.

The cell's one or two workers don't have to be technicians; a computer program monitors and controls the process, and they are guided step by step by graphic displays on computer screens. The system doesn't let the workers proceed unless they have properly executed the previous production step. If a worker encounters a problem he or she can't solve, a Solutions Center, manned around the clock by experts, is available on the Internet for help. Kirila's idea succeeds where somewhat similar Japanese "lights out" manufacturing failed because it relied on robots rather than people. It also had no communications link to knowledgeable engineers able to remedy problems as they occurred.

Kirila grew up in an industrial setting in the Shenonda Valley, which spreads across the Pennsylvania-Ohio border 60 miles northwest of Pittsburgh. His father is co-owner of a heavy-duty construction company; early on, Kirila was exposed to steel mills and other industrial enterprises. But in high school and college, football was Kirila's true passion: Not only did he play offensive lineman, but he also, in working in an industrial-arts class during his high school years, built exercise machines for the football team. While at Youngstown State University, he started a company to build exercise machines, Pyramid Fitness of Sharpsburg, Pa., and dropped out to run it. Ten years later its annual sales reached $44 million.

Frustration drove Kirila to design his cell. Composites, which can be made flexible in one part of a product and rigid in another part, are an attractive material for building exercise machines. But a lack of reliable production methods discouraged Pyramid from using the materials.

It took four years to develop the software that runs the cell, which is called virtual engineered composites, or VEC. It is an outgrowth of Kirila's longtime belief that an operating system, similar to the one that runs computers, can be designed for a manufacturing process.

By experts' accounts, VEC changes the game in low-volume composite manufacturing. Not only does it sharply reduce the cost of making thermoset composite products, but it also makes sturdier and better-looking boat hulls and other products than traditional technologies can. It's speedier too. VEC can make a 17-foot boat hull, for example, in 70 minutes. The older way can take days.

With computer controls throughout the process--supervising as many as 280 different manufacturing operations--Kirila's cell slashes production time. "The formula for success," as Kirila calls it, is relentless adjustment of the capricious and changing chemistry of the liquid components as they solidify. VEC links resin storage, injection pump, mold, and process controls into an integrated system. Temperature, viscosity, and other variables are under constant supervision and control; the data are displayed graphically for operators to see in real time.

Automatic on-the-spot verification that each previous step was properly executed accounts for the system's reliability.

Inside the cell is another clever invention, a "floating" mold. In the types of composites manufacturing that VEC competes against, a new set of molds, costing as much as $2 million, has to be made for each product. The halves of the mold, which close like the halves of a walnut shell, are chiseled out of steel or aluminum in a painstaking process that can take up to a year. Molds of that type still make sense for large production volumes. But for smaller runs, the floating mold is a better way to go.

Kirila and Robert McCollum, director of engineering at Pyramid, devised a system in which two tough composite laminated skins, each cut to accommodate the shape of a new product, are attached to a universal metallic mold frame. "Universal" means that the frame is reusable and stays unchanged. The space between each skin and its metallic support is filled with water, and the air is pumped out. Since water is noncompressible in the pressure ranges used in VEC, the skins become a rigid hydraulic system--like two firm waterbeds facing each other across a cavity. The mold halves are closed, and composite material is injected into the cavity.

The floating mold allows better control of the mold surface, resulting in faster production and a better-looking surface on the product. The mold skins cost only $1,000, compared with a minimum of $42,000 for conventional molds. There's another advantage. It takes only ten minutes to change the skins, thus creating a new mold. This introduces a new degree of flexibility to the manufacture of composite parts and products. "Out of that same work cell, I could be making bathtubs in the morning, boats in the afternoon, and utility-truck and trailer parts the next day," says Kirila. "The cell would be perfect for Third World countries where they don't have the volume to make expensive new molds."

What really forced Kirila and McCollum to come up with the floating mold was a multimillion-dollar contract that Pyramid could not have carried out with conventional molds; it didn't have the money to buy them. Kirila and McCollum hit upon the bright idea of substituting laughably cheap water for costly steel and aluminum after long discussions of such alternatives as sand, glass beads, and even Ping-Pong balls. If ever there was a triumph of ingenuity over convention, the floating mold is it. It opens the way to making composites competitive not only with aluminum and other metals but also with plain wood.

