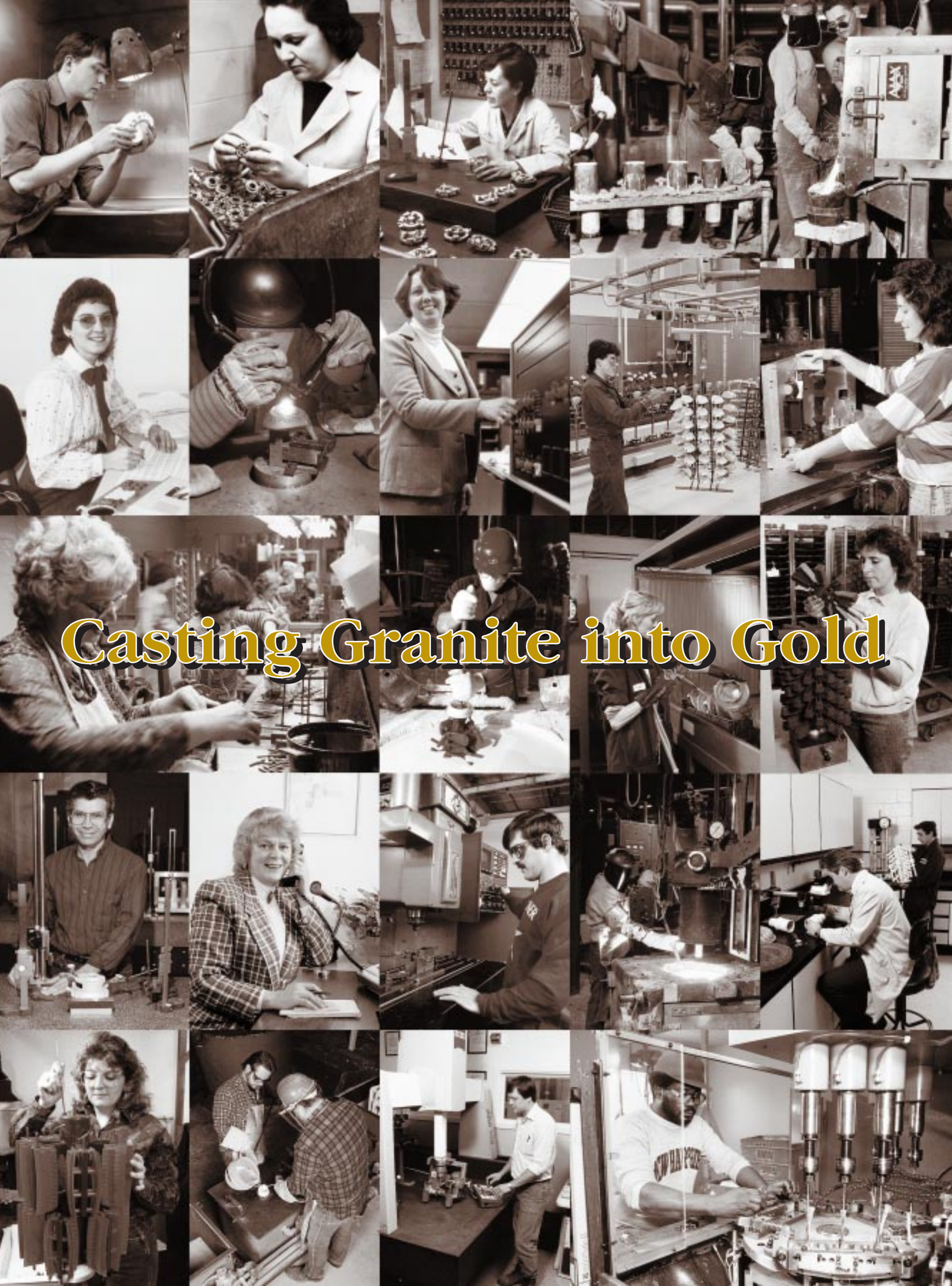


Casting Granite into Gold

Preparation of the refractory material (left, above) used to form a solid mold, circa 1946. Part size with the solid mold process was limited by the size of the flask.

