16 Nucor in 2001

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Nucor grew quickly in size, market share, and profits from 1975 to 1990. In spite of the economic recession in 1991, it appeared that the fastest-growing steel company in America was unstoppable. Customers liked Nucor's innovations and lower costs, investors were pleased with the high P/E ratio, and Nucor, with Ken Iverson as the model company president, was a media darling. But by the fall of 2001, just ten years later, much had changed. The steel industry worldwide was mired in one of its most unprofitable periods ever. The economic recession that hit Asia and Europe in the late 1990s reached the United States, speeded by the September 11 terrorist attack. The slowing economy affected major steel-consuming industries such as construction, automobiles, and farm equipment. Hamstrung by overcapacity, foreign companies with few markets abroad were dumping their steel in the United States. Although many competitors had copied Nucor's mini-mill production processes and reduced costs, over twenty U.S. steel companies had filed for bankruptcy protection since late 1997. As the company faced a new century, strategic thinking was never more important, expansion was not as simple, and opportunities in steel would be harder to come by. Nucor expected to become the largest steel maker in the United States, but the challenges ahead were as great as at any period in the company's history.

Background

Nucor could be traced back to the company that manufactured the first Oldsmobile in 1897 and became the Reo Truck Company. As the company declined into bankruptcy in the post-war years, a 1955 merger created Nuclear Corp. of America. Following the "conglomerate" trend of the period, Nuclear acquired various "high-tech" businesses, such as radiation sensors, semiconductors, rare earths, and air conditioning equipment. However, the company lost money continually, and a fourth reorganization in 1965 put forty-year-old Ken Iverson in charge. The building of Nucor had begun.

Ken Iverson had joined the navy after high school in 1943 and had been transferred from officer training school to Cornell's Aeronautical Engineering Program. On graduation he selected mechanical engineering/metallurgy for a master's degree to avoid the long drafting apprenticeship in aeronautical engineering. His college work with an electron microscope earned him a job with International Harvester. After five years in their lab, his boss and mentor prodded him to expand his vision by going with a smaller company.

Over the next ten years, Iverson worked for four small metals companies, gaining technical knowledge and increasing his exposure to other

business functions. He enjoyed working with the presidents of these small companies and admired their ability to achieve outstanding results. Nuclear Corp., after failing to buy the company Iverson worked for, hired him as a consultant to find them another metals business to buy. In 1962, the firm bought a small joist plant in South Carolina that Iverson found, on the condition that he would run it.

Over the next four years Iverson built up the Vulcraft division as Nuclear Corp. struggled. The president, David Thomas, was described as a great promoter and salesman but a weak manager. A partner with Bear Stearns actually made a personal loan to the company to keep it going. In 1966, when the company was on the edge of bankruptcy, Iverson, who headed the only successful division, was named president and moved the headquarters to Charlotte, North Carolina, where he focused the company business first on the joist industry and soon moved into steel production.

He immediately began getting rid of the esoteric, but unprofitable, high-tech divisions and concentrated on the steel joist business he found successful. They built more joist plants and in 1968 built their first steel mill in South Carolina to "make steel cheaper than they were buying from importers." By 1984 Nucor had six joist plants and four steel mills, using the new "mini-mill" technology.

From the beginning, Iverson had the people running the various plants, called divisions, make all the major decisions about how to build and run Nucor. The original board was composed of Iverson; Sam Siegel, his financial chief; and Dave Aycock, who had been with the South Carolina joist company before Nuclear acquired it. Siegel had joined Nuclear as an accountant in 1961. He quit Nuclear but in their crisis agreed to return as treasurer if Iverson were named president. Aycock and Siegel were named vice presidents at the time Iverson was named president.

Dave Aycock was the last of eight children raised on a small farm in the poor Wadesboro, North Carolina, community. He attended the University of North Carolina at Chapel Hill for one month, before financial considerations convinced him to join the navy as an enlisted man. For the next three years and eight months his specialty was as a metalsmith. On leaving the service in 1954, he got a job at Vulcraft as a welder. Over the next six years he worked his way up to production supervisor and assistant plant manager, and then to sales manager.

Aycock had been very impressed with the owner of Vulcraft, Sanborn Chase. He described him as "the best person I've ever known" and as "a scientific genius." He said he was a man of great compassion who understood the atmosphere necessary to enable people to self-motivate. Chase, an engineer by training, invented a number of things in diverse fields. He also established the incentive programs for which Nucor later became known. With only one plant, he was still able to operate with a "decentralized" manner. Before his death in 1960, while still in his forties, the company was studying the building of a steel mill using newly developed mini-mill technology. His widow ran the company until it was sold to Nucor in 1962.

Aycock met Ken Iverson when Nuclear purchased Vulcraft, and they worked together closely for the next year and a half. Located in Phoenix at the corporate headquarters, he was responsible to Iverson for all the joist operations and was given the task of planning and building a new joist plant in Texas. In late 1963 he was transferred to Norfolk, where he lived for the next thirteen years and managed a number of Nucor's joist plants. Then in 1977 he was named the manager of the Darlington, South Carolina, steel plant.

Aycock had this to say about Iverson: "Ken was a very good leader, with an entrepreneurial spirit. He is easy to work with and has the courage to do things, to take lots of risks. Many things didn't work, but some worked very well." There is the old saying "failure to take risk is failure." This saying epitomizes a cultural value personified by the company's founder and reinforced by Iverson during his time at the helm. Nucor was very innovative in steel and joists. Their plant was years ahead in wire rod welding at Norfolk. In the late 1960s they had one of the first computer inventory management systems and design/engineering programs. They were very sophisticated in purchasing, sales, and managing, and they often beat their competition by the speed of their design efforts.

In 1984, Aycock became Nucor's president and chief operating officer, while Iverson became chairman and chief executive officer. Whereas Iverson was an enthusiastic spokesman for Nucor's story, Aycock took a more low keyed position. On one occasion he commented, "I was never as consumed by the excitement of making hot metal. To me Nucor is a company with lots of employees and investors." For him

Nucor's purpose was to create value for stockholders and employees. The fact that it did so by making steel was secondary.

By 1984, in just twenty years, a bankrupt conglomerate had become a leading steel company in America. It was a fairytale story. Tom Peters used Nucor's management style as an example of "excellence," while the barons of old steel ruled over creeping ghettos. NBC featured Nucor on television and *New Yorker* magazine serialized a book about how a relatively small American steel company built a team that led the whole world into a new era of steel making. As the NBC program asked: "If Japan Can, Why Can't We?" Nucor had! Iverson was rich, owning $10 million in stock, but with a salary which rarely reached $1 million, compared with some U.S. executives' $50 or $100 million. The forty-year-old manager of the South Carolina Vulcraft plant had become a millionaire. Stockholders chuckled, and non-unionized hourly workers, who had never seen a layoff in twenty years, earned more than the unionized workers of old steel and more than 85 percent of the people in the states where they worked. Many employees were financially quite secure.

Nucor owed much of its success to its benchmark organizational style and the empowered division managers. There were two basic lines of business. The first was the six steel joist plants that made the steel frames seen in many buildings. The second included four steel mills that utilized the innovative mini-mill technology to supply first the joist plants and later the outside customers. Nucor was still only the seventh largest steel company in America. Over its second twenty years, Nucor was to rise to become the second largest U.S. steel company. A number of significant challenges were to be met and overcome to get there, and once that horizon was reached even greater challenges would arise. The following describes the systems Nucor built and its organization, divisions, management, and incentive system.

Nucor's Organization

In the early 1990s, each of Nucor's twenty-two divisions, one for every plant, had a general manager who was also a vice president of the corporation. The divisions were of three basic types: joist plants, steel mills, and miscellaneous plants. The corporate staff consisted of less than twenty-five people. In the beginning Iverson 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.* Iverson gave his views on keeping a lean organization:

> 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 on being in an organization with only four levels:

> 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.

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 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."

Nucor strengthened its position by developing strong alliances with outside parties. It did no internal research and development. Instead, it monitored others' work worldwide and attracted investors who brought it new technical applications at the earliest possible dates. Though Nucor was known for constructing new facilities at the lowest possible costs, its engineering and construction team consisted of only three individuals. They did not attempt to specify exact equipment parameters, but instead asked the

equipment supplier to provide this information and then held the manufacturer accountable. They had alliances with selected construction companies around the country who knew the kind of work Nucor wanted. Nucor bought 95 percent of its scrap steel from an independent broker who followed the market and made recommendations regarding scrap purchases. It did not have a corporate advertising department, corporate public relations department, or corporate legal or environmental department. It had long-term relationships with outsiders to provide these services.

Because the steel industry had established a pattern of absorbing the cost of shipment, all users paid the same delivered price, regardless of the distance from the mill. Nucor broke with this tradition and stopped equalizing freight. It offered all customers the same sales terms. Nucor also gave no volume discounts, feeling that with modern computer systems there was no justification. Customers located next to the plant guaranteed themselves the lowest possible costs for steel purchases. Two tube manufacturers, two steel service centers, and a cold rolling facility had located adjacent to the Arkansas plant. These facilities accounted for 60 percent of the shipments from the mill. The plants were linked electronically to each other's production schedules and thus could function in a just-in-time inventory mode. All new mills were built on large enough tracks of land to accommodate collaborating businesses.

Iverson didn't feel greater centralization would be good for Nucor. Hamilton Lott, a Vulcraft plant manager, commented in 1997, "We're truly autonomous; we can duplicate efforts made in other parts of Nucor. We might develop the same computer program six times. But the advantages of local autonomy make it worth it." Joe Rutkowski, manager at Darlington steel, agreed, "We're not constrained; headquarters doesn't restrict what I spend. I just have to make my profit contribution at the end of year."

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, and "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." *Fortune* noted, "Iverson takes the subway when he is in New York, a Wall Street analyst reports in a voice that suggests both admiration and amazement." 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.

Division Managers

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

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." He added: "When I came to this plant four years ago, I saw we had too many people, too much overhead. We had 410 people at the plant and I could see, from my experience at the Nebraska plant, we had many more than we needed. Now with 55 fewer men, we are still capable of producing the same number of tons as four years ago."

