

THE ULTIMATE NUTS & BOLTS CO.

Illinois Tool Works, which brings you nails for the rafters and six-pack holders for the soda, shows how a big business can be as nimble and creative as a small one.

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THE ILLINOIS TOOL WORKS factory in Elgin, Illinois, hardly looks like a fountainhead of industrial innovation. It is clangorous, grimy, and hot, and makes nuts and screws. Its large green forming machines are, in the words of a senior manager, "as old as Methuselah." Yet something wondrous has taken place here. By following a steadfastly low-tech approach, reconfiguring production lines, unplugging the central computer, and moving some operations into small, focused factories, Elgin's managers have tripled productivity in eight years and recaptured market share that had been lost to low-cost rivals.

Unglamorous and low-profile, ITW is a nitty-gritty manufacturer that, like its Midwestern neighbors Caterpillar and Cummins Engine, is remaking the way America makes things. Long known for superior engineering, and premium prices, the Chicago conglomerate has managed in recent years to become more cost-efficient, more price-competitive, and more inventive.

ITW has also expanded aggressively abroad (it now operates in more than 30 countries) and has abandoned its traditional aversion to leverage in order to finance a series of bold acquisitions. All this is good news for shareholders, including the Smith family, a Chicago banking clan that founded the company 78 years ago and still owns 28% of the stock.

In 1989, its fourth consecutive year of record results, ITW reported revenues of \$2.2 billion and profits of \$164 million. While it may not be a household name, its executives get high marks from their peers. For three years ITW has placed first in its industry in FORTUNE's list of most admired corporations. Other companies with that kind of record are superstars, such as Boeing and Merck.

ITW has rewarded shareholders over the past decade with an average total return of 24.7%, better than that of Boeing and Merck. The stock, enthusiastically pitched by analysts, has risen 47% in the past 12 months to a recent \$53.88 a share. ITW derives its obscurity in part from what it makes: an incredibly diverse array of items that typically are attached to, embedded in, or swathed around somebody else's goods.

It manufactures nails, screws, bolts, strapping, wrapping, valves, capacitors, filters, and adhesives, as well as the tools and machines to apply them. It is the world's largest producer of plastic buckles, a leading supplier of fasteners to General Motors, the inventor of the plastic loops that hold six-packs together, the producer (with Dow Chemical) of new Zip-Pak resealable food packages, and the maker of Kiwi-Lok, a nylon fastener New Zealanders use to secure their kiwi plants.

ITW's quick-change coupler for machine tools allowed Caterpillar to reduce some setup times in a transmission factory from eight hours to 40 minutes, and its painting equipment coats new Toyotas at a plant in Japan.

Extraordinarily innovative in mundane areas, ITW holds 2,400 active U.S. patents. The company is so decentralized and its designers so prolific that nobody at the head office can come up with an exact tally of how many products ITW makes.

HOW CAN SUCH a big company manage such diversity, promote such entrepreneurial creativity, and achieve such terrific financial results? By thinking small. This is not a business where senior managers hog power, build empires, or bark orders. ITW has 90 divisions, loosely arranged in nine groups. The largest, the \$420-million-a-year construction products group, has precisely three central administrators - a president, a controller, and a shared secretary.

Just 100 people toil at ITW world headquarters, which consists of 1 1/2 floors of a nondescript building near O'Hare Airport. The offices are so spartan and drab that a visitor can be forgiven for thinking he has punched the wrong button on the elevator. Coffee is served in styrofoam cups, the preferred uniform is shirt sleeves, and the favored mode of communication is face to face.

Chairman and Chief Executive John Nichols, 59, doesn't even occupy a corner office, just a pair of smallish rooms furnished in the spirit of the airport Sheraton. A veteran of Ford, ITT, and Aerojet-General, Nichols joined the company ten years ago. Though he earned \$750,000 last year and owns some \$14.6 million worth of company stock, he drives an Oldsmobile to work, takes the subway to meetings, and flies coach. He has a hearty laugh, a BA and an MBA from Harvard, a command of both finance and manufacturing and unmasked impatience with computers, accountants, jargon, and formality. Says Stephen Kaye, vice president for investor relations: "I can't remember the last time the chairman sent me a memo about anything."

ITW began life as a maker of metal-cutting tools and has long modeled itself on that most basic of all organisms, the amoeba. When engineers and marketers in one of the divisions develop and commercialize a new product, which seems to happen all the time, largely because of ITW's close relationships with its customers, the division often hives off the product and the personnel as a new entity.