In that era, a fully assembled sprue (left, below) could stand vertically on the bench.

In the foundry (right), the flasks were placed on a vacuum stand and molten metal was hand ladled into the mold.

Mill Building #1 (next page), Amoskeag Millyards of Manchester, NH. This long-since demolished building was home to Hitchiner Manufacturing Co., Inc. in the late 1940s.

The Origin & Early Years

After 50 years, Hitchiner Manufacturing Co., Inc. is the premier high-volume, full-service investment casting supplier to the global market. But if New Hampshire hadn't been so rock-hard to farm, the company would never have made it past its second anniversary.

Lost-Wax Found Again

When A. Fred Hitchiner bought a Long Island brass foundry in 1946, he relocated it to a less expensive site at the Amoskeag Millyard in Manchester, New Hampshire. His idea was to commercialize investment casting for industrial purposes. Hitchiner had worked for the War Production Board during World War II and knew that the 5,000-year-old lost-wax process had been the basis for successful castings of the first jet engine blades. He became one of many trying to capitalize on the precision, design freedom, and near-net-shape results of the "new" old technology.

Making the business a going concern proved difficult. With finances tight, Hitchiner worked on a job basis, expanding and contracting the work force as business demanded. The short-term economy cost dearly over time. By 1948, he had to sell out or find a strong investor.

Boom Gone Bust

The odds were against him. Settled in the early 1700s by farmers, New Hampshire became a major manufacturing center in the late 1800s and early 1900s, when agriculture moved west to richer Ohio River Valley loam. Mountain and spring-fed rivers powered hundreds of textile and lumber mills, shoe factories, and other businesses. By the 1940s, though, the state had lost much of its industry to cheaper electric power elsewhere and large pools of cheaper labor outside New England. Without agriculture or industry, the state's economy had no base for growth and little attraction for investors.

Ironically, it was for just these reasons that George Abbot Morison was seeking a manufacturing company in which he could invest.

Deep Roots, Many Branches

His family home in Peterborough, New Hampshire stood on land settled by his ancestor, Capt. Thomas Morison in 1749. Thomas Morison and other family members soon realized that farming the infertile soil would never create an acceptable way of life. By 1759, he started the first saw and grist mill in the community, soon followed by textile mills established with his son and grandson. Over the generations, family members continued to succeed in a variety of endeavors while keeping the family farm.

Born in Peterborough 100 years later, George Abbot Morison became involved in manufacturing in Wisconsin and retired to Peterborough in 1947. Upon his return he was appalled to discover the dismal state of New Hampshire's economy. What had been the country's second-largest industrialized state per capita was rapidly losing its textile, shoe, woodworking, and other small industries.

Fueled by post-World War II prosperity, the national economy was fairly bursting with hot, retail-oriented opportunities just about everywhere in the country except New England, and particularly New Hampshire. Morison determined to take on a business which would reinvigorate the state's dying industrial base and provide steadily growing, dependable employment opportunities.

He soon approached the state Industrial Development Commission to see what could be done to restore the manufacturing economy. After looking over a discouraging list of decaying mills, his interest rose when he read about Fred Hitchiner's company. The labor-saving potential of the process, which could yield complex parts to extremely close tolerances, was clearly evident.

Family Venture

In 1949, he met with Hitchiner and negotiated to buy control of the company. His son, John H. Morison, agreed to leave his job in South America and put up half the investment needed (see "John H. Morison," profile). In October, young Morison took over as president while Hitchiner stayed on with a five-year sales contract.

By the following April, the company broke even when sales reached an annual rate of $250,000. The Korean War brought an influx of orders that June; within a year of buying the foundry, Morison found the company had outgrown its facilities. Looking for a new site in which the company could grow, he selected Milford, New Hampshire.