The divisions managed their activities with a minimum of contact with the corporate staff. Each day disbursements were reported to corporate office. Payments flowed into regional lockboxes. 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.

Each month the divisions completed a two-page (11″ × 17″) "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) corporate management examination. The summarized information and the performance statistics for all the divisions were then returned to the 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 for all the plants.

Vulcraft—Joist Divisions

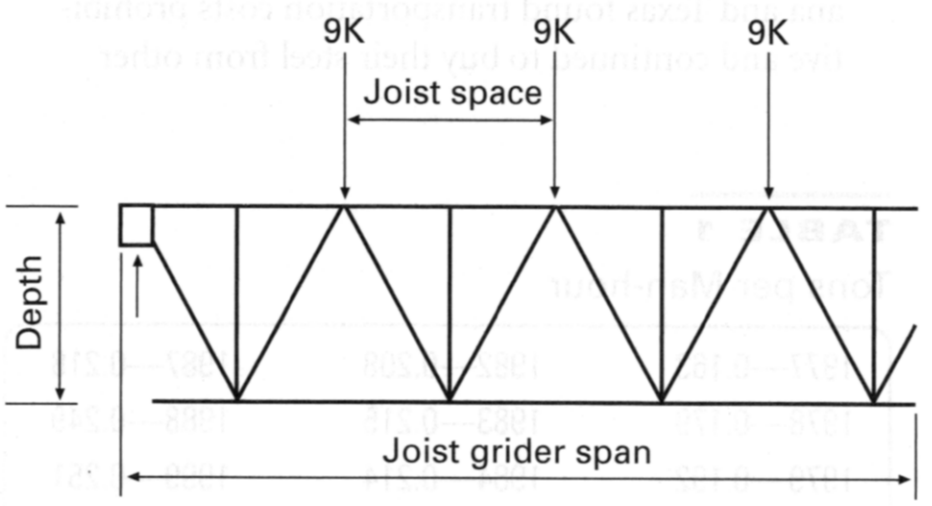
One of Nucor's major businesses was the manufacture and sale of open web steel joists and joist girders at six Vulcraft divisions located in Florence, South Carolina; Norfolk, Nebraska; Ft. Payne, Alabama; Grapeland, Texas; St. Joe, Indiana; and Brigham City, Utah. Open web joists, in contrast to solid joists, were made of steel angle iron separated by round bars or smaller angle iron (Figure 1). These joists cost less, were stronger for many applications, and were used primarily as the roof support systems in larger buildings, such as warehouses and shopping malls.

The joist industry was characterized by high competition among many manufacturers for many small customers. With an estimated 40 percent of the market, Nucor was the largest supplier in the United States. It utilized national advertising campaigns and prepared competitive bids on 80 to 90 percent of the 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." 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 150 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. Nucor's move into steel production was a move to lower the cost of steel used by the joist business.

Joist Production On the basic assembly line used at the joist divisions, three or four of which might make up any one plant, about six tons of joists per hour would be assembled. In the first stage eight people cut the angles to the right lengths or bent the round bars to the desired form. These were moved on a roller conveyer 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 the authority to reject the run of



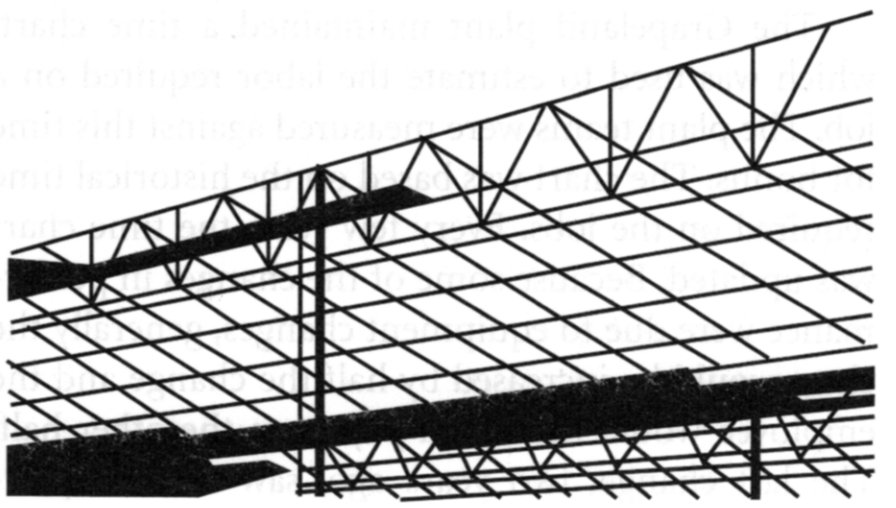


FIGURE 1
Illustration of Joists

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 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 $11 to $13 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 Texas plant was typical, with the bonus running at 225 percent, giving a wage of $27 an hour in 1999.

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 number of panels and the length and depth of the joist. At the time of production, the labor value of production, the standard, was determined in a similar manner. The South Carolina general manager stated, "In the last nine or ten years we have not changed a standard."

The Grapeland plant maintained a time chart, which was used to estimate the labor required on a job. The plant teams were measured against this time for bonus. The chart was based on the historical time required on the jobs. Every few years the time chart was updated. Because some of the changes in performance were due to equipment changes, generally the chart would be increased by half the change and the employee would benefit in pay from the other half. The last change, two years ago, saw some departments' pay increased by as much as 10 percent. The production manager at Grapeland considered himself an example for the Nucor policy—"the sky is the limit." He had started in an entry position and risen to the head of this plant of two hundred people.

Table 1 shows the productivity of the South Carolina plant in tons per man-hour for a number of years. The year 1999 set a record for overall tonnage. The manager explained that the small drop in 2000 was due to managerial changes; he was new to the division and had brought two new managers with him.

Steel Divisions

Nucor moved into the steel business in 1969 to provide raw material for the Vulcraft plants. Iverson said, "We got into the steel business because we wanted to build a mill that could make steel as cheaply as we were buying it from foreign importers or from offshore mills." Thus they entered the industry using the new mini-mill technology after they took a task force of four people around the world to investigate new technological advancements. 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, Alabama 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

TABLE 1

Tons per Man-hour

1977—0.163	1982—0.208	1987—0.218
1978—0.179	1983—0.215	1988—0.249
1979—0.192	1984—0.214	1999—0.251
1980—0.195	1985—0.228	2000—0.241
1981—0.194	1986—0.225	

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.

Between 1973 and 1981 they constructed three more bar mills and their accompanying rolling mills to convert the billits into bars, flats, rounds, channels, and other products. 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 1987 Nucor was the first steel company in the world to begin to build a mini-mill to manufacture steel sheet, the raw material for the auto industry and other major manufacturers. This project opened up another 50 percent of the total steel market. The first plant in Crawfordsville, Indiana, was successful, and three additional sheet mills were constructed between 1989 and 1990. Through the years these steel plants were significantly modernized and expanded until the total capacity was 3 million tons per year at a capital cost of less than $170 dollars per ton by 1999. Nucor's total steel production capacity was 5.9 million tons per year at a cost of $300 per ton of annual capacity. The eight mills sold 80 percent of their output to outside customers and the balance to other Nucor divisions. A new million-ton steel plate mill was under construction in Hartford County, North Carolina.

All four of the bar mills were actually two mills operating side by side. One mill concentrated on the larger bar products, which had separate production and customer demands, while the other mill concentrated on smaller-diameter bar stock. Throughout Nucor each operation was housed in its own separate building with its own staff. Nucor designed its processes to limit work-in-process inventory, to limit space, to utilize a pull approach to material usage, and to increase flexibility.

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, which would be used in larger, integrated steel mills. The typical bar mini-mill had an annual capacity of 200,000 to 600,000 tons, compared with the 7 million tons of Bethlehem Steel's Sparrow's Point, Maryland, integrated plant.

In the bar mills 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 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 2,000 degrees Fahrenheit, at which temperance 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 cutting to standard lengths, they were moved to the warehouse.

Nucor's first steel mill, which employed more than five hundred 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 general manager of the Darlington plant developed a system that involved preheating the ladles, which allowed for the faster flow of steel into the caster and resulted in better control of the steel

characteristics. Thus less time and lower capital investment were required at Darlington than at other mini-mills at the time of its construction. 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 the Darlington plant was also perhaps the only mill in the country that regularly avoided the reheating of billets. This saved $10 to $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. It lost even more on an effort at induction melting. As Iverson told *Metal Producing,* "That costs us a lot of money. Timewise it was very expensive. But you have got to make mistakes and we've had lots of failures."

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 at the time cost approximately $250 per ton, the average cost of Nucor's four 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, that were established by the department manager years ago based on historical performance. The general manager stated, "We don't change the standards." The caster, key to the operation, was used at a 92 percent level—one percentage point 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 one hundred products, each with a different historical standard. Workers received a 4 to 6 percent bonus over the computed standard for every good ton sheared per hour for the week. A manager stated: "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."

Management Philosophy

Aycock, while still the Darlington manager, 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 judging them on their results.
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> To keep a cooperative and productive work force 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.
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> 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.

In discussing his philosophy for dealing with the work force, the Florence manager stated:

> I believe very strongly in the incentive system we have. We are a nonunion 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 manage-

> ment. . . . 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.
>
> We don't lay our people off and we make a point of telling our people this. In the slowdown of 1994, 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 $17 to $19 an hour. If their base pay is half that, on Friday they would only get $8 to $9 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.

About 20 percent of the people took the fifth day at base rate, but still no one had been laid off, in an industry with a strong business cycle.

In an earlier business cycle 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, the executives held meetings. Each production line, or incentive group of workers, met in the plant conference room with all supervisory personnel—foreman, plant production manager, and division manager. The production manager explained the economic crisis the company was facing to the employees, and all of their questions were answered.

