



## CASE 27

# Nucor

This case was prepared by Frank C. Barnes of the University of North Carolina, Charlotte.

### INTRODUCTION

Nuclear Corporation of America had been near bankruptcy in 1965, when a fourth reorganization put a thirty-nine-year-old division manager, Ken Iverson, into the president's role. Iverson began a process that resulted in Nucor, a steel mini-mill and joist manufacturer, which rated national attention and reaped high praise.

In a 1981 article subtitled "Lean living and mini-mill technology have led a one-time loser to steel's promised land," *Fortune* stated:

Although Nucor didn't build his first mill until 1969, it turned out 1.1 million tons of steel last year, enough to rank among the top 20 U.S. producers. Not only has Nucor been making a lot of steel, it's been making money making steel—and a lot of that as well. Since 1969, earnings have grown 31% a year, compounded, reaching \$45 million in 1980 on sales of \$482 million. Return on average equity in recent years has consistently exceeded 28%, excellent even by Silicon Valley's standards and almost unheard of in steel. The nine-fold increase in the value of Nucor's stock over the last five years—it was selling recently at about \$70 a share—has given shareholders plenty of cause for thanksgiving.<sup>1</sup>

The *Wall Street Journal* commented, "The ways in which management style combines with technology to benefit the mini-mill industry is obvious at Nucor Corp., one of the most successful of the

forty or more mini-mill operators."<sup>2</sup> Ken Iverson was featured in an NBC special, "If Japan Can, Why Can't We?" for his management approach. As the *Wall Street Journal* commented, "You thought steel companies are only a bunch of losers, with stodgy management, outmoded plants and poor profits?" Well, Nucor and Iverson were different.

However, the challenges hadn't stopped. The economy made the 1980s a horrible time for the steel industry. All companies reported sales declines, most lost profitability and some, in both major and mini-mill operations, closed or restructured. Nucor's 30 percent plus return on equity hit 9 percent. Iverson, however, was one of fifty-two recipients of the bronze model from *Financial World* in 1983 for holding on to profitability; it kept costs down but not at the expense of laying off its people—a near-religious commitment at Nucor.

By 1990, Nucor was the ninth largest steel producer in the United States and number 323 on the *Fortune* 500 list. But the easy gains scored by the new mini-mill operations over the integrated mills were over. The historical steel companies were awakening from their twenty-year slumber, adding modern technology, renegotiating with their equally aged unions, and closing some mills. They were determined to fight back. Mini-mill was fighting mini-mill, as well as imports, and a number had closed. Thus the industry faced a picture of excess capacity which would be the backdrop in the battle for survival and success over the next years.

Iverson and Nucor knew how to fight the battle. They invested \$325 million in new processes in 1988. They went from \$185 million in idle cash in 1986 to \$180 million in debt by 1988. They had opened the first new fastener plant in the United States in decades, completed a joint venture with

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the Japanese to build a plant to make structural steel products, and built the first mini-mill in the world to make flat-rolled steel, the largest market and major business of the integrated producers. They had broken away from the other mini-mills and had at least a three-year headstart in taking a share of this market from the integrated mills. Iverson believed with their new products they should double sales, and probably earnings, by 1991. Analysts predicted a jump to seventh largest among mills and doubling or tripling share price in the immediate future.

## BACKGROUND

Nucor was the descendant of a company that manufactured the first Oldsmobile in 1897. After seven years of success, R. E. Olds sold his first company and founded a new one to manufacture the Reo. Reo ran into difficulties and filed for voluntary reorganization in 1938. Sales grew fifty times over the next ten years, based on defense business, but declined steadily after World War II. The motor division was sold and then resold in 1957 to the White Motor Corporation, where it operates as the Diamond Reo division. Reo Motors' management planned to liquidate the firm, but before it could do so, a new company gained control through a proxy fight. A merger was arranged with Nuclear Consultants, Inc., and the stock of Nuclear Corporation of America was first traded in 1955. Nuclear acquired a number of companies in high-tech fields but continued to lose money until 1960, when an investment banker in New York acquired control. New management proceeded with a series of acquisitions and dispositions: they purchased U.S. Semi-Conductor Products, Inc.; Valley Sheet Metal Company, an air conditioner contractor in Arizona; and Vulcraft Corporation, a Florence, South Carolina, steel joist manufacturer. Over the next four years, sales increased five times, but losses increased seven times. In 1965, a New York investor purchased a controlling interest and installed the fourth management team. The new president was Ken Iverson, who had been in charge of the Vulcraft division.

Ken Iverson had joined the Navy upon graduation from a Chicago-area high school in 1943. The Navy first sent him to Northwestern University for an officer training program but then decided it needed aeronautical engineers and transferred him

to Cornell. This had been "fine" with Iverson, because he enjoyed engineering. Upon receiving his bachelor's degree in 1945 at age twenty, he served in the Navy for six months, completing his four-year tour.

He wasn't too excited about an aeronautical engineering career because of the eight years of drafting required for success. Metals and their problems in aircraft design had intrigued him, so he considered a master's degree in metallurgy. An uncle had attended Purdue, so he chose that school. He married during this time, gave up teaching geometry so he could finish the program in one year, and turned down an offer of assistance toward a Ph.D. to "get to work."

At Purdue he had worked with the new electron microscope. International Harvester's research physics department had just acquired one and hired Iverson as assistant to the chief research physicist. Iverson stayed there five years and felt he was "set for life." He had great respect for his boss, who would discuss with him the directions businesses took and their opportunities. One day the chief physicist asked if that job was what he really wanted to do all his life. There was only one job ahead for Iverson at International Harvester and he felt more ambition than to end his career in that position. At his boss's urging, he considered smaller companies.

Iverson joined Illium Corporation, 120 miles from Chicago, as chief engineer (metallurgist). Illium was a sixty-person division of a major company but functioned like an independent company. Iverson was close to the young president and was impressed by his good business skill; this man knew how to manage and had the discipline to run a tight ship, to go in the right direction with no excess manpower. The two of them proposed an expansion, which the parent company insisted they delay three to four years until they could handle it without going into debt.

After two years at Illium, Iverson joined Indiana Steel products as assistant to the vice president of manufacturing, for the sole purpose of setting up a spectrographic lab. After completing this job within one year, he could see no other opportunity for himself in the company, because it was small and he could get no real responsibility. A year and a half later, Iverson left to join Cannon Muskegon as chief metallurgist.

The next seven years were "fascinating." This small (\$5-6 million in sales and sixty-to-seventy



people) family company made castings from special metals that were used in every aircraft made in the United States. The company was one of the first to get into "vacuum melting," and Iverson, because of his technical ability, was put in charge of this activity. Iverson then asked for and got responsibility for all company sales. He wasn't dissatisfied but realized that if he was to be really successful he needed broader managerial experience.

Cannon Muskegon sold materials to Coast Metals, a small, private company in New Jersey which cast and machined special alloys for the aircraft industry. The president of Coast got to know Iverson and realized his technical expertise would be an asset. In 1960 he joined Coast as executive vice president, with responsibility for running the whole company.

Nuclear Corporation of America wished to buy Coast; however, Coast wasn't interested. Nuclear's president then asked Iverson to act as a consultant to find metal businesses Nuclear could buy. Over the next year, mostly on weekends, he looked at potential acquisitions. He recommended buying a joist business in North Carolina. Nuclear said it would, if he would run it. Coast was having disputes among its owners and Iverson's future there was clouded. He ended his two years there and joined Nuclear in 1962 as a vice president, Nuclear's usual title, in charge of a 200-person joist division.

By late 1963, he had built a second plant in Nebraska and was running the only division making a profit. The president asked him to become a group vice president, adding the research chemicals (metals) and contracting businesses, and to move to the home office in Phoenix. In mid 1965 the company defaulted on two loans and the president resigned. During the summer Nuclear sought some direction out of its difficulty. Iverson knew what could be done, put together a pro-forma statement, and pushed for these actions. It was not a unanimous decision when he was made president in September 1965.

The new management immediately abolished some divisions and went to work building Nucor. According to Iverson, the vice presidents of the divisions designed Nucor in hard-working, almost T-group-type meetings. Iverson was only another participant and took charge only when the group couldn't settle an issue. This process identified Nucor's strengths and set the path for Nucor.

By 1966, Nuclear consisted of the two joist plants, the research chemicals division, and the nu-

clear division. During 1967, a building in Fort Payne, Alabama, was purchased for conversion into another joist plant. "We got into the steel business because we wanted to be able to build a mill that could make steel as cheaply as we were buying it from foreign importers or from offshore mills." In 1968 Nucor opened a steel mill in Darlington, South Carolina, and a joist plant in Texas. Another joist plant was added in Indiana in 1972. Steel plant openings followed in Nebraska in 1977 and in Texas in 1975. The Nuclear division was divested in 1976. A fourth steel plant was opened in Utah in 1981 and a joist plant was opened in Utah in 1982. By 1984, Nucor consisted of six joist plants, four steel mills, and a research chemicals division.