In 1995, Kirila built a spacious factory on a 15-acre plot in an industrial park in Greenville, Pa., rimmed by cornfields--a site that testifies that Silicon Valley has no monopoly on ingenuity. Kirila and his 65 employees used their new method to make composite parts for Ingersoll-Rand and Acuma Machine Tools, a Japanese company, and boats for sports enthusiasts. With accurate dimensions achieved on the first try, boats built with VEC have been shown in industry-sponsored tests to ride faster and better.

Kirila's original intention was to spread the VEC gospel and franchise his cells around the world. He and some friends invested $12 million in the project. But when venture capitalists failed to come through with an additional $50 million that Kirila felt he needed, he sold the technology and the company last year to Genmar Holdings in Minneapolis, the second-largest automated builder of boats in the U.S. Pyramid now operates as Genmar's R&D subsidiary.

A cell is already making boats at Genmar, and a $12 million VEC plant containing four cells will be completed this summer. The troubleshooting Solutions Center, located at Pyramid in

Pennsylvania, now connects via the Internet with the cell in Minnesota. Genmar has big plans to use VEC to build other things besides boats: transportation equipment, recreational vehicles, doors, window frames, and walls and roofs for small buildings. The company will both license VEC and work with others in joint ventures.

Says Steven J. Kubisen, senior vice president at Genmar, who joined the company last year because he was excited about VEC: "We estimate that VEC is applicable to more than $10 billion of the total $25 billion annual market in composite parts." Not a bad prospect for former offensive lineman Kirila, whose college professors thought that all he could do was play football.

Inc.

Topics > Leadership and Managing > Human Resources >

The Proof's in the Quick Quiz

Company owner assesses efficacy of management training by giving employees yearly pop quizzes.

By Michael P. Cronin | Mar 1, 1994

Gene Kirila says he believes that "conflict starts from ignorance," so when he founded Pyramid Plastics, in Sharpsville, Pa., eight years ago, he began teaching employees the latest management techniques. But is the schooling, which costs $2,000 per person in out-of-house expenses alone, worth it? Kirila devised a "baseline survey" to answer that question.

Kirila asked each department to list five things that everyone in the company should know. Then he and the managers developed questions to measure employees' knowledge. The quiz is updated periodically.

New employees take the quiz after their "indoctrination" -- 40 hours of classwork and on-the-job training -- and once a year after that. Although they know when the quiz is coming, there's no way they can study for it.

Early on, scores were in the 30%-to-40% range; now they average 69%. Each set of results tells Kirila about the effectiveness of new teaching techniques. For instance, he has cut classroom time because he found workers learned more on the job.

The scores are not used as part of employees' performance reviews. (Kirila says that would undermine teamwork; only he and outside tabulators see individual scores.) However, he does use each department's aggregate result as part of the reviews for his managers.

The results reflect more than the strength of the education program. "Our scores are very closely related to our efficiency and our profitability," Kirila claims. How closely? "Give me our score for a year, and I can tell you our gross profit."

* * *

Kirila's Test

Here are some sample questions from Kirila's quiz. Other questions ask employees to match terms such as kaizen, Pareto diagram, *and* fishbone diagram *with their definitions. How would your employees score?*

What is the date of our fiscal year end?

A. *December 31*
B. *B. June 30*
C. *C. May 31*
D. *January 1*

Why do we take physical inventory?

A. *To satisfy banks*
B. *Auditors make us*
C. *Government requirements*
D. *Production control*

Pyramid's policy for sending replacement parts is that all parts will be shipped within

A. *24 hours*
B. *36 hours*
C. *48 hours*
D. *None of the above*

Name the three major competitors of Pyramid.

(Answers to the first three questions: A, D, A.)

Driving Revenue - A Grand Master Strategy

by Verne Harnish "Growth Guy"

If revenues aren't soaring, there is something not quite right with one of these components, rough economy or not.

Are your company's revenues growing as fast as you would like? If yes, skip this column. If no, you need to look at your strategy – or more specifically, the business model aspect of your strategy. This is what Paul Silvis, founder of Restek, did when he became frustrated with a $7 million division that had stalled. Today, he has a clear path to $100 million.

As companies approach the halfway mark for 2008, its time for mid-course corrections if you're not getting the top line growth you expect. And top line growth is purely a function of your business model i.e. how you are selling what to who. If revenues aren't soaring, there is something not quite right with one of these components, rough economy or not.

Before I describe how Silvis plans to revamp his business model, let me take a moment and focus on the importance of involving "Grand Master Strategists" in the process.