Personnel and Incentive Systems

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

Jim Coblin, Nucor's vice president of human resources, described Nucor's systems for *HRMagazine* in a 1994 article: "No-frills HR at Nucor: a lean, bottom-line approach at this steel company empowers employees." Coblin, as benefits administrator, received part-time help from one of the corporate secretaries in the corporate office. The plants typically used someone from their finance department to handle compensation issues, although two plants had personnel generalists. Nucor plants did not have job descriptions; they found they caused more problems than they solved, given the flexible work force and nonunion status of Nucor employees. Surprisingly, Coblin also found performance appraisal a waste of time. If an employee was not performing well, the problem would be dealt with directly. He had observed that when promotional opportunities became available, the performance appraisals were not much help in filling the position. So he saw both of these as just more paperwork. The key, he believed, was not to put a maximum on what employees could earn and to pay them directly for productivity. Iverson firmly believed that the bonus should be direct and involve no discretion on the part of a manager.

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 that everyone in the company could tell him the level of profits in his or her division. The general managers held dinners at least once but usually twice a year with their employees. The dinners were held with fifty or sixty employees at a time, resulting in as many as twenty dinners per year. After introductory remarks the floor was open for discussion of any work-related problems. There was a new employee orientation program and an employee handbook that 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.

Absenteeism and tardiness were not a problem at Nucor. Each employee had four days of absences 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 an employee bonus pay for that week, and lateness of more than a half hour meant the loss of bonus for that day.

Safety was a concern of Nucor's critics. With ten fatalities in the 1980s, Nucor was committed to doing better. Safety administrators were appointed in each plant, and safety improved in the 1990s. The company also had a formal grievance procedure, although the Darlington manager couldn't recall the last grievance he had processed.

The company had conducted attitude surveys every three years for over two decades. These provided management insight into employee attitudes on twenty issues and allowed comparisons across plants and divisions. There were some concerns and differences, but most employees appeared very satisfied with Nucor as an employer (see appendices 1 and 2). The surveys suggested that pay was not the only thing the workers liked about Nucor. The personnel manager said that an NBC interviewer, working on the documentary "If Japan Can, Why Can't We?" often heard employees say, "I enjoy working for Nucor because Nucor is the best, the most productive, and the most profitable company that I know of."

The average hourly worker's pay was over twice the average earnings paid by other manufacturing companies in the states where Nucor's plants were located. In many rural communities where Nucor had located, it provided better wages than most other manufacturers. The new plant in Hertford County illustrated this point in a June 21, 1998, article in the *Charlotte Observer,* entitled "Hope on the Horizon: In Hertford County, Poverty Reigns and Jobs are Scarce." Here the author wrote, "In North Carolina's forgotten northeastern corner, where poverty rates run more than twice the state average, Nucor's $300 million steel mill is a dream realized." The plant on the banks of the Chowan River in North Carolina's coastal district had their employees earning a rumored $60,000 a year, three times the local average manufacturing wage. Nucor had recently begun developing its plant sites with the expectation that other companies would colocate to save shipping costs. Four companies have announced plans to locate close to Nucor's property, adding another one to two hundred jobs. People couldn't believe such wages, but calls to the plant's chief financial officer got "We don't like to promise too much, but $60,000 might be a little low." The average wage for these jobs at Darlington was $70,000. The plant's CFO added that Nucor didn't try to set pay "a buck over Wal-Mart" but went for the best workers. The article noted that steel work is hot and often dangerous, and that turnover at the plant may be high as people adjust to this and to Nucor's hard-driving team system. He added, "Slackers don't last." The state of North Carolina had given $155 million in tax credits over twenty-five years. The local preacher said, "In fifteen years, Baron (a local child) will be making $75,000 a year at Nucor, not in jail. I have a place now I can hold in front of him and say 'Look, right here. This is for you.' "

The Incentive System There were four incentive programs at Nucor, one each for (1) production workers, (2) department heads, (3) staff people such as accountants, secretaries, or engineers, and (4) senior management, which included the division managers. All of these programs were based on group performance.

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 the 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 receive a 60 percent bonus." This was paid with the regular pay the following week. The complete paycheck amount, including overtime, was multiplied by the bonus factor. A 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." The foremen were 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 between 0 and 90 percent (average 35–50 percent) of a person's base salary. The base

salaries at this level were set at 75 percent of industry norms.

There was a third plan for people who were not production workers, department managers, or senior managers. Their bonus was based on either the division return-on-assets or the corporate return-on-assets, depending on the unit they were a part of. Bonuses were typically 30 percent or more of a person's base salary for corporate positions.

The fourth program was for the senior officers. The senior officers had no employment contracts, pension or retirement plans, or other perquisites. Their base salaries were set at about 75 percent of what an individual doing similar work in other companies would receive. 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, which 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." Half the bonus was paid in cash and half was deferred. Individual bonuses ranged from zero to several hundred percent, averaging 75 to 150 percent.

However, the opposite was true as well. In 1982 the return was 8 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." In his 1997 book, *Plain Talk: Lessons from a Business Maverick,* Iverson said, "Can management expect employees to be loyal if we lay them all off at every dip of the economy, while we go on padding our own pockets?" Even so, by 1986 Iverson's stock was worth over $10 million dollars and the once Vulcraft manager was a millionaire.

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 for all people below officer level. Twenty percent of this was set aside to be paid to employees in the following March as a cash bonus, and the remainder was put into trust for each employee on the basis of the percentage of their earnings as a percentage of total wages paid within the corporation. The employee was vested after the first year. 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 on the purchase of any Nucor stock, and paid the commission. After each five years of service with the company, the employee received a service award consisting of five shares of Nucor stock. Moreover, if profits were good, extraordinary bonus payments would be made to the employees. For example, in December 1998 each employee received a $800 payment. Iverson said:

> 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 that will benefit our employees, such as to 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.

Having welcomed a parade of visitors over the years, Iverson had become concerned with the pattern apparent at other companies' steel plants: "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."

Building on Success

Throughout the 1980s and 1990s Nucor continued to take the initiative and to be the prime mover in steel and the industries vertically related to steel. For example, in 1984 Nucor broke with the industry pattern of basing the price of an order of steel on the quantity ordered. Iverson noted, "Some time ago we began to realize that with computer order entry and billing, the extra charge for smaller orders was not cost justified." In a seemingly risky move in 1986, Nucor began construction of a $25 million plant in Indiana to manufacture steel fasteners. Imports had grown to 90 percent of this market as U.S. companies failed to compete. Iverson said, "We're going to bring that business back; we can make bolts as cheaply as foreign producers." A second plant, in 1995, gave Nucor 20 percent of the U.S. market for steel fasteners. Nucor also acquired a steel bearings

manufacturer in 1986, which Iverson called "a good fit with our business, our policies and our people."

In early 1986 Iverson announced plans for a revolutionary plant at Crawfordsville, Indiana, which would be the first mini-mill in the world to manufacture flat-rolled or sheet steel, the last bastion of the integrated manufacturers. This market alone was twice the size of the existing market for mini-mill products. It would be a quarter of a billion dollar gamble on a new technology. The plant was expected to halve the integrated manufacturer's $3 of labor per ton and save $50 to $75 on a $400-a-ton selling price. If it worked, the profit from this plant alone would come close to the profit of the whole corporation. *Forbes* commented, "If any mini-mill can meet the challenge, it's Nucor. But expect the going to be tougher this time around." If successful, Nucor had the licensing rights to the next two plants built in the world with this technology.

Nucor had spent millions trying to develop the process when it heard of some promising developments at a German company. In the spring of 1986, Aycock flew to Germany to see the pilot machine at SMS Schloemann-Siemag AG. In December the Germans came to Charlotte for the first of what they thought would be many meetings to hammer out a deal with Nucor. Iverson shocked them when he announced Nucor was ready to build the first plant of its kind.

Kieth Busse was given the job of building the Crawfordsville, Indiana, sheet steel plant. Though an accountant by training, Busse had designed and built Nucor's state-of-the-art bolt factory. A midwesterner of German extraction, as a sideline he ran a gun supermarket in Fort Wayne and was the biggest machine gun dealer in northern Indiana. The process of bringing this plant online was so exciting that it became the basis for a best-selling book by Robert Preston, which was serialized in *New Yorker* magazine.

Preston reported on a conversation at dinner during construction between Iverson and Busse. Thinking about the future, Busse was worried that Nucor might someday become like Big Steel. He asked, "How do we allow Nucor to grow without expanding the bureaucracy?" He commented on the vice presidents stacked on vice presidents, research departments, assistants to assistants, and so on. Iverson agreed. Busse seriously suggested, "Maybe we're going to need group vice presidents." Iverson's heated response was "Do you want to ruin the company? That's the old Harvard Business School thinking. They would only get in the way, slow us down." He said the company could at least double, to $2 billion, before it added a new level of management. "I hope that by the time we have group vice presidents I'll be collecting Social Security."

The gamble on the new plant paid off and Busse, the general manager of the plant, became a key man within Nucor. The new mill began operations in August of 1989 and reached 15 percent of capacity by the end of the year. In June of 1990 it had its first profitable month, and Nucor announced the construction of a second plant in Arkansas.

In December 1992, Nucor signed a letter of intent with Oregon Steel Mills to build a sheet mill on the West Coast to begin in 1994. This project was later canceled. The supply and cost of scrap steel to feed the mini-mills was an important future concern to Iverson. So at the beginning of 1993 Nucor announced the construction of a plant in Trinidad to supply its mills with iron carbide pellets. The innovative plant would cost $60 million and take a year and a half to complete. In 1994 the two existing sheet mills were expanded and a new $500 million, 1.8-million-ton sheet mill in South Carolina was announced, to begin operation in early 1997.

In what the *New York Times* called their "most ambitious project yet," in 1987 Nucor had begun a joint venture with Yamato Kogyo, Ltd., to make structural steel products in a mill on the Mississippi River in a direct challenge to the Big Three integrated steel companies. He put John Correnti in charge of the operation.