In 1983, in testimony before the Congress, Iverson warned of the hazards of trade barriers, that they would cause steel to cost more and that manufacturers would move overseas to use the cheaper steel shipped back into this country. He commented, "We have seen serious problems in the wire industry and the fastener industry." *Link* magazine reported that in the last four years, forty domestic fastener plants had closed and that imports had over 90 percent of the market.

In 1986, Nucor began construction of a \$25 million plant in Indiana to manufacture steel fasteners. Iverson told the *Atlanta Journal*, "We are going to bring that business back."<sup>3</sup> He told *Inc.* magazine, "We've studied for a year now, and we decided that we can make bolts as cheaply as foreign producers and make a profit at it."<sup>4</sup> He explained that in the old operation two people, one simply required by the union, made one hundred bolts a minute. "But at Nucor, we'll have an automated machine which will manufacture 400 bolts a minute. The automation will allow an operator to manage four machines." Hans Mueller, a steel industry consultant at East Tennessee State University, told the *Journal*, "I must confess that I was surprised that Iverson would be willing to dive into that snake pit. But he must believe that he can do it because he is not reckless."<sup>5</sup>

Before making the decision, a Nucor task force of four people traveled the world to examine the latest technology. The management group was headed by a plant manager who joined Nucor after several years' experience as general manager of a bolt company in Toronto. The manager of manufacturing was previously plant manager of a 40,000-ton melt-shop for Ervin Industries. The sales manager was a veteran of sales, distribution, and

manufacturing in the fastener industry. The plant's engineering manager transferred from Nucor R & D in Nebraska. The Touche-Ross accountant who worked on the Nucor account joined the company as controller. The first crew of production employees received three months of in-depth training on the bolt-making machines, with extensive cross-training in tool making, maintenance, and other operations. By 1988, the new plant was operating close to its capacity of 45,000 tons.

In what the *New York Times* called their "most ambitious project yet," Nucor signed an agreement in January 1987 to form a joint venture with Yamato Kogyo, Ltd., a small Japanese steel maker, to build a steel mill on the Mississippi River with a 600,000 ton per year capacity.<sup>6</sup> The \$200 million dollar plant would make very large structural products, up to 24 inches. Structural steel products are those used in large buildings and bridges. Iverson noted, "These are now only made by the Big Three integrated steel companies." The Japanese company, which would own 49 percent of the stock, had expertise in continuous-casting in which Nucor was interested. Their 1985 sales totaled \$400 million, with approximately 900 workers. They would provide the continuous-casting technology while Nucor would provide the melting technology and management style. The mill was completed in 1988 at a cost of \$220 million for 650,000 tons of capacity. By the end of 1988, the plant was operating at 50 percent of capacity.

In August 1986, Iverson told Cable News Network, "We are talking about within the next two years perhaps building a steel mill to make flat roll products; that would be the first time a mini-mill has been in this area."<sup>7</sup> It was expected that approximately \$10 million would be needed to develop this process. The thin-slab would also produce feed stock for Vulcraft's 250,000 tons per year steel deck operation. Although the project was considered pure research at the time and projected for "late 1988," the Division Manager stated, "The more we look into it, the more we feel we'll be able to successfully cast those slabs." This process would be the most significant development in the steel industry in decades and would open up the auto and appliance businesses to the mini-mills. Then in January 1987 plans were announced to build the \$200 million, 800,000 ton mill for the production of high-grade flat rolled steel by the first half of 1989. They stated, "We've tested numerous approaches . . . this one is commercially feasible. It's been tested and it can do the job."<sup>8</sup>

The flat rolled steel was the largest market for steel products at 40 million tons in 1988 and 52 percent of the U.S. market. This is the thin sheet steel used in car bodies, refrigerators, and countless products. Making flat rolled steel required casting a slab rather than a billet and had not been achieved in the mini-mill. Nucor had invested several million in research on a process but in 1986 chose to go with a technology developed by SMS, a West Germany company. SMS had a small pilot plant using the new technology and Nucor would be the first mini-mill in the world to manufacture flat rolled steel commercially.

The plant would be built in Crawfordsville, Indiana, with an April 1988 start-up. It was expected that labor hours per ton would be half the integrated manufacturer's 3.0, yielding a savings of \$50 to \$75 on a \$400 a ton selling price. If the project were completed successfully, Nucor planned to have three plants in operation before others could build. Investment advisers anticipated Nucor's stock could increase to double or triple by the mid 1990s. In July 1989, when Nucor announced a 14 percent drop in 2nd quarter earnings due to start-up costs, its stock went up \$1.62, to \$63. Iverson stated, "We hope this will map out the future of the company for the next decade."

However, it would not be as easy as earlier ventures. In April 1989, *Forbes* commented "if any mini-mill can meet the challenge, it's Nucor. But expect the going to be tougher this time around."<sup>9</sup> The flat-rolled market was the last bastion of the integrated manufacturers and they had been seriously modernizing their plants throughout the '80s.

In December 1986, Nucor announced its first major acquisition, Genbearco, a steel bearings manufacturer. At a cost of more than \$10 million, it would add \$25 million in sales and 250 employees. Iverson called it "a good fit with our business, our policies, and our people." It was without a union and tied pay to performance.

In October 1988, Nucor agreed to sell its Chemicals Division to a New York company for a \$38 million gain.

Nucor's innovation was not limited to manufacturing. In the steel industry, it was normal to price an order based on the quantity ordered. In 1984, Nucor broke that pattern. As Iverson stated, "Some time ago we began to realize that with computer order entry and billing, the extra charge for smaller orders was not cost justified. We found the cost of servicing a 20 ton order compared with a 60 ton



order was about 35 cents a ton and most of that was related to credit and collection. We did agonize over the decision, but over the long run we are confident that the best competitive position is one that has a strong price to cost relationship." He noted that this policy would give Nucor another advantage over foreign suppliers in that users could maintain lower inventories and order more often. "If we are going to successfully compete against foreign suppliers, we must use the most economical methods for both manufacturing and distribution."

## THE STEEL INDUSTRY

The early 1980s had been the worst years in decades for the steel industry. Data from the American Iron and Steel Institute showed shipments falling from 100.2 million tons in 1979 to the mid-80 levels in 1980 and 1981. Slackening in the economy, particularly in auto sales, led the decline. In 1986, when industry capacity was at 130 million tons, the outlook was for a continued decline in per capita consumption and movement toward capacity in the 90-100 million ton range. The chairman of Armco saw "millions of tons chasing a market that's not there; excess capacity that must be eliminated."

The large, integrated steel firms, such as U.S. Steel and Armco, which made up the major part of the industry, were the hardest hit. The *Wall Street Journal* stated, "The decline has resulted from such problems as high labor and energy costs in mining and processing iron ore, a lack of profits and capital to modernize plants, and conservative management that has hesitated to take risks."<sup>10</sup>

These companies produced a wide range of steels, primarily from ore processed in blast furnaces. They had found it difficult to compete with imports, usually from Japan, and had given up market share to imports. They sought the protection of import quotas. Imported steel accounted for 20 percent of the U.S. steel consumption, up from 12 percent in the early 1970s. The U.S. share of world production of raw steel declined from 19 percent to 14 percent over the period. Imports of light bar products accounted for less than 9 percent of U.S. consumption of those products in 1981, according to the U.S. Commerce Department, while imports of wire rod totaled 23 percent of U.S. consump-

tion. "Wire rod is a very competitive product in the world market because it's very easy to make," Ralph Thompson, the Commerce Department's steel analyst, told the *Charlotte Observer*.<sup>11</sup>

*Iron Age* stated that that exports, as a percent of shipments in 1985, were 34 percent for Nippon, 26 percent for British Steel, 30 percent for Krupp, 49 percent for USINOR of France, and less than 1 percent for every American producer on the list. The consensus of steel experts was that imports would average 23 percent of the market in the last half of the 1980s.<sup>12</sup>

Iverson was one of very few in the steel industry to oppose import restrictions. He saw an outdated U.S. steel industry which had to change.

About 12% of the steel in the U.S. is still produced by the old open hearth furnace. The Japanese shut down their last open hearth furnace about five years ago. . . . The U.S. produces about 16% of its steel by the continuous casting process. In Japan over 50% of the steel is continuously cast. . . . We Americans have been conditioned to believe in our technical superiority. For many generations a continuing stream of new inventions and manufacturing techniques allowed us to far outpace the rest of the world in both volume and efficiency of production. In many areas this is no longer true and particularly in the steel industry. In the last three decades, almost all the major developments in steel making were made outside the U.S. There were 18 continuous casting units in the world before there was one in this country. I would be negligent if I did not recognize the significant contribution that the government has made toward the technological deterioration of the steel industry. Unrealistic depreciation schedules, high corporate taxes, excessive regulation and jaw-boning for lower steel prices have made it difficult for the steel industry to borrow or generate the huge quantities of capital required for modernization.