Like Peterborough and Manchester, Milford had lost its once-thriving manufacturing industry. Even so, town selectmen were wary of helping the foundry get established. They recalled an earlier case in which they had given a tax abatement to attract a new industry only to see the company pull out when the tax holiday ended. At the end of a long meeting, however, a local banker swayed the vote when he demonstrated his confidence by saying he would buy notes offered by the company to help fund the cost of a new building.

Fast Start

The deal done, the company broke ground on three acres of the old Hutchinson homestead west of town in December 1950. On Labor Day, 1951, it moved 50 employees into a 12,800-square-foot building, now the midsection of Plant I. An expanded product mix—parts for guns, aircraft, electronics, sewing machines, textile machines, and more—included ferrous as well as nonferrous-based alloys. Sales for the year continued to climb, reaching nearly $400,000.

From that point on, the organization grew at a remarkable pace, adding employees and new products every year, as well as doubling its casting capacity to hit the $2 million sales mark in 1956.

Leadership Profile

John H. Morison

- *Board of directors, 1949-96*
- *President and chief executive officer, 1949-72, 1979-81*
- *Chairman, 1973-92*
- *Chairman emeritus, 1992-present*

"Private ownership has been a key to the company's growth and, more important, to serving the purpose for which my father and I acquired the company in 1949—to provide healthy employment opportunities and build a sound economic base in the State of New Hampshire.

"When we started, there were a number of small companies doing the same thing. There was always a desire to get ahead of our competitors, pressure to grow. Some of them tried to go public. One that did so in the 1960s has been sold twice since. It has survived, but it is still small and struggling.

"An initial public offering can bring in cash. But let's face it; the casting industry is not a hot buy the way some other stocks are. Over the long run, you give up too much for too little by going public. You spend your time worrying about where your stock is going instead of where the company is going.

"We're here because the region needs strong, stable employers. To run the risk of selling out and having somebody move the business was certainly never part of our game plan."

A portfolio of parts from the early 1950s (previous page). Castings produced during this period were limited by the process to six inches in any dimension.

Hitchiner's first chemistry lab (above) was established at the Milford Plant in 1952. All analysis was done by wet chemical methods.

Manually operated air-driven wax pumps (below) were designed and constructed at Hitchiner.

The Cellini Club (right), organized in 1966, was named after Benvenuto Cellini, the great renaissance sculptor and goldsmith who utilized the "lost wax" process in his work. The club honors and recognizes the contribution of long-service employees.

Basic Values & Long-Range Vision

Since 1949, Hitchiner Manufacturing Co., Inc. has been a privately held company managed under the leadership of the Morison family. This uncomplicated provenance has yielded a remarkably consistent adherence to the mission, character, and core philosophy that John H. Morison, once president and now chairman emeritus, first set for the company—

- *Mission:* Consistent growth
- *Character:* Leadership
- *Core philosophy:* Dissatisfaction with the status quo

According to Morison, Hitchiner's stability—steady, dependable growth as an industrial business and employer—rests on a sound financial foundation based on a long-term outlook, private ownership, and capital reinvestment. Leadership in all areas requires the highest degree of ethical integrity coupled with long-range vision. Cultivation of a pervasive dissatisfaction with the status quo advances the business as a whole while ensuring an effective and proactive response to dynamically changing conditions.

After 50 years of application and practice, the mission, character, and core philosophy are more than traditions; they constitute a firmly established direction for the many talented individuals who are and will be Hitchiner Manufacturing Co., Inc.

Five focus areas within the core philosophy have remained constant throughout the history of the company: recruitment, investment in an effective work force, marketing, and innovation in technology and production methods.

The Best People

"No one has a monopoly of ideas. We want the best and the brightest at every level," says Morison.

The majority of the company's board of directors has always been made up of outsiders to whom the president reports. With few exceptions, the board has not included active investors; company bankers, lawyers, or consultants; relational investors; or inactive family members. There have been no interlocking directorships with other companies and no one has been nominated to the board by virtue of fulfilling a special interest. Active membership is encouraged through fees and grants of non-controlling stock. In short, Hitchiner has long modeled what *Chief Executive* magazine calls the "hallmarks of an effective board."