John Correnti, born in the Finger Lakes region of western New York, received a degree in civil engineering from Clarkson University in 1969. He commented: "I was a C/F student my first two years and an A/B student my last two years." After seventeen offers, he accepted a job with U.S. Steel in their construction department. He was energetic and ambitious and became one of the youngest people to ever become a construction superintendent there. The construction group members were considered mavericks at U.S. Steel and specialized in overcoming the bureaucracy and paperwork. While employed by U.S. Steel, Correnti conducted projects in a wide range of steel operations across the country.

While working on a project in Texas in 1980, Correnti married a Texan and decided to leave U.S. Steel

rather than move his wife out of Texas. A headhunter showed him a construction manager job with Nucor, a company he had never heard of. And Ken Iverson convinced him to join the company and move to Salt Lake City to build a bar plant at Plymoth, Utah. Correnti was used to being independent: "I just started doing things, and I figured that when they didn't want me to do something, I'd hear from somebody. I never heard from anybody."

In 1984 he moved to a more-challenging job of vice president and general manager of the Utah bar mill, which was not performing well. He wasted no time getting everyone focused on cost cutting, pointing out examples of wasted pens in one man's desk and the possibility of washing and reusing gloves. The plant office, dubbed the Taj Mahal by people in the plant, was too far from the main operations, so Correnti had it torn down and moved the staff into a nearby engineering building. He wouldn't let the salespeople have carpet until their sales reached the desired level. By the time he left in 1986 to build the Nucor-Yamato plant, the division was turning profitable.

Correnti built and then became the general manager of Nucor-Yamato when it started up in 1988. In 1991 he surprised many people by deciding to double Nucor-Yamato's capacity by 1994. It became Nucor's largest division and the largest wide flange producer in the United States. By 1995, Bethlehem Steel was the only other wide flange producer of structural steel products left and had plans to leave the business.

Nucor started up its first facility to produce metal buildings in 1987. A second metal buildings facility began operations in late 1996 in South Carolina, and a new steel deck facility, in Alabama, was announced for 1997. At the end of 1997 the Arkansas sheet mill was undergoing a $120 million expansion to include a galvanizing facility.

In 1995 Nucor became involved in its first international venture, an ambitious project with Brazil's Companhia Siderurgica National to build a $700 million steel mill in the state of Ceara. While other minimills were cutting deals to buy and sell abroad, Nucor was planning to ship iron from Brazil and process it in Trinidad.

Nucor set records for sales and net earnings in 1997 (see appendix 3 for financial reports and appendix 4 for financial ratios). In the spring of 1998, as Iverson approached his seventy-third birthday, he was commenting, "People ask me when I'm going to retire. I tell them our mandatory retirement age is ninety-five, but I may change that when I get there." It surprised the world when, in October 1998, Ken Iverson left the board. He retired as chairman at the end the year. Although sales for 1998 decreased 1 percent and net earnings were down 10 percent, the management made a number of long-term investments and closed draining investments. Start-up began at the new South Carolina steam mill and at the Arkansas sheet mill expansion. The plans for a North Carolina steel plate mill in Hertford were announced. This would bring Nucor's total steel production capacity to 12 million tons per year. The plant in Trinidad, which had proven much more expensive than was originally expected, was deemed unsuccessful and closed. Finally, directors approved the repurchase of up to 5 million shares of Nucor stock.

Still, the downward trends at Nucor continued. Sales and earnings were down 3 percent and 7 percent, respectively, for 1999. However, these trends did not seem to affect the company's investments. Expansions were under way in the steel mills, and a third building systems facility was under construction in Texas. Nucor was actively searching for a site for a joist plant in the Northeast. A letter of intent was signed with Australian and Japanese companies to form a joint venture to commercialize the strip casting technology. To understand the challenges facing Nucor, industry, technology, and environmental trends in the 1980s and 1990s must be considered.

The U.S. Steel Industry in the 1980s

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 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- to 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, that 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."

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 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 to 14 percent over the period. Imports of light bar products accounted for less that 9 percent of the 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. consumption.

Iron Age stated that exports, as a percentage 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.

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

> 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 eighteen 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 make it difficult for the U.S. 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 industry made a pronounced move toward segmentation. Integrated producers focused on mostly flat-rolled and structural grades, reorganized steel companies focused on a limited range of products, mini-mills dominated the bar and light structural product areas, and specialty steel firms sought niches. There was an accelerated shutdown of older plants, elimination of products by some firms, and the installation of new product lines with new technologies by others. High-tonnage mills restructured to handle sheets, plates, structural beams, high-quality bars, and large pipe and tubular products, which allowed a resurgence of specialized mills: cold-finished bar manufacturers, independent strip mills, and mini-mills.

The road for the integrated mills was not easy. As *Purchasing* pointed out, tax laws and accounting rules slowed the closing of inefficient plants. Shutting down a ten-thousand-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 planned shutdown are so large that they can quickly devastate a company's balance sheet."

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 over capacity." *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."

The American Iron and Steel Institute reported steel production in 1988 of 99.3 million tons, up from 89.2 million in 1987, and the highest in seven years. As a result of modernization programs, 60.9 percent of production was from continuous casters. Exports for steel increased and imports fell. Some steel experts believed the United States was now cost-competitive with Japan. However, 1989

proved to be a year of "waiting for the other shoe to drop," according to *Metal Center News.* U.S. steel production was hampered by a new recession, the expiration of the voluntary import restraints, and labor negotiations in several companies. Declines in car production and consumer goods hit flat-rolled steel hard. 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."

The U.S. Steel Industry in the 1990s

The economic slowdown of the early 1990s did lead to a decline in the demand for steel through early 1993, but by 1995 America was in its best steel market in twenty years and many companies were building new flat-roll mini-mills. A *Business Week* article at the time described it as "the race of the Nucor look-alikes." Six years after Nucor pioneered the low-cost German technology in Crawfordsville, Indiana, the competition was finally gearing up to compete. Ten new projects were expected to add 20 million tons per year of the flat-rolled steel, raising U.S. capacity by as much as 40 percent by 1998. These mills opened in 1997, just as the industry was expected to move into a cyclical slump. It was no surprise that worldwide competition increased and companies that had previously focused on their home markets began a race to become global powerhouses. The foreign push was new for U.S. firms, which had focused on defending their home markets. U.S. mini-mills focused their international expansion primarily in Asia and South America.

Meanwhile, in 1994 U.S. Steel, North America's largest integrated steel producer, began a major business process reengineering project to improve order fulfillment performance and customer satisfaction on the heels of a decade of restructuring. According to *Steel Times International,* "U.S. Steel had to completely change the way it did business. Cutting labor costs, and increasing reliability and productivity took the company a long way towards improving profitability and competitiveness. However, it became clear that this leaner organization still had to implement new technologies and business processes if it was to maintain a competitive advantage." The goals of the business process reengineering project included a sharp reduction in cycle time, greatly decreased levels of inventory, shorter order lead times, and the ability to offer real-time promise dates to customers. In 1995, the company successfully installed integrated planning/production/order fulfillment software, and the results were very positive. U.S. Steel believed that the reengineering project had positioned it for a future of increased competition, tighter markets, and raised customer expectations.

In late 1997 and again in 1998 the decline in demand prompted Nucor and other U.S. companies to slash prices to compete with the unprecedented surge of imports. By the last quarter of 1998 these imports had led to the filing of unfair trade complaints with U.S. trade regulators, causing steel prices in the spot market to drop sharply in August and September before they stabilized. A press release by the U.S. secretary of commerce, William Daley, stated, "I will not stand by and allow U.S. workers, communities and companies to bear the brunt of other nations' problematic policies and practices. We are the most open economy of the world. But we are not the world's dumpster." In early 1999 American Iron and Steel Institute reported in its Opinion section of its web page the following quotes by Andy Sharkey and Hank Barnette. Sharkey said, "With many of the world's economies in recession, and no signs of recovery on the horizon, it should come as no surprise that the United States is now seen as the only reliable market for manufactured goods. This can be seen in the dramatic surge of imports." Barnette noted, "While there are different ways to gauge the impact of the Asian crisis, believe me, it has already hit. Just ask the 163,000 employees of the U.S. steel industry."

The Commerce Department concluded in March 1999 that six countries had illegally dumped stainless steel in the United States at prices below production costs or home market prices. The Commerce Department found that Canada, South Korea, and Taiwan were guilty only of dumping, while Belgium, Italy, and South Africa also gave producers unfair subsidies that effectively lowered prices. However, on June 23, 1999, The *Wall Street Journal* reported that the Senate decisively shut off an attempt to restrict U.S. imports of steel, despite industry complaints that a flood of cheap imports was driving them out of business. Advisors of President Clinton were reported to have said that the president would likely veto the bill if it

passed. Administrative officials opposed the bill because it would violate international trade law and leave the United States open to retaliation.

The American Iron and Steel Institute (AISI) reported that in May 1999 U.S. steel mills shipped 8,330,000 net tons, a decrease of 6.7 percent from the 8,927,000 net tons shipped in May 1998. They also stated that for the first five months of 1999 shipments were 41,205,000 net tons, down 10 percent from the same period in 1998. AISI president and CEO Andrew Sharkey III said, "Once again, the May data show clearly that America's steel trade crisis continues. U.S. steel companies and employees continue to be injured by high levels of dumping and subsidized imports. . . . In addition, steel inventory levels remain excessive, and steel operating rates continue to be very low." Table 2A compares the average import customs value per net ton of steel for May 1999 to the first quarter of 1998, and Table 2B compares U.S. imports of steel mill products by country of origin for the first five months in 1999 to those of 1998 and 1997.

As the 1990s ended, Nucor was the second largest steel producer in the United States, behind USX. The company's market capitalization was about two times that of the next smaller competitor. Even in a tight industry, someone can win. Nucor was in the best position because the industry was very fragmented and there are many marginal competitors.