GRAND MASTERS HAVE THE MOST MOVES

Kaihan Krippendorf, the brilliant ex-McKinsey strategist and author of The Art of the Advantage (recently renamed Hide a Dagger Behind a Smile) points out that Grand Master chess players aren't thinking any more moves ahead in a chess match than expert-designated players. Th e diff erence is that given the layout of the chess board at any particular moment the Grand Master has 10 times the available next moves he or she can make i.e. more available patterns residing in their brain. Kaihan, who is doing strategy training for some of the top fi rms in the world fi nds that most executives have the same handful of moves or patterns they fall back on when plotting strategy. What you need are a bunch more next-moves in your arsenal.

Kaihan, who is doing strategy training for some of the top firms in the world finds that most executives have the same handful of moves or patterns they fall back on when plotting strategy. What you need are a bunch more next-moves in your arsenal.

Enter Gene Kirila. Kirila was the youngest-ever named "Hero of Manufacturing" in the U.S. by FORTUNE magazine for pioneering several manufacturing technologies that have changed entire industries. Knowing that the best need coaching, Silvis invited Kirila in to look at this stalled $7 million division of his $60 million chromatography firm.

50 DEALS AND EXPERIENCE

Kirila has been involved in over 50 deals during the same time that Silvis has grown essentially one business. Not that Kirila has better moves, he just has a lot more and diff erent moves than most business owners. This is why we all need outsiders – advisors, consultants, coaches – to help us maximize the potential of ourselves and our businesses.

Kirila started by asking what main differential advantage this $7 million division provided customers. In essence, their metal coatings can reduce costs by 20% – 30%. He then asked who their largest customer was which was a large fi rm doing just $400 k of business with Restek. He then asked Silvis how much business this customer should be doing with this Restek division. Silvis replied roughly $25 million.

Kirila then had Silvis's team pull up the 10 k for this publicly-listed customer and point out "which line item on the income statement is affected by the 20% – 30% improvement?" Turns out, in the larger scheme of things, Restek's process is maybe impacting the customer a fraction of a percent – not enough to get anyone to be a strong advocate for Restek's services.

Kirila then asked if there was any existing client where the Restek process made a critical impact on the business. One of the people in the meeting said yes, there's a critical valve in off -shore rigs that has to be replaced frequently. And when the rig is shut down for the eight hours to replace this valve, it costs the company millions of dollars. Restek's process can have a signifi cant impact on the life-expectancy of these valves!! The strategy, therefore, is to dramatically narrow the focus of marketing/sales and go after companies in this industry. There's one client alone that needs $100 million worth of these services!

Silvis also notes that Kirila opened his eyes to a marketing strategy he never would have contemplated.

Silvis also notes that Kirila opened his eyes to a marketing strategy he never would have contemplated. Th ey have a another major customer that has been balking at the cost of their coating process. Kirila suggested Restek do the coating for free (install a coating facility within this major customer's plant – something Kirila did himself in another venture) and then split the gains i.e. if the coating will let the customer increase the price of the product by $10, Restek and the customer split the gain.

Haller Enterprise Institute

Entrepreneur of the Year 2003

Gene Kirila, a native of Brookfield, Ohio, went into business full-time when he was a sophomore at Youngstown State University. He and a fellow Brookfield High graduate started Pyramid Fitness in 1984 and created a high growth profitable business before selling it in 1993. Pyramid was one of four small businesses to have a site visit for the United States Department of Commerce's Malcolm Baldrige Award.

During the nine years that Pyramid Fitness was growing, Kirila founded Pyramid Composites where he pioneered the VEC Operating System for which he is widely known today. The VEC - virtual engineering composite - Operating System was described in Fortune Magazine as a "factory in a box." According to Kirila, the VEC technology is a "small factory that can be set up almost anywhere to turn out a variable set of products from the same basic units, run by just a handful of people and controlled by computer... it's fast, inexpensive, efficient and environmentally friendly."

In 1994, Kirila founded his third company, Efficient Machine Tool Sales, Inc. (EMT). EMT reached the number 13 slot on the "Fastest-growing Companies" list published by Inc. Magazine in 1999.

Kirila was given the distinguished "Heroes in Manufacturing" award by Fortune Magazine in 2000. Also in 2000, Kirila was featured in a Time Magazine article, "The Revolution in a Box."

Mr. Kirila and his wife Ginger have four children and reside in Transfer, PA.