By the mid 1980s the integrated mills were moving fast to get back into the game; they were restructuring, cutting capacity, dropping unprofitable lines, focusing products, and trying to become responsive to the market. The president of USX explained: "Steel executives, in trying to act as prudent businessmen, are seeking the lowest-cost

solutions to provide what the market wants." Karlis Kirsis, director of World Steel Dynamics at PaineWebber, told *Purchasing Magazine*, "The industry as we knew it five years ago is no more; the industry as we knew it a year ago is gone."<sup>13</sup>

*Purchasing* believed that buyers would be seeing a pronounced industry segmentation. There would be integrated producers making mostly flat-rolled and structural grades, reorganized steel companies making a limited range of products, mini-mills dominating the bar and light structural product areas, specialty steel firms seeking niches, and foreign producers. There would be accelerated shutdowns of older plants, elimination of products by some firms, and the installation of new product lines with new technologies by others. There would also be corporate facelifts as executives diversified from steel to generate profits and entice investment dollars. They saw the high-tonnage mills restructuring to handle sheets, plates, structurals, high quality bars, and large pipe and tubular products which would allow for a resurgence of specialized mills: cold-finished bar manufacturers, independent strip mills and mini-mills.<sup>14</sup>

Wheeling-Pittsburgh illustrated the change under way in the industry. Through Chapter 11 reorganization, it had cut costs by more than \$85 per ton. It divided into profit centers, negotiated the lowest hourly wage rate (\$18 per hour) among unionized integrated steel plants, renegotiated supply contracts, closed pipe and tube mills, and shut 1.6 million tons of blast furnace capacity in favor of an electric furnace with continuous casting.

PaineWebber pointed out the importance of "reconstituted mills," which it called the "People Express" of the industry. These were companies that had reorganized and refocused their resources, usually under Chapter 11. They included Kaiser Steel, the Weirton Works, Jones and Laughlin, Republic, Youngstown, Wheeling, LTV, and others.

Joint Ventures had arisen to produce steel for a specific market or region. The chairman of USX called them "an important new wrinkle in steel's fight for survival" and stated, "If there had been more joint ventures like these two decades ago, the U.S. steel industry might have built only half of the dozen or so hot-strip mills it put up in that time and avoided today's overcapacity." *Purchasing* observed, "The fact is that these combined operations are the result of a laissez-faire attitude within the

Justice Department under the Reagan administration following the furor when government restrictions killed the planned USS takeover of National Steel (which later sold 50 percent interest to a Japanese steelmaker)."<sup>15</sup>

However, the road ahead for the integrated mills would not be easy. While it was estimated they would need \$10 billion to improve their facilities, the industry had lost over \$7 billion since 1982. *Purchasing* pointed out that tax laws and accounting rules are slowing the closing of inefficient plants. Shutting down a 10,000-person plant could require a firm to hold a cash reserve of \$100 million to fund health, pension, and insurance liabilities. The chairman of Armco commented: "Liabilities associated with a plant shutdown are so large that they can quickly devastate a company's balance sheet."<sup>16</sup>

The American Iron and Steel Institute (AIS) reported steel production in 1988 of 99.3 million tons, up from 89.2 in 1987, and the highest in seven years. As a result of modernization programs, 60.9 percent of production was from continuous casters. Exports of steel were increasing, 2 million tons in 1988 and forecast to 3 in 1989, and imports were falling, expected to be less than 20 percent in 1989. Some steel experts believed the United States was now cost competitive with Japan. Several countries did not fill their quotas allowed under the five-year-old voluntary restraint agreements, which would expire in September 1989. The role of service centers in the distribution of steel continued with its fifth consecutive record year in 1988 of 23.4 million tons.

"If 1988 is remembered as the year of steel prosperity despite economic uncertainties, then 1989 is just as likely to go down as the year of 'waiting for the other shoe to drop,'" according to *Metal Center News* in January 1989.<sup>17</sup> The fears and the expectation of a somewhat weaker year arose from concerns about a recession, expiration of the voluntary import restraints, and labor negotiations schedules in several companies. Declines in car production and consumer goods were expected to hit flat-rolled hard. Service centers were also expected to be cutting back on inventories. AUJ Consultants told *MCN*, "The U.S. steel market has peaked. Steel consumption is tending down. By 1990, we expect total domestic demand to dip under 90 million tons."<sup>18</sup> Iverson expected 1989 to be mediocre compared with 1988.



## THE MINI-MILL

A new type of mill, the "mini-mill," emerged in the United States during the 1970s to compete with the integrated mill. The mini-mill used electric arc furnaces to manufacture a narrow product line from scrap steel. In 1981, the *New York Times* reported:

The truncated steel mill is to the integrated steel mill what the Volkswagen was to the American auto industry in the 1960's: smaller, cheaper, less complex and more efficient. Although mini-mills cannot produce such products as sheet steel [flat rolled] and heavy construction items, some industry analysts say it is only a matter of time before technological breakthroughs make this possible.<sup>19</sup>

Since mini-mills came into being in the 1970s, the integrated mills' market share has fallen from about 90 percent to about 60 percent, with the loss equally divided between mini-mills and foreign imports. While the integrated steel companies averaged a 7 percent return on equity, the mini-mills averaged 14 percent, and some, such as Nucor, achieved about 25 percent.

The leading mini-mills were Nucor, Florida Steel, Georgetown Steel (Korf Industries), North Star Steel, and Chaparral. Nucor produced "light bar" products: bars, angles, channels, flats, smooth round, and forging billets. It was beginning to make more alloy steels. Florida Steel made mostly reinforcing bar for construction (rebar) and dominated the Florida market. Korf Industries had two mini-mill subsidiaries, which used modern equipment to manufacture wire-rod.

The mini-mills were not immune to the economic slump in the early 1980s. Korf Industries, which owned Georgetown Steel, found its interest charges too large a burden and sought reorganization in 1983. In March 1983, Georgetown followed the historic wage cutting contract between the United Steel Workers of America and the major steel companies and asked its union to accept reductions and to defer automatic wage increases. In 1982, Nucor froze wages and executives took a 5 percent pay cut. Plants went to a four-day schedule in which workers would receive only base rate if they chose to work a fifth day doing cleanup.

Florida Steel, with two-thirds of its sales in Florida, also felt the impact. At its headquarters in Tampa, a staff of over 100 handled accounting, pay-

roll, sales entry, and almost all other services for all its facilities. Their division managers did not have sales responsibilities. Florida Steel experienced a sales decline for 1982 of 22 percent and an earnings drop from \$3.37 per share to a loss of \$1.40. The next year was also a year of losses.

Florida Steel employees had faced periodic layoffs during the recession. The firm was non-union (although the Charlotte plant lost an election in 1973) and pay was based on productivity. A small facility at Indian Town, near West Palm Beach, never became productive, even with personnel changes, and had to be closed. A new mini-mill in Tennessee was completed in late 1983.

Mini-mills had tripled their output in the last decade to capture 17 percent of domestic shipments. PaineWebber predicted the big integrated mills' share of the market would fall to 40 percent, the mini-mills' share would rise to 23 percent, "reconstituted" mills would increase from 11 percent to 28 percent, and specialized mills would increase their share from 1 percent to 7 percent. Iverson stated mini-mills could not go beyond a 35 percent to 40 percent share due to technical limitations; mini-mills could not produce the flat rolled sheet steel used in cars and appliances.

Iverson told *Metal Center News* in 1983: "We are very interested in the development of a thin slab, which would then allow mini-mills to produce plate and other flat rolled products . . . actually, the thinnest slab that can now be produced is about 6 inches thick. . . . (That results in a plant that is too large.) There are a number of people working to develop the process. . . . We have done some work, but our primary efforts at the moment are in connection with other people who are working on it. . . . The likelihood is it would be developed by a foreign company. There are more efforts by foreign steel companies in that direction than in the United States. . . . I'd say probably a minimum of three to five years, or it could take as much as 10 to achieve this."<sup>20</sup>

In 1983, Iverson described the new generation of mini-mills he foresaw: "If you go way back, mini-mills got started by rolling reinforcing bar. With the advent of continuous casting and improvements in rolling mills, mini-mills gradually got into shapes. Now they have moved in two other directions: one being to larger sizes, and the other being a growing metallurgical expertise for improved product quality and production of special bar quality in alloys.

Both of these represent expansion of markets for mini-mills."

By 1986, the new competitive environment was apparent. Four mini-mills had closed their doors within the year and Iverson saw that more shut-downs were ahead. The overcapacity of steel bar products and the stagnant market had made it difficult for some companies to generate the cash needed to modernize and expand their product lines. "The mini-mills are going through the same kind of restructuring and rethinking as the integrated mill. They know the problem of overcapacity isn't going to go away quickly. And, for some of the remaining firms to survive, they will have to move into more sophisticated products like special quality and clean-steel bars and heavier structurals and, once the technology is perfected, flat-rolled products. You won't see the market growth by the mini-mills the way it was in the past until the overcapacity issue is resolved and the mills begin entering new product areas."