Steel Technology and the Mini-Mill

A new type of mill, the "mini-mill," had emerged in the United States during the 1970s to compete with the integrated mill. The mini-mill used electric arc furnaces initially to manufacture a narrow product line from scrap steel. The leading U.S. mini-mills in the 1980s were Nucor, Florida Steel, Georgetown Steel, North Star Steel, and Chaparral. Between the late 1970s and 1980s, the integrated mills' market share fell from about 90 percent to about 60 percent, with the integrated steel companies averaging a 7 percent return on equity, the mini-mills averaging 14 percent, and some, such as Nucor, achieving about 25 percent. In the 1990s mini-mills tripled their output to capture 17 percent of domestic shipments. Moreover, integrated mills' market share fell to around 40 percent, while mini-mills' share rose to 23 percent, reconstructed mills' increased their share from 11 to 28 percent, and specialized mills increased their share from 1 to 6 percent.

Some experts believed that a relatively new technology, the twin shell electric arc furnace, would help mini-mills increase production, lower costs, and take market share. According to the *Pittsburgh Business Times,* "With a twin shell furnace, one shell—the chamber holding the scrap to be melted—is filled and heated. During the heating of the first shell, the

TABLE 2A

Average Import Customs Value per Net Ton (selected products)

Product	May 1999	1st Quarter 1998	% Change
Wire rods	$275	$350	−21.50%
Structural shapes	267	379	−29.60
Plates cut lengths	456	490	−6.90
Plates in coils	257	377	−31.70
Reinforcing bars	198	300	−33.90
Line pipe	429	524	−18.20
Black plate	551	627	−12.20
Sheets, hot rolled	242	304	−20.40
Sheets, cold rolled	400	549	−27.10
Sheet & strip galvanized electrolytic	483	609	−20.70
Total, all steel mill products	332	455	−27.00

Source: American Iron and Steel Press Release, June 24, 1999.

TABLE 2B

U.S. Imports of Steel Mill Products by Country of Origin (thousands of net tons)

Country	5 Mos 99 Prelim	5 Mos 98	5 Mos 97	5 Mos 99 vs. 5 Mos 98 % Change	5 Mos 99 vs. 5 Mos 97 % Change
European Union	2,569	2,634	3,048	−2.5%	−15.7%
Canada	2,157	2,146	2,035	0.5	6.0
Japan	1,452	2,099	1,015	−30.8	43.1
Mexico	1,444	1,263	1,432	14.3	0.8
Brazil	1,428	987	1,565	44.7	−8.8
Korea	1,330	1,064	643	25.0	106.8
Russia	343	1,583	1,680	−78.3	−79.6
Australia	316	366	121	−13.7	161.2
South Africa	252	214	120	17.8	110.0
China	243	177	274	37.3	−11.3
India	170	118	90	70.3	123.3
Indonesia	187	116	33	61.2	466.7
Turkey	148	232	209	−36.2	−29.2
Ukraine	105	392	290	−73.2	−63.8
Others	1,546	1,188	1,038	27.5	46.0
Total	**13,690**	**14,578**	**13,593**	**−6.1**	**0.7**

Source: American Iron and Steel Press Release, June 24, 1999.

second shell is filled. When the heating is finished on the first shell, the electrodes move to the second. The first shell is emptied and refilled before the second gets hot." This increased production by 60 percent. Twin shell production had been widely adopted in the last few years. For example, Nucor Steel began running a twin shell furnace in November 1996 in Berkeley, South Carolina, and installed another in Norfolk, Nebraska, which began operations in 1997. "Everyone accepts twin shells as a good concept because there's a lot of flexibility of operation," said Rodney Mott, vice president and general manager of Nucor-Berkeley. However, this move toward twin shell furnaces could mean trouble with scrap availability. According to an October 1997 quote in the *Pittsburgh Business Times* by Ralph Smaller, vice president of process technology at Kvaerner, "Innovations that feed the electric furnaces' production of flat-rolled [steel] will increase the demand on high quality scrap and alternatives. The technological changes are just beginning and will accelerate over the next few years."

According to a September 1997 *Industry Week* article, steel makers around the world are now closely monitoring the development of continuous "strip casting" technology, which may prove to be the next leap forward for the industry. "The objective of strip casting is to produce thin strips of steel (in the 1-mm to 4-mm range) as liquid steel flows from a tundish—the stationary vessel which receives molten steel from the ladle. It would eliminate the slab-casting stage and all of the rolling that now takes place in a hot mill." Strip casting was reported to have some difficult technological challenges, but companies in Germany, France, Japan, Australia, Italy, and Canada had strip-casting projects under way. In fact, all of the significant development work in strip casting was taking place outside the United States.

Larry Kavanaph, American Iron and Steel Institute vice president for manufacturing and technology,

said, "Steel is a very high-tech industry, but nobody knows it." Today's most productive steel-making facilities incorporate advanced metallurgical practices, sophisticated process-control sensors, state-of-the-art computer controls, and the latest refinements in continuous casting and rolling mill technology. Michael Shot, vice president for manufacturing at Carpenter Technology Corp., Reading, Pennsylvania, a specialty steels and premium-grade alloys producer, said, "You don't survive in this industry unless you have the technology to make the best products in the world in the most efficient manner."

Environmental and Political Issues

Not all stakeholders have been happy with the way Nucor does business. In June 1998, *Waste News* reported that Nucor's mill in Crawfordsville, Indiana, was cited by the United States Environmental Protection Agency for alleged violations of federal and state clean air rules. The Pamlico–Tar River Foundation, the NC Coastal Federation, and the Environmental Defense Fund had concerns about the state's decision to allow the company to start building the plant before the environmental review was completed. According to the *News & Observer* web site, "The environmental groups charge that the mill will discharge 6,720 tons of pollutants into the air each year."

There were also concerns about the fast-track approval of the facility being built in Hertford County. First, this plant was located on the banks of one of the most important and sensitive stretches of the Chowan, a principal tributary to the national treasure Albemarle Sound and the last bastion of the state's once vibrant river-herring fishery. North Carolina passed a law in 1997 that required the restoration of this fishery through a combination of measures designed to prevent overfishing, restore spawning and nursery habitats, and improve water quality in the Chowan. "New federal law requires extra care in protecting essential habitat for the herring, which spawn upstream," stated an article in the *Business Journal.* Second, there were concerns regarding the excessive incentives the state gave to convince Nucor to build a $300 million steel mill in the state. Some questioned whether the promise of three hundred well-paying jobs in Hertford County was worth the $155 million in tax breaks the state was giving Nucor to locate there.

Management Evolution

As Nucor opened new plants, each was made a division and given a general manager who had complete responsibility for all aspects of the business. The corporate office did not involve itself in the routine functioning of the divisions. There was no centralized purchasing, hiring and firing, or division accounting. The total corporate staff was still less than twenty-five people, including clerical staff, when 1999 began.

In 1984, Dave Aycock moved into the corporate office as president. Ken Iverson was chief executive officer and chairman. Iverson, Aycock, and Sam Siegel operated as an executive board, providing overall direction to the corporation. By 1990 Aycock, who had invested his money wisely, owned over 600,000 shares of Nucor stock, five hotels and farms in three states, and was ready to retire. He was sixty, five years younger than Iverson, and was concerned that if he waited, he and Iverson might be leaving the company at the same time. Two people stood out as candidates for the presidency, Keith Busse and John Correnti. In November, Iverson called Correnti to the Charlotte airport and offered him the job. Aycock commented, "Keith Busse was my choice, but I got outvoted." In June 1991 Aycock retired and Keith Busse left Nucor to build an independent sheet mill in Indiana for a group of investors.

Thus Iverson, Correnti, and Siegel led the company. In 1993, Iverson had heart problems and major surgery. Correnti was given the CEO role in 1996. The Board of Directors had always been small, consisting of the executive team and one or two past Nucor vice presidents. Several organizations with large blocks of Nucor stock had been pressing Nucor to diversify its board membership and add outside directors. In 1996 Jim Hlavacek, head of a small consulting firm and friend of Iverson, was added to the board.

Only five, not six, members of the board were in attendance during the Board of Directors meeting in the fall of 1998, because of the death of Jim Cunningham. Near its end, Aycock read a motion, drafted by Siegel, that Ken Iverson be removed as chairman. It was seconded by Hlavacek and passed. It was announced in October that Iverson would be a chairman emeritus and a director, but after disagreements Iverson left the company completely. It was agreed that Iverson would receive $500,000 a year for five years. Aycock left retirement to become chairman.

The details of Iverson's leaving did not become known until June of 1999, when John Correnti resigned after disagreements with the board and Aycock took his place. All of this was a complete surprise to investors and brought the stock price down 10 percent. Siegel commented, "The board felt Correnti was not the right person to lead Nucor into the twenty-first century." Aycock assured everyone that he would be happy to move back into retirement as soon as replacements could be found.

In December 1999 Correnti became chairman of rival Birmingham Steel, with an astounding corporate staff of 156 people. With Nucor's organizational changes, he questioned their ability to move as fast in the future. "Nucor's trying to centralize and do more mentoring. That's not what grew the company to what it is today."

Aycock moved ahead with adding outside directors to the board. He appointed Harvey Gantt, principal in his own architectural firm and former mayor of Charlotte; Victoria Haynes, formally B. F. Goodrich's chief technology officer; and Peter Browning, chief executive of Sonoco (biographical sketches of board members and executive management are provided in appendices 5 and 6). Then he moved to increase the corporate office staff by adding a level of executive vice presidents over four areas of business and adding two specialist jobs in strategic planning and steel technology. When Siegel retired, Aycock promoted Terry Lisenby to CFO and treasurer, and hired a director of information technology to report to Lisenby (Figure 2 provides the organization chart).

Jim Coblin, vice president of human resources, believed the additions to management were necessary, saying, "It's not bad to get a little more like other companies." He noted that the various divisions did their business cards and plant signs differently; some did not even want a Nucor sign. Sometimes six different Nucor salesmen would call on the same customer.

