The Man From CHAOS

by William Green

Dick Morley, inventor of the floppy disk, wants to reinvent your factory. His message: to gain control, you've got to lose control.

Factories are complex organisms," preaches Richard Morley, unofficial leader of a movement to overthrow the old notions of how to run a manufacturing plant. Morley and his band of fellow visionaries want to replace the control-freak mind-set of the Industrial Age with an approach derived from chaos theory. "You don't have a prayer in hell of ever understanding factories. You really don't have control. By striving to get control, you only make it worse."

Dick Morley is an outspoken thinker who readily compares his extraordinary views on technology and business to those of a Martian. ("Let us assume we are a Martian slowly descending upon the city of Boston,"he wrote in an article that uses chaos theory to explain how taxi systems work.) At 63, the acclaimed inventor rides a Harley, keeps 11 pairs of skis by the front door of the New Hampshire barn where he lives and works, has sponsored more than two dozen foster children, and has started roughly 50 companies. Morley was one of the technicians who created the floppy disk and is also the father of the programmable logic controller – an invention that transformed the factory, spawned a $4 billion industry, and pushed manufacturing toward mass customization.

Since the mid-1980s, Morley has devoted much of his time to designing a computer system that draws on the principles of chaos theory to run factories. By studying everything from the weather to the swirls of smoke emitted by cigarettes, chaos theorists have concluded that there are complex patterns underlying what once seemed to be erratic behavior. A school of thought most closely associated with the fashionable Santa Fe Institute, chaos theory is now influencing everything from Wall Street trading strategies to software design.

And now manufacturing. According to Morley, factories are havens of erratic behavior, places where, he says, "Everything is going wrong all the time." Morley's solution: abandon the illusion that you can predict these technological headaches, or that you can avert them with forward planning. Instead he designs his computer systems with what he describes as "the ability to solve problems, to deal with stuV that you cannot explain."

In 1992, Ernest Vahala began testing Morley's chaos computer system in a General Motors assembly plant in Fort Wayne, Indiana. At the time Vahala was director of manufacturing engineering for GM's worldwide truck group, so he had the clout to try an experiment that even he regarded as a trifle bizarre. For the next three years, Morley's computer system ran the paint shop in a GM factory in which robots paint 60 trucks an hour.

The sophisticated software needed to paint trucks must enable the robots at each paint booth to perform a series of complex tasks. Among other things, the robots treat the surface of the truck with phosphate, apply base coats and clear coats, and set the paint in an oven at a temperature of up to 300 degrees Farenheit.

Vahala says Morley's system handled these tasks with ease. More important, the chaos-based approach "reduced the software we required by nearly 100 times," says Vahala – no small matter given the enormous cost of software engineering.

For example, in the past, a single paint booth might have been required to paint a red truck, then a blue truck, then a black truck. As a result, paints would have to be changed and machinery cleaned

before each truck could be painted. Morley's system completely changed the game: it enabled the paint booths themselves to "bid" for the right to paint certain trucks. If a particular booth had been painting black trucks all day, it would bid to paint any subsequent trucks that were to be painted black. Says Morley, "The booth is empowered to decide what it does."

"It ran beautifully," says Vahala. "It saved $1 million a year in paint alone. You don't have to be a rocket scientist to say, `Holy damn!' I became a complete believer."

Despite this triumph, General Motors recently notified Morley that it has dismantled his computer system. Vahala explains that the company is replacing its hydraulic paint robots with electric ones, an overhaul that requires the installation of new software. He says GM is likely to reexplore the chaos approach later but admits, "There continues to be resistance to chaos because people don't understand it. It defies good logic."

Morley is sufficiently self-confident not to take this setback personally. "I'm disappointed," he says, "for them. It's like seeing your child decide to be a garbage man instead of a doctor."

Morley's computer system is gaining greater acceptance in Japan where Yaskawa Electric Corp., a licensee, has sold about 90 chaos computers (average price: $20,000). One current application is to simulate the operation of the Central Japan Railway's famous bullet trains. Other customers are using chaos computers to run steel-plant operations and to schedule the loading and unloading of boats in dock operations.

Morley believes the Japanese will continue to embrace the chaos approach, but he's given up on selling his computers in the United States. "People here don't want this stuff," he says. "Americans like reorganization. They don't like technology. When Japan cleans our clock," he says, "then we'll rush to catch up. Again."

William Green wgreen1995@aol.com , who has written for the "New Yorker" and the "London Independent", lives his life according to chaos theory in Brookline, Massachusetts.