## ORGANIZATION

Nucor, with its eighteen-person corporate office located in Charlotte, North Carolina, had divisions spread across the United States. The 15 divisions, one for every plant, each had a general manager, who was also a vice-president of the corporation, directly responsible to Iverson and Aycock. (See Figure 1.) The divisions were of two basic types, joist plants and steel mills. The corporate staff consisted of single specialists in personnel and planning and a four-person financial function under Sam Siegel. Iverson, in the beginning, had chosen Charlotte "as the new home base for what he had envisioned as a small cadre of executives who would guide a decentralized operation with liberal authority delegated to managers in the field," according to *South Magazine*.<sup>21</sup>

Iverson gave his views on organization:

You can tell a lot about a company by looking at its organization chart. . . . If you see a lot of staff, you can bet it is not a very efficient organization. . . . Secondly, don't have assistants. We do not have that title and prohibit it in our company. . . . In this organization nobody reports to the corporate office; the division managers report directly to me. . . . And one of the most important things is to resist as much as possible the number of management layers. . . . I've often

thought that when a company builds a fancy corporate office, it's on its way down.

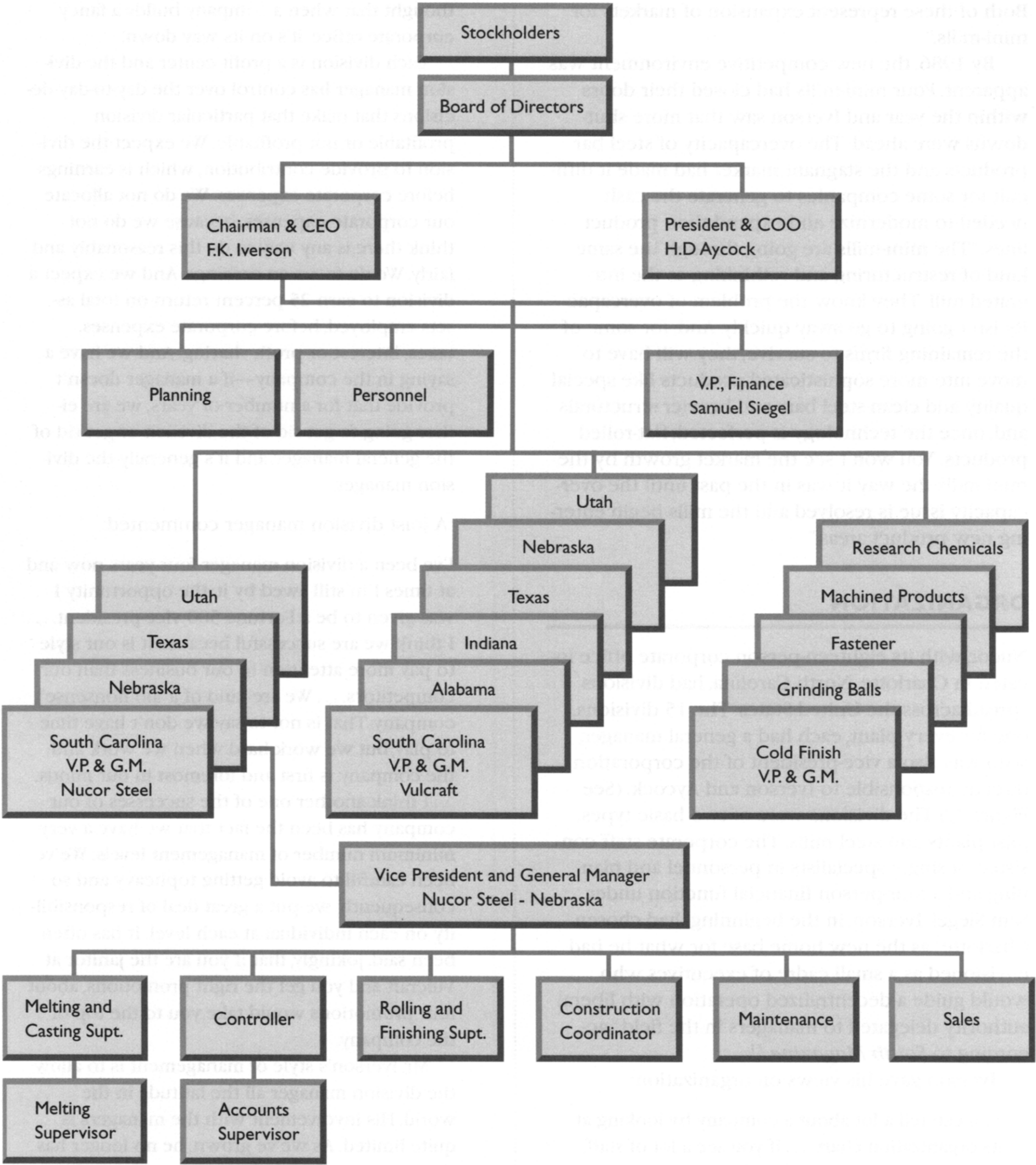
Each division is a profit center and the division manager has control over the day-to-day decisions that make that particular division profitable or not profitable. We expect the division to provide contribution, which is earnings before corporate expenses. We do not allocate our corporate expenses, because we do not think there is any way to do this reasonably and fairly. We do focus on earnings. And we expect a division to earn 25 percent return on total assets employed, before corporate expenses, taxes, interest or profit sharing. And we have a saying in the company—if a manager doesn't provide that for a number of years, we are either going to get rid of the division or get rid of the general manager, and it's generally the division manager.

A joist division manager commented:

I've been a division manager four years now and at times I'm still awed by it: the opportunity I was given to be a Fortune 500 vice-president. . . . I think we are successful because it is our style to pay more attention to our business than our competitors. . . . We are kind of a "no nonsense" company. That is not to say we don't have time to play, but we work hard when we work and the company is first and foremost in our minds. . . . I think another one of the successes of our company has been the fact that we have a very minimum number of management levels. We've been careful to avoid getting topheavy and so consequently we put a great deal of responsibility on each individual at each level. It has often been said, jokingly, that if you are the janitor at Vulcraft and you get the right promotions, about four promotions would take you to the top of the company.

Mr. Iverson's style of management is to allow the division manager all the latitude in the world. His involvement with the managers is quite limited. As we've grown, he no longer has the time to visit with the managers more than one or twice a year. . . . Whereas in many large companies the corporate office makes the major decisions and the people at the operating level sit back to wait for their marching orders, that's not the case at Nucor. . . . In a way I feel like I run my own company because I really don't get any marching orders from Mr. Iverson.





**FIGURE 1**  
Nucor Organizational Chart

He lets you run the division the way you see fit and the only way he will step in is if he sees something he doesn't like, particularly bad profits, high costs or whatever. But in the years I've worked with him I don't believe he has ever issued one single instruction to me to do something differently. I can't recall a single instance.

The divisions did their own manufacturing, selling, accounting, engineering, and personnel management. A steel division manager, when questioned about Florida Steel, which had a large plant 90 miles away, commented, "I really don't know anything about Florida Steel. . . . I expect they do have more of the hierarchy. I think they have central purchasing, centralized sales, centralized credit collections, centralized engineering, and most of the major functions." He didn't feel greater centralization would be good for Nucor. "The purchasing activity, for example, removed from the field tends to become rather insensitive to the needs of the field and does not feel the pressures of responsibility. And the division they are buying for has no control over what they pay. . . . Likewise centralized sales would not be sensitive to the needs of their divisions."<sup>22</sup>

*South Magazine* observed that Iverson had established a characteristic organizational style described as "stripped down" and "no nonsense." "Jack Benny would like this company," observed Roland Underhill, an analyst with Crowell, Weedon and Co. of Los Angeles; "so would Peter Drucker." Underhill pointed out that Nucor's thriftiness doesn't end with its "spartan" office staff or modest offices. "There are no corporate perquisites," he recited. "No company planes. No country club memberships. No company cars."<sup>23</sup>

*Fortune* reported, "Iverson takes the subway when he is in New York, a Wall Street analyst reports in a voice that suggests both admiration and amazement."<sup>24</sup> The general managers reflected this style in the operation of their individual divisions. Their offices were more like plant offices or the offices of private companies built around manufacturing rather than for public appeal. They were simple, routine, and businesslike.

In 1983, one of Iverson's concerns had been that as Nucor continued to grow they would have to add another layer of management to their lean structure. In June 1984 he named Dave Aycock president and chief operating officer, while he became chairman and chief executive officer—they

would share one management level. Aycock had most recently been Division Manager of the steel mill at Darlington. But he had been with the company longer than Iverson, having joined Vulcraft in 1955, and had long been recognized as a particularly valued and close adviser to Iverson.

Iverson explained: "The company got to the size that I just wasn't doing the job that I thought should be done by this office. I couldn't talk to the analysts and everyone else I have to talk to, put the efforts into research and development I wanted to, and get to all the units as frequently as I should. That's why I brought Dave in. And, of course, he has been with the company forever." In a February 1985 letter, he told stockholders: "These changes are to provide additional emphasis on the expansion of the company's businesses."