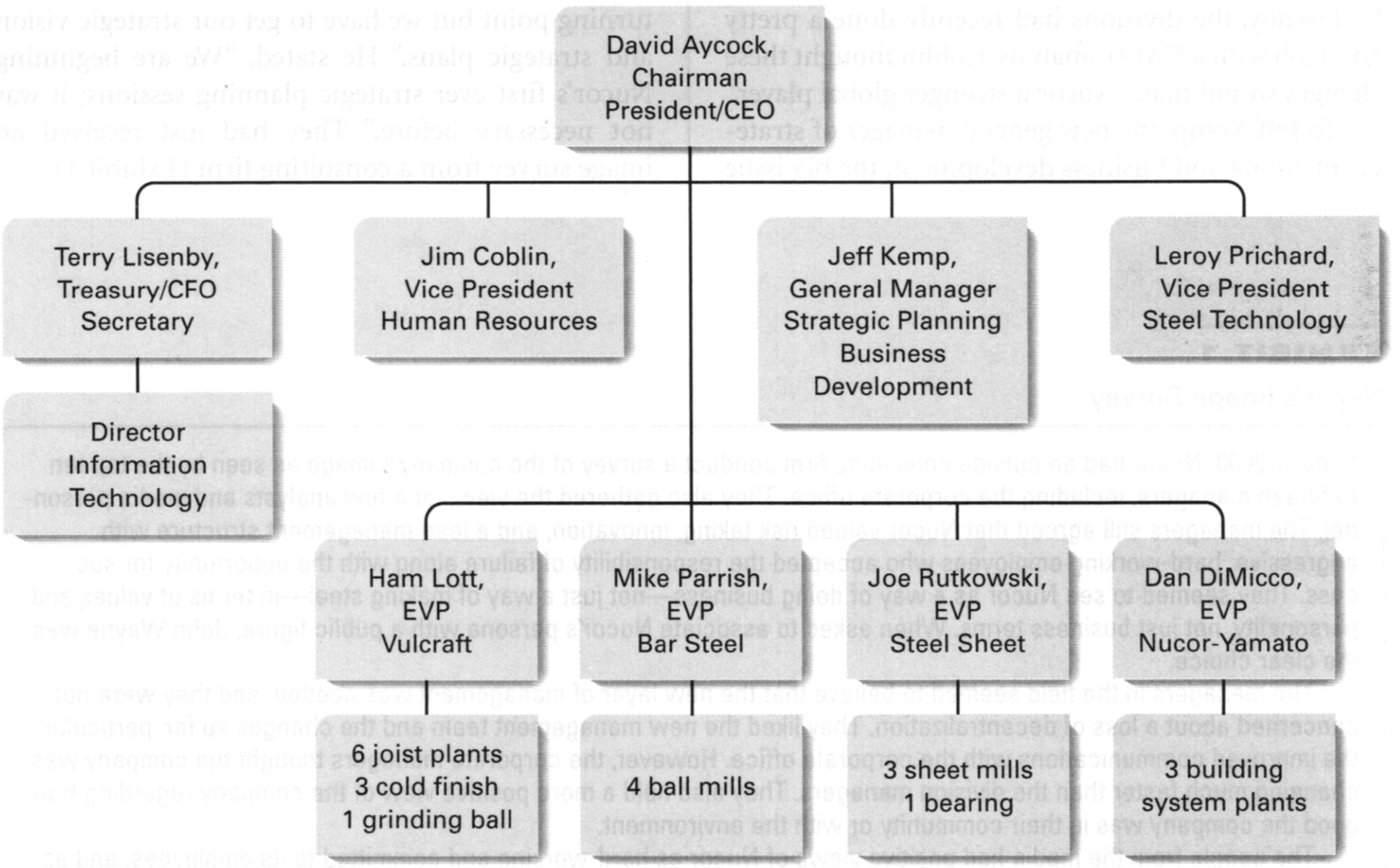

FIGURE 2
Nucor Organization Chart

"There is no manager of human resources in the plants, so at least we needed to give additional training to the person who does most of that work at the plant," he stated. With these new additions there would be a director of information technology and two important committees, one for environmental issues and the second for audit.

Coblin believed that the old span of control of twenty people might have worked well when there was less competition. Aycock considered it "ridiculous," saying, "It was not possible to properly manage, to know what was going own. The top managers have totally lost contact with the company." Coblin was optimistic that the use of executive vice presidents (EVPs) would improve management. The three meetings of the general managers had slowly increased from about one and a half days to about two and a half days and had become more focused. The new EVP positions would add a perspective above the level of the individual plants. Instead of fifteen individual detailed presentations, each general manager would give a five-minute briefing and then there would be an in-depth presentation on the group, with team participation. After some training by Lisenby, the divisions had recently done a pretty good job with a SWOT analysis. Coblin thought these changes would make Nucor a stronger global player.

To **Jeff Kemp,** the new general manager of strategic planning and business development, the big issue was how to sustain earnings growth. In the U.S. steel industry there were too many marginal competitors. The U.S. government had recently added to the problem by giving almost a billion dollars to nine mills, which simply allowed them to limp along and weaken the industry. Kemp was looking for Nucor's opportunities within the steel industry. He asked why Nucor had bought a bearing company. His experience in the chemical industry suggested a need for Nucor to establish a position of superiority and grow globally, driving industry competition rather than reacting. He argued that a company should protect its overall market position, which could mean sacrifices for individual plants. Aycock liked Kemp's background in law and accounting and had specifically sought someone from outside the steel industry to head up Nucor's strategic planning. By June 2000 Kemp had conducted studies of other industries in the U.S. market and had developed a working document that identified opportunities worthy of further analysis.

"Every company hits a plateau," Aycock observed. "You can't just go out and build plants to grow. How do you step up to the next level? I wouldn't say it's a turning point but we have to get our strategic vision and strategic plans." He stated, "We are beginning Nucor's first ever strategic planning sessions; it was not necessary before." They had just received an image survey from a consulting firm (Exhibit 1).

EXHIBIT 1

Nucor's Image Survey

In early 2000, Nucor had an outside consulting firm conduct a survey of the company's image as seen by the top ten to fifteen managers, including the corporate office. They also gathered the views of a few analysts and media personnel. The managers still agreed that Nucor valued risk taking, innovation, and a lean management structure with aggressive, hard-working employees who accepted the responsibility of failure along with the opportunity for success. They seemed to see Nucor as a way of doing business—not just a way of making steel—in terms of values and personality, not just business terms. When asked to associate Nucor's persona with a public figure, John Wayne was the clear choice.

The managers in the field seemed to believe that the new layer of management was needed, and they were not concerned about a loss of decentralization. They liked the new management team and the changes so far, particularly the improved communications with the corporate office. However, the corporate managers thought the company was changing much faster than the division managers. They also held a more positive view of the company regarding how good the company was in their community or with the environment.

The people from the media had positive views of Nucor as hard-working and committed to its employees, and as an innovative risk-taking economic powerhouse. Some who were most familiar with the company believed that it needed to do a better job of communicating its vision during a period of transition.

Aycock believed Nucor needed to be quick to recognize developing technology in all production areas. He noted the joint venture to develop a new "strip caster" that would cast the current flat-rolled material in a more-finished form. The impact could be "explosive," allowing Nucor to build smaller plants closer to markets. This would be particularly helpful on the West Coast. Nucor would own the U.S. and Brazilian rights, and its partners would own the rest. Aycock was also looking forward to the next generation of steel mills and this time wanted to own the rights. He praised Iverson's skill at seeing new technology and committing the company to it.

Aycock was very interested in acquisitions, but he believed "they must fit strategically." A bar mill in the upper central Midwest and a flat-rolled plant in the Northeast would be good. A significant opportunity existed in preengineered buildings. Aycock intended to concentrate on steel for the next five to six years, achieving an average growth rate of 15 percent per year. In about seven years he would like to see Nucor ready to move into other areas. He said Nucor had already "picked the low-hanging grapes" and must be careful in its next moves.

Steel and Nucor in the Twenty-first Century

In September 2000, David Aycock stepped aside as he had planned, and Dan DiMicco was elected president and chief executive officer of Nucor. Peter Browning was elected chairman of the Board of Directors. Aycock retired from the board a year later.

Sales for 2000 increased 14 percent over 1999 to reach a record level. Earnings were also at record levels, 27 percent over 1999. The year had begun on a strong footing, but business had turned weak by the year's end. While Nucor remained profitable, other steel companies faced bankruptcy. A Vulcraft plant was under construction in New York. It was Vulcraft's first northeastern operation and expanded its geographical coverage into a new region. It was also attempting a breakthrough technological step in strip casting at Crawfordsville—the Castrip process. It sold its grinding ball process and the bearing products operation because they were not a part of Vulcraft's core business.

In the company's annual report DiMicco laid out its plans for 2000 and beyond: "Our targets are to deliver an average annual earnings growth of 10 to 15 percent over the next ten years, to deliver a return well in excess of our cost of capital, to maintain a minimum average return on equity of 14 percent, and to deliver a return on sales of 8 to 10 percent. Our strategy will focus on Nucor becoming a "market leader" in every product group and business in which we compete. This calls for significant increases in market share for many of our core products and the maintenance of market share where we currently enjoyed a leadership position." While pointing out that it would be impossible to obtain this success through the previous strategy of greenfield construction, he added, "There will now be a heavy focus on growth through acquisitions. We will also continue growing through the commercialization of new disruptive and leapfrog technologies."

In early 2001 the *Wall Street Journal* predicted that all but two of the United States's biggest steel makers would post fourth-quarter losses. AK Steel Holding Corp. and Nucor Corp. were expected to have profits for the quarter of 2000, while U.S. Steel Group, a unit of USX Corp., was expected to post a profit for the year but not for the fourth quarter. By October 1, more than twenty steel companies in the United States, including Bethlehem Steel Corp. and LTV Corp., the nation's third and fourth largest U.S. steel producers, respectively, had filed for bankruptcy protection. Over a dozen producers were operating under Chapter 11 bankruptcy-law protection, which allows them to maintain market share by selling steel cheaper than non–Chapter 11 steel makers. On October 20, *The Economist* noted that of the fourteen steel companies followed by Standard & Poor, only Nucor was indisputably healthy. In the fall of 2001, 25 percent of domestic steel companies were in bankruptcy proceedings, and the United States was the largest importer of steel in the world. Experts believed that close to half of the U.S. steel industry might be forced to close before conditions improved.