The company has always sought input from high-level academic and commercial organizations. In particular, its alliance with the Massachusetts Institute of Technology has yielded world-class recruitment opportunities and consulting for more than 40 years.

Investing in Human Capital

As an employer, Hitchiner is known for its high entrance requirements and dedication to education and training. Courses in many disciplines from basic literacy and math to statistical process control, rigorous 8,000-hour apprenticeships in specialized fields like toolmaking, management seminars, and comprehensive, ongoing ethics education and training are just a few of the areas in which the company has distinguished itself as a leader.

Hitchiner was also among the first to implement the Scanlon Plan in 1953. The plan gave employees a vested interest in the company while it empowered and rewarded initiative. Profit sharing and regular systems like the core team program for soliciting, acting on, and rewarding employee input remain strong incentives. Bonuses and stock plans for top achievers likewise ensure that such talent remains an integral part of the company.

Marketing

From the beginning, the company had to sell the advantages of a higher-cost, "new" technology—investment casting—against better-known processes like die casting. By the '70s, it was selling its revolutionary countergravity

processes against the traditional investment casting processes it had done so much to establish.

As a job shop with no product of its own, the company learned to move nimbly into new growth markets. Over time, it became clear that Hitchiner performed best in specialized niches—thin wall, high volume casting rather than turbine blades and other aerospace components, for example—where its technology and production methods offered a competitive advantage.

Thus, educational selling and a focus on markets in which the advantages of its processes outweighed cost or could bring down the total cost of production have remained constants throughout Hitchiner's history.

"Serendipity," notes Morison with a smile, "is being there with a prepared mind."

Like many managers of small start-up companies, Morison began by using manufacturers representatives. While the strategy saves the overhead cost of an underemployed direct sales force, it also poses some challenges. Working solely on commission, independent agents have little desire to spend valuable sales time training themselves on a technology, cold calling, and working through a relatively long sales cycle—exactly the activities needed to sell the advantages of investment casting.

"We were very lucky to have Fred [Hitchiner] stay on with sales through the '50s," says Morison. "We didn't have to teach him the technology. He knew it. We didn't have to sell him on its advantages. He knew them. Once he was free to focus on sales and marketing, he formed his own rep company, and he was good at it."

To encourage representatives to invest their time and energy in the company, Hitchiner promised that it would not cap commissions. "We said, 'We don't care how much you make, we won't take the accounts back," says Morison. At the same time, the company took the then-innovative step of asking its independent agents to help generate the sales and market forecasts it needed to plan for consistent growth.

In return, the company hosted annual sales and training meetings, customer events, and eventually put salaried district managers in place to support the sales agents. The time did come when some customers required a dedicated, full-time sales team. Otherwise most sales, other than golf and automotive, still go through independent agents.

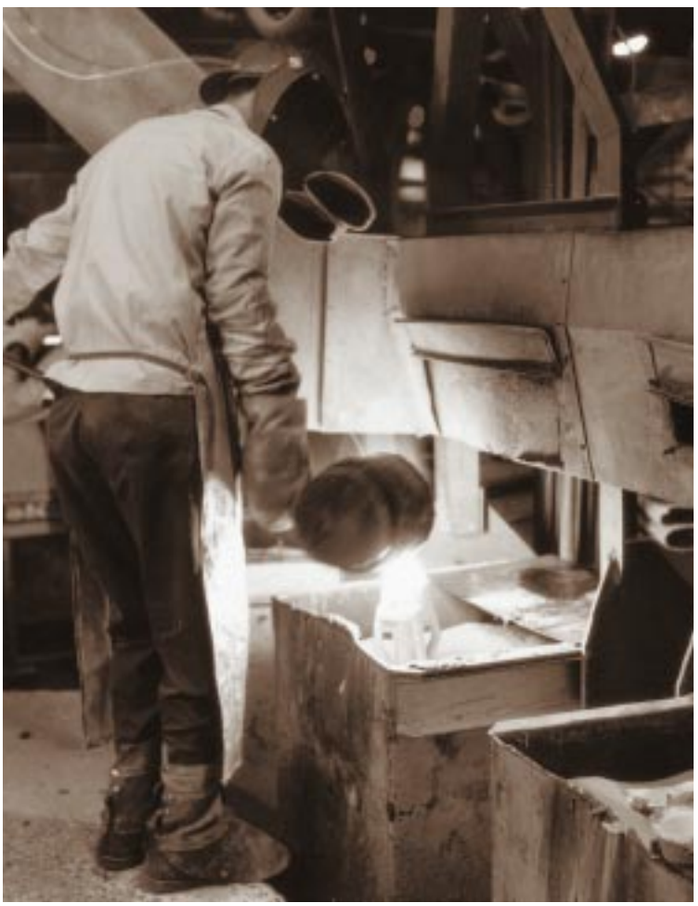
Outside the United States, and particularly in Europe, Hitchiner found the cost of establishing its own marketing and manufacturing sites high. Strong interest on the part of many good local manufacturers in the company's technology, however, led to a focus on marketing through licensing (see "Knowledge-Based Earnings"). More recently, stronger demand for its processes, especially in the automotive industry, have made it more practical for the company to establish its own sales offices and work directly with customers.