"Dave is a very analytical person and very thorough in his thought process," another division manager told *33 Metal Producing*, a McGraw-Hill publication. "And Ken, to use an overworked word, is an entrepreneurial type. So, they complement each other. They're both very aggressive men, and make one hell of a good team."<sup>25</sup> Aycock stated: "I am responsible for the operations of all our divisions. To decide where we are going, with what technologies; what are our purposes. And what is our thrust. I help Ken shape where we are going and with what technologies. . . . I've been quite aggressive my whole career at updating, adapting, and developing new technology and new ideas in production and marketing. "Dave's the fellow who now handles most of the day-to-day operations," Iverson commented. "And he handles most of the employees who write to us"—about 10 to 15 percent of his time.<sup>26</sup>

## DIVISION MANAGERS

The general managers met three times a year. In late October, they presented preliminary budgets and capital requests. In late February, they met to finalize budgets and treat miscellaneous matters. Then, at a meeting in May, they handled personnel matters, such as wage increases and changes of policies or benefits. The general managers as a group considered the raises for the department heads, the next lower level of management. As one of the managers described it,<sup>27</sup>

In May of each year, all the general managers get together and review all the department heads



throughout the company. We have kind of an informal evaluation process. It's an intangible thing, a judgment as to how dedicated an individual is and how well he performs compared to the same position at another plant. Sometimes the numbers don't come out the way a general manager wants to see them, but it's a fair evaluation. The final number is picked by Mr. Iverson. Occasionally there are some additional discussions with Mr. Iverson. He always has an open mind and might be willing to consider a little more for one individual. We consider the group of, say, joist production managers at one time. The six managers are rated for performance. We assign a number, such as +3 to a real crackerjack performer or a -2 to someone who needs improvement. These ratings become a part of the final pay increase granted.

The corporate personnel manager described management relations as informal, trusting, and not "bureaucratic." He felt that there was a minimum of paperwork, that a phone call was more common and that no confirming memo was thought to be necessary. Iverson himself stated:

Management is not a popularity contest. If everybody agrees with the organization, something is wrong with the organization. You don't expect people in the company to put their arms around each other, and you don't interfere with every conflict. Out of conflict often comes the best answer to a particular problem. So don't worry about it. You are always going to have some conflict in an organization. You will always have differences of opinion, and that's healthy. Don't create problems where there are none.

A Vulcraft manager commented: "We have what I would call a very friendly spirit of competition from one plant to the next. And of course all of the vice presidents and general managers share the same bonus systems so we are in this together as a team even though we operate our divisions individually." The general managers are paid a bonus based on a total corporate profit rather than their own divisions' profits. A steel mill manager explained:

I think it's very important for the general managers to be concerned with contributing to the overall accomplishment of the company. There is a lot of interplay between the divisions with a flow of services, products, and ideas between di-

visions. Even though we are reasonably autonomous, we are not isolated. . . . We don't like the division managers to make decisions that would take that division away from where we want the whole company to go. But we certainly want the divisions to try new things. We are good copiers; if one division finds something that works, then we will all try it. I think that's one of our strengths. We have a lot of diverse people looking at ways to do things better.

Iverson revealed his view of management in his disdain for consultants:

They must have a specific job to do because they can't make your decisions. . . . The fellow on the line has to make decisions. . . . First he has to communicate and then he has to have the intestinal fortitude and the personal strength to make the decisions, sometimes under very difficult conditions. . . . A good manager is adaptable and he is sensitive to cultural, geographical, environmental, and business climates. Most important of all, he communicates. . . . You never know if someone is a good manager until he manages. And that's why we take people as young as we possibly can, throw responsibility at them, and they either work or they don't. In a sense it's survival of the fittest. But don't kid yourself; that's what industry is all about.

A steel division manager commented in comparing the Nucor manager with the typical manager of a large corporation:

We would probably tend to have managers who have confidence in their abilities and, very importantly, have confidence in other people in their division. And people who are very sensitive to the employees of their division. . . . But I think if you saw four or five different division managers, you'd have four or five different decision-making styles.

A Vulcraft general manager in his early forties who had been promoted to the division manager level nine years earlier said:

The step from department manager to division manager is a big one. I can't think of an instance when a general manager job has been offered to an individual that it has been passed up. Often it means moving from one part of the country to another. There are five department heads in six

joist plants, which means there are 30 people who are considered for division manager slots at a joist plant. Mr. Iverson selects the division managers.

His own experience was enlightening:

When I came to this plant four years ago, we had too many people, too much overhead. We had 410 people at the plant and I could see, because I knew how many people we had in the Nebraska plant, we had many more than we needed. That was my yardstick and we set about to reduce those numbers by attrition. . . . We have made a few equipment changes that made it easier for the men, giving them an opportunity to make better bonuses. Of course the changes were very subtle in any given case but overall in four years we have probably helped the men tremendously. With 55 fewer men, perhaps 40 to 45 fewer in the production area, we are still capable of producing the same number of tons as four years ago.

The divisions managed their act with the corporate staff. Each day disbursements were reported to Siegel's office. Payments flowed into regional lock boxes. On a weekly basis, joist divisions reported total quotes, sales cancellations, backlog, and production. Steel mills reported tons-rolled, outside shipments, orders, cancellations, and backlog. Iverson graphed the data. He might talk to the division about every two weeks. On the other hand, Iverson was known to bounce ideas off the steel division manager in Darlington with whom he had worked since joining the company.

The Vulcraft manager commented on the communications with the corporate office: "It's kind of a steady pipeline. I might talk to the corporate office once a day or it might be once a week. But it generally involves, I would not say trivial information, just mundane things. Occasionally I hear from Sam or Ken about serious matters."

Each month the divisions completed a two-page (11 by 17 inches) "Operations Analysis" which was sent to all the managers. Its three main purposes were (1) financial consolidation, (2) sharing information among the divisions, and (3) Iverson's examination. The summarized information and the performance statistics for all the divisions were then returned to the managers.

## VULCRAFT—THE JOIST DIVISIONS

Half of Nucor's business was the manufacture and sale of open web steel joists and joist girders at six Vulcraft divisions located in Florence, South Carolina; Norfolk, Nebraska; Ft. Payne, Alabama; Grapeland, Texas; St. Joe, Indiana; and Brigham City, Utah. Open web joists, in contrast to solid joists, were made of steel angle iron separated by round bars or smaller angle iron (see Figure 2).

These joists were costless and of lower greater strength for many applications and were used primarily as the roof support systems in larger buildings, such as warehouses and stores.

The joist industry was characterized by high competition among many manufacturers for many small customers. The Vulcraft divisions had over 3,000 customers, none of whom dominated the business. With an estimated 25 percent of the market, Nucor was the largest supplier in the United States. It utilized national advertising campaigns and prepared competitive bids on 80 percent to 90 percent of buildings using joists. Competition was based on price and delivery performance. Nucor had developed computer programs to prepare designs for customers and to compute bids based on current prices and labor standards. In addition, each Vulcraft plant maintained its own engineering department to help customers with design problems or specifications. The Florence manager commented, "Here on the East Coast we have six or seven major competitors; of course none of them are as large as we are. The competition for any order will be heavy, and we will see six or seven different prices."<sup>28</sup> He added, "I think we have a strong selling force in the marketplace. It has been said to us by some of our competitors that in this particular industry we have the finest selling organization in the country."

Nucor aggressively sought to be the lowest-cost producer in the industry. Materials and freight were two important elements of cost. Nucor maintained its own fleet of almost 100 trucks to ensure on-time delivery to all of the states, although most business was regional because of transportation costs. Plants were located in rural areas near the markets they served.

The Florence manager stated:

I don't feel there's a joist producer in the country that can match our cost. . . . We are sticklers



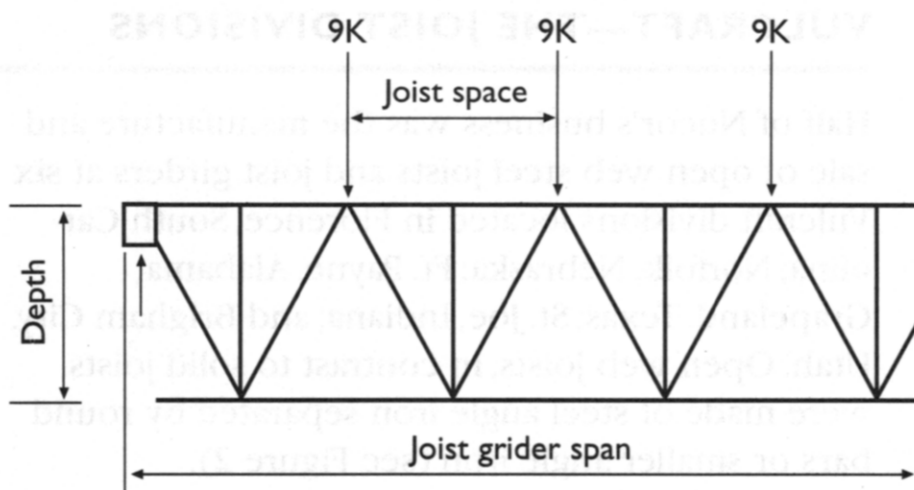
**FIGURE 2**

Illustration of Joists

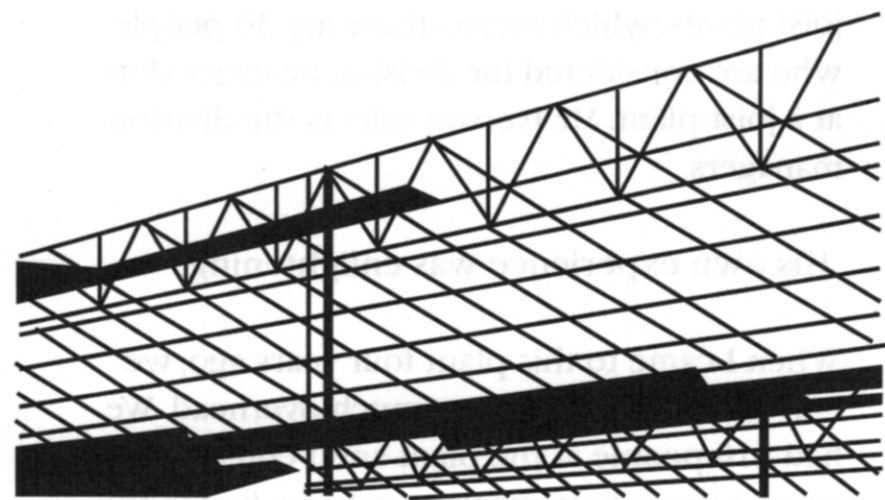
about cutting out unnecessary overhead. Because we put so much responsibility on our people and because we have what I think is an excellent incentive program, our people are willing to work harder to accomplish these profitable goals.