The world steel industry found itself in the middle of one of its most unprofitable and volatile periods, in part because of a glut of steel that has sent prices to twenty-year lows. While domestic steel producers found themselves mired in red ink, many foreign steel makers desperately needed to continue to sell in the relatively open U.S. market to stay profitable. The industry was hovering around 75 percent capacity, a level too low to be profitable for many companies. Three European companies—France's USINOR SA, Luxembourg's Arbed SA, and Spain's

Aceralia Corp.—were in the process of merging to form the world's largest steel company. Two Japanese companies—NKK Corp. and Kawasaki Steel Corp.—were in talks of a merger that would make them the world's second biggest steel maker. These new large steel makers could outmuscle U.S. competitors, which were less efficient, smaller, and financially weaker than their competitors in Asia and Europe. The largest U.S. steel maker, USX-U.S. Steel Group, was currently only the eleventh largest producer in the world, and consolidation in the industry could push it further down the list. In spite of these worsening conditions, global steel production increased 7 percent last year to a record 747 million tons, and efforts were under way to negotiate a worldwide reduction in steel production.

In addition to cheap imports, U.S. steel producers were facing higher energy prices, weakening demand by customer industries, increasingly tough environmental rules, and a changing cost structure among producers. With the declining economy, energy prices could begin to drop. However, so would the demand for construction, automobiles, and farm equipment. Environmental rules could lead to costly modifications and closings of old plants that produced coke along with vast clouds of ash and acrid green smoke. In 1990 mini-mills accounted for 36 percent of the domestic steel market, but by 2000 the more efficient mini-mills had seized 50 percent of the market and the resulting competition had driven prices lower.

In March 2001, Nucor made its first acquisition in ten years, purchasing a mini-mill in New York from Sumitomo Corp. Nucor had hired about five people to help plan for future acquisitions. DiMicco commented, "It's taken us three years before our team has felt this is the right thing to do." In the challenged industry, it would be cheaper to buy than to build plants. During this downturn Nucor was taking advantage of competitors' weaknesses to take market share and invest in new facilities.

In the first quarter, sales decreased 14 percent and earnings were cut in half, despite steel shipments' being at record levels. By the third quarter, sales were down 12 percent, profit was down 70 percent, and earnings per share were down 60 percent from the previous year. In the third quarter Nucor had $20.5 million in net income, compared to $67.8 million from the year before. The company shipped 3.04 million tons of steel, a 10.4 percent increase over the year before, setting a new tonnage record. DiMicco stated, "All the U.S. mills could close and there would still be excess capacity." The year 2001 would indeed be a year to test the metal of the new Nucor!

Appendix 1: Nucor Employee Survey

Question Description	Year*	Almost Never	Seldom	Sometimes	Often	Very Often
1. Meet schedule	*5*	1	4	22	47	26
	4	1	4	25	48	21
	3	4	10	39	37	9
	2	11	16	40	26	7
	1	10	15	0	0	75
2. Have tools	*5*	1	4	19	44	32
	4	1	3	21	47	28
	3	2	5	32	46	15
	2	6	10	36	37	10
	1	6	11	0	0	83
3. Open communication	*5*	7	14	34	29	16
	4	11	19	35	25	11
	3	11	19	37	26	7
	2	24	23	32	16	5
	1	24	25	0	0	51

(continued)

Appendix 1: Nucor Employee Survey *(continued)*

Question Description	Year*	Almost Never	Seldom	Sometimes	Often	Very Often
4. Maintenance	*5*	5	11	28	37	19
	4	6	11	31	36	16
	3	5	14	32	37	13
	2	13	16	34	28	10
	1	13	16	0	0	71
5. Drug test	*5*	2	3	9	34	53
	4	4	4	12	35	45
	3	5	4	13	33	44
	2					
	1					
6. Rules fair	*5*	8	13	24	30	25
	4	9	13	25	31	22
	3	10	11	23	31	25
	2					
	1					
7. Computer systems	*5*	8	14	32	29	16
	4	10	17	33	27	13
	3	13	18	32	27	10
	2	21	20	34	19	7
	1	23	21	0	0	57
8. Informed	*5*	5	9	21	34	31
	4	6	9	24	34	26
	3	9	14	27	33	17
	2	15	15	30	28	12
	1	16	16	0	0	69
9. Supervisor fair	*5*	4	7	20	36	34
	4	6	7	20	35	32
	3	6	9	26	38	21
	2	10	11	32	35	13
	1	13	12	0	0	74
10. Supervisor ideas	*5*	7	11	24	30	29
	4	8	12	29	30	21
	3	11	15	28	30	16
	2	17	18	31	24	10
	1	18	17	0	0	65
11. Division managers' actions	*5*	8	12	39	31	19
	4	7	14	33	33	13
	3	9	17	35	30	9
	2	20	21	34	20	6
	1	18	22	0	0	60
12. Division managers informed	*5*	7	12	27	34	20
	4	6	12	28	35	19
	3	8	15	31	32	14
	2	17	18	33	23	9
	1	15	20	0	0	65

(continued)

Appendix 1: Nucor Employee Survey *(continued)*

Question Description	Year*	Almost Never	Seldom	Sometimes	Often	Very Often
13. General managers' actions	*5*	6	9	27	35	23
	4	7	14	33	33	13
	3	9	17	35	30	9
	2	20	21	34	20	6
	1	18	22	0	0	60
14. General managers' response	*5*	8	13	31	30	18
	4	7	14	32	33	14
	3	12	19	34	28	8
	2	19	20	35	21	6
	1	20	22	0	0	58
15. General managers' information	*5*	4	8	25	38	25
	4	6	12	28	35	19
	3	8	15	31	32	14
	2	17	18	33	23	9
	1	15	20	0	0	65
16. Oa tm gd	*5*	2	5	19	42	32
	4	6	9	27	35	22
	3	8	11	29	35	17
	2	17	14	32	26	11
	1	13	12	0	0	74
17. Headquarter directions	*5*	2	3	18	44	33
	4	1	2	17	45	36
	3	1	3	19	47	29
	2					
	1					
18. Paid fr-out	*5*	6	9	21	31	32
	4	6	9	20	34	30
	3	10	13	24	33	20
	2	14	13	28	31	14
	1	11	13	0	0	75
19. Paid fr-in	*5*	10	13	24	29	24
	4	10	14	22	31	23
	3	16	16	25	29	14
	2	21	15	26	27	11
	1	19	15	0	0	66
20. Heal care	*5*	10	14	30	32	14
	4	8	12	31	35	14
	3	19	18	31	24	7
	2	11	13	33	31	12
	1	8	11	0	0	80

* The most recent survey was 5.

Appendix 2: Nucor Survey Plant Comparisons

Question*	Descrpt.	Total Company	Vulcraft Plants						Steel Plants					Other Plants					
			V1	V2	V3	V4	V5	V6	S1	S2	S3	S4	S5	O1	O2	O3	O4	O5	O6
1	**Meet sche**	5	4	6	5	6	5	5	5	6	5	4	1	5	11	2	18	6	3
2	**Have tools**	5	2	4	3	7	3	4	2	8	6	3	2	6	11	3	17	5	6
3	**Open com**	21	17	23	16	15	18	26	21	26	23	19	15	24	31	23	35	21	30
4	**Maint**	16	12	13	12	9	22	13	13	26	25	19	9	13	29	11	33	15	29
5	**Drug test**	5	5	6	5	3	3	5	8	7	4	5	2	4	9	3	4	5	11
6	**Rules fair**	21	15	24	19	13	12	20	21	31	16	26	15	22	26	32	36	19	37
7	**Cmplt sys**	22	16	22	18	20	19	31	20	27	28	24	15	28	26	18	55	24	40
8	**Informed**	14	8	22	12	15	18	17	12	1 8	19	10	8	22	16	15	23	17	11
9	**Supv fair**	11	9	21	13	11	12	15	10	13	10	10	4	15	14	13	9	11	10
10	**Supv idea**	18	14	32	19	20	18	24	15	18	18	13	9	26	25	18	25	20	13
11	**Dmgr act**	20	13	23	17	14	15	28	23	26	32	16	11	18	18	14	48	24	41
12	**Dmgr infm**	19	17	16	15	14	14	23	19	27	31	19	13	15	24	9	44	21	36
13	**Gmgr act**	15	9	17	8	15	9	25	16	17	15	19	5	29	20	4	43	10	43
14	**Gmgr gets**	21	15	22	12	18	14	24	22	25	24	28	12	30	25	9	45	25	43
15	**Gmgr infm**	12	11	8	7	14	7	17	15	13	15	18	4	1 1	15	2	35	13	34
16	**Oa tm gd**	7	3	7	3	4	7	8	7	9	13	6	1	8	5	2	22	15	13
17	**Hq direct**	5	3	7	3	2	2	10	6	11	16	4	3	3	4	1	11	4	2
18	**Paid fr-out**	15	16	26	19	20	19	20	16	15	14	10	6	42	25	8	11	11	19
19	**Paid fr-in**	23	18	33	21	28	23	26	24	22	25	23	12	45	29	20	28	20	33
20	**Heal care**	24	14	19	16	34	16	27	22	42	31	12	25	18	8	27	7	29	23

* For text of questions, see appendix 1.