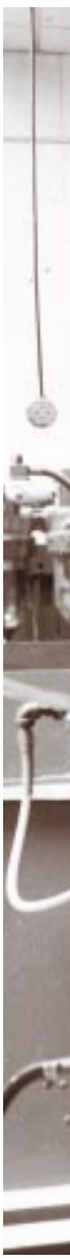
Process

From the beginning, management was determined to change the lost-wax process in a way that hadn't been done for 5,000 years. Long-term commercial viability hinged on the ability to cast larger parts in high volume.

Countergravity investment casting, developed in 1970, constituted the real breakthrough. The method opened the door to increasing automation, cost cutting, and high-volume market service.

The opening of the first mechanized, high-volume ceramic shell process plant in 1962 marked the start of an ongoing and aggressive pursuit of state-of-the-art production methods that has made Hitchiner the most advanced company in its industry. "We knew we had to apply the technology in very high volume. We had to cut scrap, lower cost. We had to have full manufacturing ability and quality in all things," says Morison. As the first investment casting company to receive ISO-9000 certification, the company has achieved that and more.





Hitchiner's second Milford, NH plant (above) was designed and built to be the first mechanized investment casting facility for high volume applications.

A commitment to community service has long been a company tradition. Participation in local events, such as the 1968 Labor Day Parade (below), are commonplace.

Installation of a chain-driven carousel (right) in the Plant II foundry increased throughput and efficiency.

Hitchiner was the first investment casting foundry to utilize conveyorization and automated shell building equipment (next page).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23

From Milford to Mexico

During the Korean War, we decided to increase our defense work while continuing to emphasize commercial business," says Morison. "At the same time, the solid-mold process was too limited. We needed to improve our process and increase capacity."

Early Automation

The search led to the less expensive, more productive shell method developed by Metropolitan Vickers Ltd. of England. Richard T. Carter, one of those responsible for the innovation, left Vickers to join Hitchiner in 1958 and devote his energies to establishing the first mechanized shell plant.

Hitchiner opened Plant II in 1962. While the automation would be considered weak today, at the time it cut costs and increased productivity.

Other resourceful moves in the '60s included the acquisitions of Delta Microwave Corp. (Hackensack, NJ) in 1961 and a substantial minority interest in a ceramics research concern, Lexington Laboratories (Cambridge, MA), in 1963.

Delta specialized in aluminum investment castings for electronics. The plant quickly expanded into the commercial aircraft market and became Hitchiner's nonferrous arm.

The restructuring and added high-volume capacities pushed sales to more than $11 million in 1967.

Top Talents

To drive and manage such expansion, Morison continued to recruit the best. In 1967, Nicholas Babich, an executive at Singer, Inc., came on board as general manager of the Ferrous Division. Babich, who would be a key player in the long-term success of the company, also became general manager of the Aerospace Division, established in 1968 at Wallingford, Connecticut, and vice president, operations, during his first tenure at Hitchiner.