### Production

On the basic assembly line used at Nucor, three or four of which might make up any one plant, about 6 tons per hour would be assembled. In the first stage, eight people cut the angles to the right lengths or bent the round bars to desired form. These were moved on a roller conveyor to six-man assembly stations, where the component parts would be tacked together for the next stage, welding. Drilling and miscellaneous work were done by three people between the lines. The nine-man welding station completed the welds before passing the joists on roller conveyers to two-man inspection teams. The last step before shipment was the painting.

The workers had control over and responsibility for quality. There was an independent quality control inspector who had authority to reject the run of joists and cause them to be reworked. The quality control people were not under the incentive system and reported to the engineering department.

Daily production might vary widely, since each joist was made for a specific job. The wide range of joists made control of the workload at each station difficult; bottlenecks might arise anywhere along



(b)

the line. Each workstation was responsible for identifying such bottlenecks so that the foreman could reassign people promptly to maintain productivity. Since workers knew most of the jobs on the line, including the more skilled welding job, they could be shifted as needed. Work on the line was described by one general manager as "not machine type but mostly physical labor." He said the important thing was to avoid bottlenecks.

There were four lines of about twenty-eight people each on two shifts at the Florence division. The jobs on the line were rated on responsibility and assigned a base wage, from \$6 to \$8 per hour. In addition, a weekly bonus was paid on the total output of each line. Each worker received the same percent bonus on his base wage.

The amount of time required to make a joist had been established as a result of experience; the general manager had seen no time studies in his fifteen years with the company. As a job was bid, the cost of each joist was determined through the computer program. The time required depended on the length, number of panels, and depth of the joist.

At the time of production, the labor value of production, the standard, was determined in a similar manner. The general manager stated, "In the last nine or ten years we have not changed a standard." The standards list in use was over ten years old. Previously, they adjusted the standard if the bonus was too high. He said the technological improvements over the last few years had been small. The general manager reported that the bonus had increased from about 60 percent nine years earlier to

**TABLE 1**

**Tons per Manhour, Fifty-two-Week  
Moving Average**

1977	.163
1978	.179
1979	.192
1980	.195
1981	.194
1982	.208
1983	.215
1984	.214
1985	.228
1986	.225
1987	.218

about 100 percent in 1982 and had stabilized at that point. Tables 1 and 2 show data typically computed on performance and used by the manager. He said the difference in performance on the line resulted from the different abilities of the crews:

We don't have an industrial engineering staff. Our Engineering Department's work is limited to the design and the preparation of the paperwork prior to the actual fabrication process. Now, that is not to say that we don't have any involvement in fabrication. But the efficiency of the plant is entirely up to the manufacturing department. . . . When we had our first group in a joist plant, we produced 3½ tons an hour. We thought that if we ever got to 4 tons, that would

**TABLE 2**

**A Sample of Percentage  
Performance, July 1982**

Shift		Line			
		1	2	3	4
1st		117	97	82	89
2nd		98	102	94	107

be the Millennium. Well, today we don't have anybody who produces less than 6½ tons an hour. This is largely due to improvements that the groups have suggested.

### Management

In discussing his philosophy for dealing with the work force, the Florence manager stated:<sup>29</sup>

I believe very strongly in the incentive system we have. We are a non-union shop and we all feel that the way to stay so is to take care of our people and show them we care. I think that's easily done because of our fewer layers of management. . . . I spend a good part of my time in the plant, maybe an hour or so a day. If a man wants to know anything, for example, an insurance question, I'm there and they walk right up to me and ask me questions which I'll answer the best I know how. . . . You can always tell when people are basically happy. If they haven't called for a meeting themselves or they are not hostile in any way, you can take it they understand the company's situation and accept it. . . . We do listen to our people. . . . For instance last fall I got a call from a couple of workers saying that people in our Shipping and Receiving area felt they were not being paid properly in relation to production people. So we met with them, discussed the situation and committed ourselves to reviewing the rates of other plants. We assured them that we would get back to them with an answer by the first of the year. Which we did. And there were a few minor changes.

The manager reported none of the plants had any particular labor problems, although there had been some in the past.

In 1976, two years before I came here, there was a union election at this plant which arose out of racial problems. The company actually lost the election to the U.S. Steelworkers. When it came time to begin negotiating the contract, the workers felt, or came to see, that they had little to gain from being in the union. The union was not going to be able to do anything more for them than they were already doing. So slowly the union activity died out and the union quietly withdrew.



He discussed formal systems for consulting with the workers before changes were made:

In the economic slump of 1982, we scheduled our line for four days, but the men were allowed to come in the fifth day for maintenance work at base pay. The men in the plant on an average running bonus might make \$13 an hour. If their base pay is half that, on Friday they would only get \$6-\$7 an hour. Surprisingly, many of the men did not want to come in on Friday. They felt comfortable with just working four days a week. They are happy to have that extra day off. Of course we're cautioned by our labor counsel to maintain an open pipeline to our employees. We post all changes, company earnings, changes in the medical plan, anything that might affect an employee's job. Mr. Iverson has another philosophy, which is, "Either tell your people everything or tell them nothing." We choose to tell them everything. We don't have any regularly scheduled meetings. We meet whenever there's a need. The most recent examples were a meeting last month to discuss the results of an employee survey and three months before we held our annual dinner meetings off site.

We don't lay our people off and we make a point of telling our people this.

Recently the economic trouble in Texas had hurt business considerably. Both plants had been on decreased schedules for several months. About 20 percent of the people took the fifth day at base rate, but still no one had been laid off.

In April 1982, the executive committee decided, in view of economic conditions, that a pay freeze was necessary. The employees normally received an increase in their base pay the first of June. The decision was made at that time to freeze wages. The officers of the company, as a show of good faith, accepted a 5 percent pay cut. In addition to announcing this to the workers with a stuffer in their pay envelopes, meetings were held. Each production line, or incentive group of workers, met in the plant conference room with all supervision—foreman, plant production manager, and division manager. The economic crisis was explained to the employees by the production manager and all questions were answered.

## STEEL DIVISIONS

Nucor had steel mills in five locations: Indiana, Nebraska, South Carolina, Texas, and Utah. The mills were modern mini-mills, all built within the last twenty years to convert scrap steel into standard angles, flats, rounds, and channels using the latest technology. Sales in 1988 were 1.44 tons, a 10 percent increase over those of 1987. This figure represented about 70 percent of the mills' output, the remainder being used by other Nucor divisions. In recent years, Nucor has broadened its product line to include a wider range of steel chemistries, sizes, and special shapes. The total capacity of the mills reached 2.8 tons in 1988.

A case writer from Harvard recounted the development of the steel divisions:

By 1967 about 60% of each Vulcraft sales dollar was spent on materials, primarily steel. Thus, the goal of keeping costs low made it imperative to obtain steel economically. In addition, in 1967 Vulcraft bought about 60% of its steel from foreign sources. As the Vulcraft Division grew, Nucor became concerned about its ability to obtain an adequate economical supply of steel and in 1968 began construction of its first steel mill in Darlington, South Carolina. By 1972 the Florence, South Carolina, joist plant was purchasing over 90% of its steel from this mill. The Fort Payne plant bought about 50% of its steel from Florence. The other joist plants in Nebraska, Indiana and Texas found transportation costs prohibitive and continued to buy their steel from other steel companies, both foreign and domestic. Since the mill had excess capacity, Nucor began to market its steel products to outside customers. In 1972, 75% of the shipments of Nucor steel was to Vulcraft and 25% was to other customers.<sup>30</sup>

Iverson explained in 1984:

In constructing these mills we have experimented with new processes and new manufacturing techniques. We serve as our own general contractor and design and build much of our own equipment. In one or more of our mills we have built our own continuous casting unit, reheat furnaces, cooling beds and in Utah even our own mill stands. All of these to date have

cost under \$125 per ton of annual capacity—compared with projected costs for large integrated mills of \$1,200–1,500 per ton of annual capacity, ten times our cost. Our mills have high productivity. We currently use less than four man hours to produce a ton of steel. This includes everyone in the operation: maintenance, clerical, accounting, and sales and management. On the basis of our production workers alone, it is less than three man hours per ton. Our total employment costs are less than \$60 per ton compared with the average employment costs of the seven largest U.S. steel companies of close to \$130 per ton. Our total labor costs are less than 20% of our sales price.