Appendix 3: Financial Report

Annual Report: Consol. Inc Acct., Yrs End. Dec.31 (thousand $)

	12/31/2001	12/31/2000	12/31/1999	12/31/1998	12/31/1997
Net sales	$4,139,248	$4,586,146	$4,009,346	$4,151,232	$4,184,498
Costs and expenses					
Cost of products sold	$3,820,303	$3,925,478	$3,480,479	$3,591,783	$3,578,941
Marketing, administrative and other expenses	$138,559	$183,175	$154,774	$147,972	$145,410
Interest expense (income)	($6,525)	($816)	($5,095)	($3,832)	($35)
	$3,965,387	$4,107,838	$3,630,157	$3,735,924	$3,724,315
Earnings before federal income taxes	$173,861	$487,308	$379,189	$415,309	$460,182
Federal income taxes	$60,900	$167,400	$134,600	$151,309	$165,700
Net earnings	**$112,961**	**$310,908**	**$244,589**	**$263,709**	**$294,482**
Com. divds	—	—	45,354	42,129	35,154
Capital expenditures	$261,145	$415,405	$374,718	$502,910	$306,749
Average number of shares (thousands)	77,814	77,582	87,247	87,862	87,872
Operating income as calculated	—	—	$630,730	$664,595	$677,911
Depreciation	$289,063	$259,365	$256,637	$253,118	$217,764

Consolidated Balance Sheet (thousand $)

	12/31/2001	12/31/2000	12/3 1/1999	12/31/1998	12/31/1997
Assets					
Current assets	$1,373,666	$1,379,539	$1,538,509	$1,129,467	$1,125,508
Property, plant, and equipment	$2,365,655	$2,329,421	$2,191,339	$2,097,079	$1,858,875
Total assets	**$3,759,348**	**$3,710,867**	**$3,729,848**	**$3,226,546**	**$2,984,383**
Liabilities and Stockholders' Equity					
Total current liabilities	$484,159	$558,068	$531,031	$486,897	$524,454
Long-term debt after one year	$460,450	$460,450	$390,450	$215,450	$167,950
Total stockholders' equity	$2,201,460	$2,130,951	$2,262,248	$2,072,552	$1,876,426
Total liabilities	**$3,759,348**	**$3,710,867**	**$3,729,848**	**$3,226,546**	**$2,984,383**
Net working capital	$889,507	$821,460	$1,007,478	$642,570	$601,055
Equity per share	$28.29	$27.47	$25.96	$23.73	$21.32
Capital expenditures	$261,145	$415,405	$374,718	$502,910	$306,749
Number of common shares (thousands)			90,103	90,052	
Number of treasury shares (thousands)			2,969	2,699	

Source: Standard & Poor's Corporate Records.

Appendix 4: Financial Ratios

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Net sales	1,481	1,465	1,619	2,253	2,975	3,462	3,647	4,184	4,151	4,009	4,586
Net earnings	75	65	79	123	227	275	248	294	264	245	311
Current assets	313	334	382	468	639	831	828	1,126	1,129	1,539	1,381
Current liabilities	203	229	272	350	382	447	466	524	487	531	558
Long-term debt > 1 year	29	73	247	352	173	107	153	168	215	390	460
Stockholders' equity	653	712	784	902	1,123	1,382	1,609	1,876	2,973	2, 262	2,131
Total assets	1,036	1,182	1,507	1,829	2,002	2,296	2,620	2,984	3,227	3,730	3,722
COGS	1,293	1,303	1,417	1,966	2,492	2,900	3,139	3,579	3,591	3,480	3,925
Shares out, year end	86	86	87	87	87	88	88	88	88	87	78
Current ratio	1.54	1.46	1.40	1.34	1.67	1.86	1.78	2.15	2.32	2.90	2.47
Long-term debt : equity ratio	0.04	0.10	0.32	0.39	0.15	0.08	0.10	0.09	0.07	0.17	0.22
Profit margin	5.1%	4.4%	4.9%	5.5%	7.6%	7.9%	6.8%	7.0 %	6.4%	6.1%	6.8%
Return on equity	11.5%	9.1%	10.1%	13.6%	20.2%	19.9%	15.4%	15.7%	8.9%	10.8%	14.6%
Return on total assets	7.2%	5.5%	5.2%	6.7%	11.3%	12.0%	9.5%	9.9%	8.2%	6.6%	8.4%
Total asset turnover	143.0%	124.0%	107.0%	123.0%	149.0%	151.0%	139.0%	140.0%	129.0%	107.0%	123.0%
Gross profit margin	12.7%	11.1%	12.5%	12.7%	16.2%	16.2%	13.9%	14.5%	13.5%	13.2%	14.4%
Earning per share	$0.87	$0.76	$0.91	$1.41	$2.61	$3.13	$2.82	$3.34	$3. 00	$2.82	$3.99

Appendix 5: Board of Directors and Executive Management

To 1990

Board: Iverson, Aycock, Siegel, Vandekieft
Executive Office: Iverson, Aycock, Siegel

1990

Board: Iverson, Aycock, Cunningham, Siegel, Vandekieft
Executive Office: Iverson, Aycock, Siegel

1991 to 1994

Board: Iverson, Aycock, Siegel, Cunningham, Correnti
Executive Office: Iverson, Siegel, Correnti, Lisenby, Prichard

1995 to 1996

Board: Iverson, Aycock, Siegel, Cunningham, Correnti, Hlavacek
Executive Office: Iverson, Siegel, Correnti, Doherty, Prichard

1997

Board: Iverson, Aycock, Siegel, Cunningham, Correnti, Hlavacek
Executive Office: Iverson, Siegel, Correnti, Lisenby, Prichard

1998

Board: Aycock, Siegel, Correnti, Hlavacek, Browning, Gantt, Haynes
Executive Office: Aycock, Siegel, Correnti, Parrish, Rutkowski, Lisenby, Prichard

1999 to 2000

Board: Aycock, Siegel, Hlavacek, Browning, Gantt, Haynes
Executive Office: Aycock, Lisenby, DiMicco, Lott, Parrish, Rutkowski, Coblin, Prichard

Appendix 6: Biographies of Board Members and Executive Managers

H. David Aycock joined the predecessor to Nucor in 1962 when it bought the Vulcraft plant in Florence, South Carolina, where he was sales manager. He became the general manager at the Vulcraft plant in Nebraska in 1963. He was instrumental in building and operating the plant, and he also managed the Texas plant. In 1981 he became general manager of the Nucor steel plant in South Carolina. In 1985 he became president and chief operating officer. He retired in June 1991 but remained on the board. In October 1998, Mr. Aycock became chairman and, in June 1999, chief executive officer. In September 2000 he stepped down as Nucor's CEO and chairman of the Board of Directors. He retired from the board in 2001.

Peter C. Browning has been the president and chief executive officer of Sonoco Products Company and was senior officer in 1993. He was previously the president, chairman, and chief executive officer of National Gypsum Company. He was elected chairman of Nucor's Board of Directors in September 2000.

James W. Cunningham was a vice president of Nucor and general manager of the research chemicals division in Phoenix from 1966 until the division was sold in 1998. He died on September 15, 1998, at seventy-seven years of age.

Daniel R. DiMicco was executive vice president of Nucor-Yamato, Nucor Steel Hertford (plate division), and Nucor Building Systems before becoming president. He graduated from Brown University in 1972 with a bachelor of science in engineering, metallurgy, and materials science. He received a master's in metallurgy from the University of Pennsylvania in 1975. He was with Republic Steel in Cleveland as a research metallurgy and project leader until he joined Nucor in 1982 as plant metallurgist and manager of quality control for Nucor Steel in Utah. In 1988 he became melting and castings manager. In 1991 he became general manager of Nucor-Yamato and a vice president in 1992. In September 2000 he was elected president and chief executive officer of Nucor.

John A. Doherty served as vice president and engineering consultant at Nucor.

Harvey B. Gantt was a partner in Gantt Huberman Architects for more than twenty-five years. He also served as mayor of the city of Charlotte, North Carolina, and was active in civic affairs. He was the first African American graduate of Clemson University. He joined Nucor's Board of Directors in 1998.

Victoria F. Haynes is the president of Research Triangle Institute in Chapel Hill, North Carolina. Until 2000, she was the chief technical officer of the B. F. Goodrich Co. and vice president of its advanced technology group. She started with Goodrich in 1992 as vice president of research and development. She joined Nucor's Board of Directors in 1998.

James D. Hlavacek is the managing director of Market Driven Management. Mr. Hlavacek was a neighbor and long-term friend of Mr. Iverson. He joined Nucor's Board of Directors in 1995.

Terry S. Lisenby is chief financial officer and an executive vice president of Nucor. He graduated from the University of North Carolina at Charlotte in 1976 with a bachelor of science in accounting. Mr. Lisenby held accounting and management positions with Seidman and Seidman, Harper Corporation of America, and Concept Development, Inc. He joined Nucor in September 1985 as manager of financial accounting. He became vice president and corporate controller in 1991 and assumed the role of chief financial officer on January 1, 2000.

Hamilton Lott, Jr., is executive vice president of the Vulcraft operations, cold-finished operations in Nebraska, and the Utah grinding ball plant. He graduated from the University of South Carolina in 1972 with a bachelor of science in engineering and then served in the United States Navy. He joined Nucor in 1975 as a design engineer at Florence. He later served as engineering manager and as sales manager of Nucor's Vulcraft division in Indiana. He was general manager of the Vulcraft division in Texas from 1987 to 1993 and general manager in Florence from 1993 to 1999. He became a vice president in 1988 and joined the Executive Office in 1999.

D. Michael Parrish is executive vice president for the four steel plants and Nucor Fastener. He graduated from the University of Toledo in 1975 with a bachelor of science in civil engineering. He joined Nucor in September 1975 as a design engineer for Vulcraft and became engineering manager at Vulcraft in 1981. In 1986 he moved to Alabama as manufacturing manager and in 1989 returned to Utah as vice president and general manager. In 1991 he took the top job with Nucor Steel Texas and in 1995 with Nucor Steel Arkansas. In January 1999 he moved into the corporate office as executive vice president.

Leroy C. Prichard is vice president, Steel Technologies, at Nucor.

Joseph A. Rutkowski is executive vice president of Nucor Steel in Indiana, Arkansas, Berkeley, and South Carolina and of Nucor Bearing Products. He graduated from Johns Hopkins University in 1976 with a bachelor of science in materials science engineering. He held metallurgical and management positions with Korf Lurgi Steeltec, North American Refractories, Georgetown Steel, and Bethlehem Steel. He joined Nucor in 1989 as manager of cold finish in Nebraska and became melting and casting manager in Utah before becoming vice president and general manager of Nucor Steel in Darlington in 1992. In 1998 he moved to Hertford as vice president and general manager to oversee the building of the new plate mill.

Richard N. Vandekieft is a former vice president of Nucor.