That is how a unit known as Nexus came into being six years ago, a young researcher in the Fastex division invented a durable, safety-rated plastic buckle for a customer who makes life jackets. Last year Nexus, along with its licensees, sold about \$45 million of the buckles for backpacks, bicycle helmets, and pet collars.

Another product of divisional mitosis is Hi-Cone, which makes those plastic rings that bind beer and soft drink containers into six-packs. Lately it has pioneered the plastic 12-pack and, in response to environmental concerns, has shifted much of its production to plastic that is photodegradable.

Typically divisions are small, with no more than \$30 million in annual revenues. Each division chief controls his own manufacturing, marketing, and R&D. New managers are sometimes nonplussed by the freedom they receive from higher-ups. "When I first got here, I kept waiting for the phone to ring and for someone to tell me what to do," says Bob Sanders, hired by ITW a year ago to run a newly acquired unit that makes metal anchors used in concrete.

ITW seeks out, and often dominates, market niches. "We try to sell where our competitors aren't," says David Speer, general manager of the Buildex division, a

maker of construction products. Working with Owens-Corning Fiberglas, Buildex came up with small retainer plates for fastening insulation to the roofs of commercial buildings. The new product anticipated a move by insurance companies to discourage the use of adhesives with such insulation. This year Buildex brought out a tool called AccuTrac that affixes the plates and enables a lone roofer to do work that previously required two. The system has already captured a large share of the \$50-million-a-year market.

Even a company that is decentralized, innovative, and market-oriented can fall victim to complacency, lethargy, and, perish the thought, bureaucracy. In the screw business, for example, ITW watched as patents on important designs ran out, and by the early 1980s found itself facing low-cost competition from the Far East.

Says Nichols: "Just when you are doing well is usually the time you fall asleep and go to the termites." He has been in charge of pest prevention ever since joining the company as executive vice president for operations. He became CEO in 1982 and added the title of chairman in 1986 when the incumbent, Silas Cathcart, retired. (Cathcart later became head of Kidder Peabody.)

Cathcart tapped Nichols to rethink ITW's strategy because the world in which the company did business was changing profoundly. Inflation, that great friend of high-cost producers, tapered off; and customers, newly concerned about cost and quality, began winnowing out suppliers. ITW came under especially heavy pressure from Detroit automakers as they lost ground to the Japanese. Recalls executive vice president James Farrell: "We had to lower prices to our major customers, to help them be more competitive. That represented a major change for us. We had never lowered our prices."

To afford the cuts, ITW had to reduce costs, a goal Nichols and his colleagues decided to reach without compromising either quality or innovation. Searching for a solution, they toured Japanese factories, studied corporate profiles in business publications, and conferred with consultants. Most ITW factories, they concluded, were sloughs of inefficiency. A prime offender: the Elgin plant, which Nichols recalls condemning as "the worst factory I had ever been in in my life." Its most important product was the

"self-drilling" screw, an ITW invention that is designed for use with hand-held power drills on automobile assembly lines.

The screw makes its own hole through two pieces of sheet metal and binds them together. Fabricating such humble parts is a surprisingly arduous process that typically involves six highly skilled operators, five large machines, and a furnace. Each screw must be headed, threaded, pointed, slotted, heat-treated, and plated. And that's only part of the story. Because such operations are unavoidably grungy, the embryonic screw must be washed after each step.

Until 1982 the Elgin factory was organized by function. There was a heading department, a threading department, and so forth -- as well as a frothing central bath of near-oceanic proportions. The plant wasn't so much an assembly line as a loose confederation of city-states that periodically engaged in mutual commerce. Because Elgin made some 2,500 varieties of self-drilling screw (different diameters, head sizes, slot sizes, and lengths), scheduling was a nightmare. In each department bins full of "work-in-process" took up every available inch of floor space, waiting as long as five weeks to proceed to the next stage.

Using a mainframe computer, Elgin's managers tried mightily, but usually fruitlessly, to schedule, track, and cost each batch of screws. After two years of tinkering, ITW came up with a potent combination of three basic manufacturing concepts: "in-lining," the "80/20 rule," and "focused factories." Nothing about the ITW formula is arcane, or even particularly novel. It's the sort of approach that managers inevitably label common sense, after they've figured out how to do it.