In contrast to Nucor's less than four man hours, similar Japanese mills were said to require more than five hours and comparable U.S. mills over six hours. Nucor's average yield from molten metal to finished products was over 90 percent compared with an average U.S. steel industry yield of about 74 percent, giving energy costs of about \$39 per ton compared with their \$75 a ton. Nucor ranked 46th on *Iron Age's* annual survey of world steel producers. It was second on the list of top ten producers of steel worldwide based on tons per employee, at 981 tons. At the head of the list was Tokyo Steel at 1,485. U.S. Steel was seventh at 479. Some other results were: Nippon Steel, 453; British Steel, 213; Bethlehem Steel, 329; Kruppstahl, 195; Weirton Steel, 317; and Northstar Steel, 936. Nucor also ranked seventh on the list ranking growth of raw steel production. U.S. Steel was fifth on the same list. U.S. Steel topped the list based on improvement in tons-per-employee, at 56 percent; Nucor was seventh with a 12 percent improvement.<sup>31</sup>

## THE STEEL-MAKING PROCESS

A steel mill's work is divided into two phases, preparation of steel of the proper "chemistry" and the forming of the steel into the desired products. The typical mini-mill utilized scrap steel, such as junk auto parts, instead of the iron ore that would be used in larger, integrated steel mills. The typical mini-mill had an annual capacity of 200–600 thousand tons, compared with the 7 million tons of Bethlehem Steel's Sparrow's Point, Maryland, integrated plant.

A charging bucket fed loads of scrap steel into electric arc furnaces. The melted load, called a heat, was poured into a ladle to be carried by an overhead crane to the casting machine. In the casting machine, the liquid steel was extruded as a continuous red-hot solid bar of steel and cut into lengths weighing some 900 pounds, called "billets." In the typical plant, the billet, about 4 inches in cross section and about 20 feet long, was held temporarily in a pit where it cooled to normal temperatures. Periodically, billets were carried to the rolling mill and placed in a reheat oven to bring them up to 2000°F, at which temperature they would be malleable. In the rolling mill, presses and dies progressively converted the billet into the desired round bars, angles, channels, flats, and other products. After being cut to standard lengths, they were moved to the warehouse.

Nucor's first steel mill, employing more than 500 people, was located in Darlington, South Carolina. The mill, with its three electric arc furnaces, operated twenty-four hours per day, five and a half days per week. Nucor had made a number of improvements in the melting and casting operations. The former general manager of the Darlington plant had developed a system that involved preheating the ladles, allowing for the faster flow of steel into the caster and resulting in better control of the steel characteristics. Less time and lower capital investment were required. The casting machines were "continuous casters," as opposed to the old batch method. The objective in the "front" of the mill was to keep the casters working. At the time of the Harvard study at Nucor each strand was in operation 90 percent of the time, while a competitor had announced a "record rate" of 75 percent, which it had been able to sustain for a week.

Nucor was also perhaps the only mill in the country that regularly avoided the reheating of billets. This saved \$10–12 per ton in fuel usage and losses due to oxidation of the steel. The cost of developing this process had been \$12 million. All research projects had not been successful. The company spent approximately \$2 million in an unsuccessful effort to utilize resistance-heating. They lost even more on an effort at induction melting. As Iverson told *33 Metal Producing*, "That cost us a lot of money. Timewise it was very expensive. But you have got to make mistakes and we've had lots of failures."<sup>32</sup> In the rolling mill, the first machine



was a roughing mill by Morgarshammar, the first of its kind in the Western Hemisphere. This Swedish machine had been chosen because of its lower cost, higher productivity, and the flexibility. Passing through another five to nine finishing mills converted the billet into the desired finished product. The yield from the billet to finished product was about 93 percent.

The Darlington design became the basis for plants in Nebraska, Texas, and Utah. The Texas plant had cost under \$80 per ton of annual capacity. Whereas the typical mini-mill cost approximately \$250 per ton, the average cost of all four of Nucor's mills was under \$135. An integrated mill was expected to cost between \$1,200 and \$1,500 per ton.

The Darlington plant was organized into twelve natural groups for the purpose of incentive pay: two mills, each had two shifts with three groups—melting and casting, rolling mill, and finishing. In melting and casting there were three or four different standards, depending on the material, established by the department manager years ago based on historical performance. The general manager stated, "We don't change the standards." The caster, the key to the operation, was used at a 92 percent level—one greater than the claims of the manufacturer. For every good ton of billet above the standard hourly rate for the week, workers in the group received a 4 percent bonus. For example, with a common standard of 10 tons per run hour and an actual rate for the week of 28 tons per hour, the workers would receive a bonus of 72 percent of their base rate in the week's paycheck.

In the rolling mill there were more than 100 products, each with a different historical standard. Workers received a 4 percent to 6 percent bonus for every good ton sheared per hour for the week over the computed standard. The Darlington general manager said that the standard would be changed only if there was a major machinery change and that a standard had not been changed since the initial development period for the plant. He commented that in exceeding the standard the worker wouldn't work harder but would cooperate to avoid problems and move more quickly if a problem developed: "If there is a way to improve output, they will tell us." Another manager added: "Meltshop employees don't ask me how much it costs Chaparral or LTV to make a billet. They want to know what it costs Darlington, Norfolk, Jewitt to

put a billet on the ground—scrap costs, alloy costs, electrical costs, refractory, gas, etc. Everybody from Charlotte to Plymouth watches the nickels and dimes."<sup>33</sup>

The Darlington manager, who became COO in 1984, stated:

The key to making a profit when selling a product with no aesthetic value, or a product that you really can't differentiate from your competitors, is cost. I don't look at us as a fantastic marketing organization, even though I think we are pretty good; but we don't try to overcome unreasonable costs by mass marketing. We maintain low costs by keeping the employee force at the level it should be, not doing things that aren't necessary to achieve our goals, and allowing people to function on their own and by judging them on their results.

To keep a cooperative and productive workforce you need, number one, to be completely honest about everything; number two, to allow each employee as much as possible to make decisions about that employee's work, to find easier and more productive ways to perform duties; and number three, to be as fair as possible to all employees. Most of the changes we make in work procedures and in equipment come from the employees. They really know the problems of their jobs better than anyone else. We don't have any industrial engineers, nor do we ever intend to, because that's a type of specialist who tends to take responsibility off the top division management and give them a crutch.

To communicate with my employees, I try to spend time in the plant and at intervals have meetings with the employees. Usually if they have a question they just visit me. Recently a small group visited me in my office to discuss our vacation policy. They had some suggestions and, after listening to them, I had to agree that the ideas were good.<sup>34</sup>

## THE INCENTIVE SYSTEM

The foremost characteristic of Nucor's personnel system was its incentive plan. Another major personnel policy was providing job security. Also all employees at Nucor received the same fringe bene-

fits. There was only one group insurance plan. Holidays and vacations did not differ by job. The company had no executive dining rooms or restrooms, no fishing lodges, no company cars, or reserved parking places.

Absenteeism and tardiness were not problems at Nucor. Each employee had four days of absence before pay was reduced. In addition to these, missing work was allowed for jury duty, military leave, or the death of close relatives. After this, a day's absence cost them bonus pay for that week and lateness of more than a half hour meant the loss of bonus for that day.

Employees were kept informed about the company. Charts showing the division's results in return-on-assets and bonus payoff were posted in prominent places in the plant. The personnel manager commented that as he traveled around to all the plants, he found everyone in the company could tell him the level of profits in their division. The general managers held dinners at least twice a year with their employees. The dinners were held with fifty or sixty employees at a time. After introductory remarks, the floor was open for discussion of any work-related problems. The company also had a formal grievance procedure. The Darlington manager couldn't recall the last grievance he had processed.

There was a new employee orientation program and an employee handbook, which contained personnel policies and rules. The corporate office sent all news releases to each division where they were posted on bulletin boards. Each employee in the company also received a copy of the Annual Report. For the last several years the cover of the Annual Report had contained the names of all Nucor employees. Every child of every Nucor employee received up to \$1,200 a year for four years if he or she chose to go on to higher education, including technical schools.

The average hourly worker's pay was \$31,000, compared with the average earnings in manufacturing in that state of slightly more than \$13,000. The personnel manager believed that pay was not the only thing the workers liked about Nucor. He said that an NBC interviewer, working on the documentary "If Japan Can, Why Can't We," often heard, "I enjoy working for Nucor because Nucor is the best, the most productive, and the most profitable company that I know of."<sup>35</sup>

"I honestly feel that if someone performs well, they should share in the company and if they are going to share in the success, they should also share in the failures," Iverson stated.<sup>36</sup> There were four incentive programs at Nucor, one each for production workers, department heads, staff people such as accountants, secretaries, or engineers, and senior management, which included the division managers. All of these programs were on a group basis.