ITW's in-lining is a modern variant of Henry Ford's Model-T assembly line, souped up with elements of what factory experts refer to as cellular manufacturing. At Elgin it meant moving the big green machines into rows (header followed by threader followed by pointer), junking the system of interdepartmental conveyor belts, and draining the central bath, which was replaced by washtubs at strategic spots along each production line.

The operators of each line perform all the functions needed to make a particular product. (At other ITW plants, assembly-line workers even take charge of ordering supplies, packaging, and labeling.)

When in-lining is done right, productivity soars, inventories dwindle, and work-in-process all but disappears. There is, however, an important catch: The practice works best on high-volume production. On low-volume runs, operators may spend so much time resetting machines that there are no gains in efficiency.

This, ITW found, is where the 80/20 rule comes in. With remarkable consistency, 80% of the business at any given plant tends to come from 20% of the customers, folks who order only a handful of products but in huge quantities. The converse is also true: 80% of the customers generate only 20% of the orders. These small-batch guys can drag down the productivity of an entire plant. The way around the problem is segregation: Apply in-lining to high-volume work and relegate low-volume production to a corner of the factory.

Once the jobs at Elgin were sorted this way, managers found scheduling so much easier that they jettisoned their mainframe and began keeping track of production on simple PCs. Executives were so taken with the results that their favorite gifts to suppliers and customers became brass and cork coasters emblazoned with the symbol "80/20."

The focused-factories idea carries in-lining a step further by turning production workers into entrepreneurs. ITW has spun off nine of Elgin's high-volume automotive component lines into their own small plants. The new facilities, which typically have no more than 25 workers, are sprinkled across the dairy land of Wisconsin, where labor is relatively cheap and the work ethic strong.

What ITW has done in Elgin it has also done, or is in the process of doing, at all its plants around the world, a transformation eased by the fact that almost none of the factories are unionized. Employees seem to like the change. Says Thelma Douglas, 42, who works on a line that makes automobile air conditioner valves in Mokena, Illinois: "It's like we have our own little factory. It makes you feel like you belong to something."

ITW's effort to spread the gospel of 80/20 to recent acquisitions has been more taxing. The toughest restructuring was at Signode, a packaging maker that ITW bought in 1986 for \$524 million, its biggest deal ever. A highly centralized company that had stumbled in its efforts to diversify, Signode had nothing in common with its new parent's amoeba-like style.

Its products, materials and machines used to pack, wrap, and strap industrial goods, appliances, and newspapers, were in demand; the main problems were bureaucracy and inflexibility. At headquarters in Glenview, Illinois, a gargantuan Amdahl mainframe, tended by scores of workers, controlled everything - manufacturing, purchasing, engineering, payroll, accounting, and planning. Says John Powers, a 32-year Signode veteran who now heads most of the former Signode operations: "We had a centralized business that could have run the whole federal government."

Nichols took on the reform of Signode as his personal mission. "It gave me something new to do," he jokes. "It got me out of the hair of my executive VPs, who had become pretty good at their jobs." Adds Powers: "John never came in and said, 'Here are your marching orders,' but he challenged us on how we did our work." With coaxing from Nichols, Powers disconnected the Amdahl and sold it. He cut \$20 million out of Signode's overhead. Now he is busy reorganizing the huge plastics plant next door to headquarters; later this summer some of the Glenview operations will be spun off into focused factories in Wisconsin and Iowa.

ITW has already boosted innovation at Signode. Says engineer Larry Shelton, 67, a 41-year veteran: "We're becoming more like entrepreneurs. We talk to the customer ourselves, rather than wait for the marketing people to come to us with ideas." The former Signode unit where Shelton works makes tools and nails for building contractors. It recently introduced the first (and, so far, only) power nailing tool that operates without a compressor and an air hose. Marketed as an alternative to the hammer, the \$889 Impulse is powered by a battery and a fuel cell.

Contractors give it rave reviews. Says Ron Wyncott, a general contractor in Libertyville, Illinois: "It saves wear and tear on my arm, and it cuts down on my need for extra

workers." ITW was less than thrilled, however, when the tool (which has multiple safety features) recently showed up as a lethal weapon in the film Lethal Weapon II.

Despite ITW's gains in efficiency, Nichols isn't satisfied. He says his campaign for simplification has met with only "partial success." Now that the factory floor is in pretty good shape, he has his eye on the front office: He wants to apply in-lining and the 80/20 rule to purchasing, billing, accounting, and customer service. It won't be easy teaching office workers to be more productive, but a company that can revolutionize the way screws are made is probably capable of just about anything.