Within the production program, groups ranged in size from twenty-five to thirty people and had definable and measurable operations. The company believed that a program should be simple and that bonuses should be paid promptly. "We don't have any discretionary bonuses—zero. It is all based on performance. Now we don't want anyone to sit in judgment, because it never is fair . . .," said Iverson. The personnel manager stated: "Their bonus is based on roughly 90 percent of historical time it takes to make a particular joist. If during a week they make joists at 60 percent less than the standard time, they received a 60 percent bonus." This was paid with the regular pay the following week. The complete pay check amount, including overtime, was multiplied by the bonus factor. Bonus was not paid when equipment was not operating: "We have the philosophy that when equipment is not operating everybody suffers and the bonus for downtime is zero."<sup>37</sup> The foremen are also part of the group and received the same bonus as the employees they supervised.

The second incentive program was for department heads in the various divisions. The incentive pay here was based on division contribution, defined as the division earnings before corporate expenses and profit sharing are determined. Bonuses were reported to run as high as 51 percent of a person's base salary in the division and 30 percent for corporate positions.

Officers of the company were under a single profit sharing plan. Their base salaries were approximately 75 percent of comparable positions in industry. Once return on equity reached 9 percent, slightly below the average for manufacturing firms, 5 percent of net earnings before taxes went into a pool that was divided among the officers based on their salaries. "Now if return-on-equity for the company reaches, say 20 percent, which it has, then we can wind up with as much as 190 percent of our



base salaries and 115 percent on top of that in stock. We get both.”<sup>38</sup> In 1982 the return was 9 percent and the executives received no bonus. Iverson’s pay in 1981 was approximately \$300,000 but dropped the next year to \$110,000. “I think that ranked by total compensation I was the lowest paid CEO in the *Fortune* 500. I was kind of proud of that, too.”<sup>39</sup> In 1986, Iverson’s stock was worth over \$10 million. The young Vulcraft manager was likewise a millionaire.

There was a third plan for people who were neither production workers nor department managers. Their bonus was based on either the division return on assets or the corporate return on assets.

The fourth program was for the senior officers. The senior officers had no employment contracts, pension or retirement plans, or other normal perquisites. Their base salaries were set at about 70 percent of what an individual doing similar work in other companies would receive. More than half of the officers’ compensation was reported to be based directly on the company’s earnings. Ten percent of pretax earnings over a preestablished level, based on a 12 percent return on stockholders’ equity, was set aside and allocated to the senior officers according to their base salary. Half the bonus was paid in cash and half was deferred.

In lieu of a retirement plan, the company had a profit sharing plan with a deferred trust. Each year 10 percent of pretax earnings was put into profit sharing. Fifteen percent of this was set aside to be paid to employees the following March as a cash bonus and the remainder was put into trust for each employee on the basis of percent of their earnings as a percent of total wages paid within the corporation. The employee was vested 20 percent after the first year and gained an additional 10 percent vesting each year thereafter. Employees received a quarterly statement of their balance in profit sharing.

The company had an Employer Monthly Stock Investment Plan to which Nucor added 10 percent to the amount the employee contributed and paid the commission on the purchase of any Nucor stock. After each five years of service with the company, the employee received a service award consisting of five shares of Nucor stock. Additionally, if profits were good, extraordinary bonus payments would be made to the employees. In December 1988, each employee received a \$500 payment.

According to Iverson:

I think the first obligation of the company is to the stockholder and to its employees. I find in this country too many cases where employees are underpaid and corporate management is making huge social donations for self-fulfillment. We regularly give donations, but we have a very interesting corporate policy. First, we give donations where our employees are. Second, we give donations which will benefit our employees, such as the YMCA. It is a difficult area and it requires a lot of thought. There is certainly a strong social responsibility for a company, but it cannot be at the expense of the employees or the stockholders.<sup>40</sup>

Nucor had no trouble finding people to staff its plants. When the mill in Jewett, Texas, was built in 1975, there were over 5,000 applications for the 400 jobs—many coming from people in Houston and Dallas. Yet everyone did not find work at Nucor what they wanted. In 1975, a Harvard team found high turnover among new production workers after start-up. The cause appeared to be pressure from fellow workers in the group incentive situation. A survival-of-the-fittest situation was found in which those who didn’t like to work seldom stuck around. “Productivity increased and turnover declined dramatically once these people left,” the Harvard team concluded. Iverson commented: “A lot of people aren’t goal-oriented. A lot of them don’t want to work that hard, so initially we have a lot of turnover in a plant but then it’s so low we don’t even measure after that.”<sup>41</sup>

The *Wall Street Journal* reported in 1981:

Harry Pigg, a sub-director for the USW in South Carolina, sees a darker side in Nucor’s incentive plan. He contends that Nucor unfairly penalizes workers by taking away big bonus payments for absence or tardiness, regardless of the reason. Workers who are ill, he says, try to work because they can’t afford to give up the bonus payment. “Nucor whips them into line,” he adds. He acknowledges, though, that high salaries are the major barrier to unionizing the company.<sup>42</sup>

Having welcomed a parade of visitors over the years, Iverson had become concerned with the pattern: “They only do one or two of the things we do. It’s not just incentives or the scholarship program;

it's all those things put together that results in a unified philosophy for the company."

Looking ahead, Iverson had said: "The next decade will be an exciting one for steel producers. It will tax our abilities to keep pace with technological changes we can see now on the horizon." Imports didn't have to dominate the U.S. economy. He believed the steel industry would continue to play a pivotal role in the growth of American industry. He pointed out comparative advantages of the U.S. steel industry: an abundance of resources, relatively low energy costs, lower transportation costs, and the change in the government's attitude toward business.

The excitement he had predicted had occurred. Imports were a challenge for steel, just as for textiles, shoes, machine tools, and computers. The old steel companies were flexing their muscle and getting back into the game. Overcapacity hadn't left the mini-mill immune; there was no safe haven for anyone. Nucor was no longer a small company, David, with free shots at Goliath.

The honeymoon appeared over. Wall Street worried about what Nucor should do. Cable News Network posed the position of some on Wall Street: "They say basically you guys are selling to the construction companies; you are selling to some fairly depressed industries. They also say, Nucor, they were a specialized little niche company. They did what they did very well; but now all of a sudden, they are going out, building these big mills to make huge pieces of steel and they are talking casted cold, all that stuff. They're worried that you may be getting into deals that are a little too complicated from what they perceive you as being able to do well."<sup>43</sup>

The *New York Times* pointed out that expansion would certainly hurt earnings for the next several years. They quoted a steel consultant: "It is hard to do all that they are trying to do and keep profits up. With the industry in the shape it's in, this is not the time to expand beyond the niche they've established."<sup>44</sup>

When they were sitting with \$185 million in cash, Iverson told *Inc.*: "It (going private) has been mentioned to us by a number of brokerage firms and investment houses, but we wouldn't even consider it. It wouldn't be fair to employees, and I don't know whether it would be fair to the stockholders. . . . You're going to restrict the growth op-

portunities. . . . You either grow or die. . . . Opportunities wouldn't be created for people within the company."<sup>45</sup>

Iverson told CNN: "We've decided that really we want to stay in that niche (steel). We don't want to buy any banks. . . . All of the growth of the company has been internally generated. We think there are opportunities in the steel industry today. . . . There are ample opportunities, although they are somewhat harder to find than they used to be."<sup>46</sup>

"Another of my strengths is the ability to stick to my knitting. The reason executives make a lot of mistakes is that sometimes they get bored—they think the grass is greener on the other side so they go out and buy a bank or an oil company or they go into business where they have no expertise. . . . I have never gotten bored with this company. I've done this job so long that I think I have some insight into the needs and the capabilities of the company. I'm not misled into thinking we can do something that we can't."<sup>47</sup>

An economics professor and steel consultant at Middle Tennessee State University told the *Times*, "You're not going to see any growth in the steel market, so the only way to make money is to reduce costs and have new technology to penetrate other company's business."<sup>48</sup>

The *New York Times* stated: "Critics question whether it is wise to continue expanding production capabilities, as Nucor is doing, when there is already overcapacity in the steel industry and intense competition already exists between the mini-mills." Iverson insisted the strategy would pay off in the long-term. He told the *Times*, "The company's strategy makes sense for us. To gain a larger share in an ever-shrinking market, you've got to take something from someone else."<sup>49</sup>

They had sold the chemicals division, gotten into the structural steel components business, into the fastener industry, and should soon be ready to go head-to-head with the major integrated producers for the lucrative flat-rolled market. Sales and earnings were projected to double in the next two years, as the stock price doubled or tripled.

Iverson's position was clear: "We're going to stay in steel and steel products. The way we look at it, this company does only two things well, builds plants economically and runs them efficiently. That



is the whole company. We don't have any financial expertise, we're not entrepreneurs, we're not into acquisitions. Steel may not be the best business in the world, but it's what we know how to do and we do it well."

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