The company also brought in former MIT graduate student and TRW technical director G. Dixon Chandley as vice president, technology (see "G. Dixon Chandley," profile). Chandley's charge: change the investment casting process in a way that hadn't been done in 5,000 years.

In addition to the Aerospace Division, the company created the Nonferrous Division at O'Fallon, Missouri, in 1968. "Delta was strictly solid mold," says Morison. "We needed more capacity and a site closer to nonferrous markets where the shell process could be installed."

For added income, Hitchiner formed Brico Metal Products, a joint venture with Associated Engineering Ltd. of Leamington Spa, England, to distribute the British firm's automotive products and drill bushings in the United States.

Although the results of these initiatives proved mixed, over the long run each played a significant role in the growth of the company.

That same year, Nelson J. McDermott came out of General Electric to run the company as executive vice president while Morison retained the title of president (see "Nelson J. McDermott," profile).

By 1970, productivity gains at O'Fallon enabled the company to close the Delta plant. It also sold its interest in Lexington Laboratories and launched its own technical center in Milford.

Reversing Newton

Within the year, researchers led by Chandley revolutionized investment casting by developing the countergravity low-pressure air melt (CLA) investment casting process. The new method was a major step on the way to nearly full automation, making investment casting viable for high-volume markets.

The countergravity low-pressure vacuum melt (CLV) process followed in 1971. CLA and CLV have established the exclusive quality advantages for which Hitchiner is known today. But those benefits, later proven so important to the company's success, were not the direct target at the time.

Indeed, the first record of the process, Chandley's January 1969 memo "Concepts for an Automated Foundry," focused on time, labor, and a 50 percent material savings, only briefly noting that, "It is assumed that casting quality would be much improved...."

By the end of 1973, Hitchiner had more than doubled 1966 sales to $20 million, expanded its commercial market base, and added large casting capacity at Wallingford and 10,000 square feet to the Milford foundry.

Riding Out the Recession

Rapid growth in golf club heads and telephone equipment castings jumped sales to $28 million in 1974. Then the recession hit. Sales seesawed over the next four years. Even on the upswings, earnings declined through 1978. Despite these fluctuations, Hitchiner continued to invest in capacity, automation, and technology.

The sluggish economy and investment pressure forced a more focused approach to market opportunities. McDermott reorganized the sales force in 1976, charging one group with growth in traditional markets, the other with finding and selling into new markets.

Hitchiner won its first high-volume automotive orders from General Motors Corp. in 1977. The company advanced automation another level, and on the technology front, supplemented ceramic shells with lower-cost resin-bonded shells.

As the company entered 1979, all plants were exceeding budgeted profit level. The year "was the culmination of things we were working on," says McDermott, who retired that year. "We got the volume in once we had the capacity."

The economic recovery of the late '70s foreshadowed the early '80s boom in southern New Hampshire's low unemployment and high turnover rates at Hitchiner. The company investigated low-cost housing to attract workers to Milford, even buying 200 acres (later given to the town). In 1979, it was forced to site a new facility for all Milford wax pattern and ceramic core work, plus a full foundry and finishing facilities 70 miles north at Plymouth, New Hampshire.

Morison served as president until Babich returned to Hitchiner as chief executive officer and president in 1981 (see "Nicholas Babich," profile). By then, sales had hit $54.6 million.

Dual-Market Drive

Already a significant player in the golf club industry, Hitchiner was well-positioned for leadership when metalwoods rapidly became the club of choice. Hitchiner was also one of the first to recognize the value of one-stop shopping, adding finishing and polishing operations in 1982.

Doing the same for automotive customers, starting a full computerization effort, and creating the Tool & Die Division in Amherst, New Hampshire, the company took its first steps toward becoming a full-service manufacturer.

Hitchiner shed Wallingford in 1983, leaving the mature aerospace casting market to others. Although the plant was well-equipped, operated state-of-the-art processes, and generated income, it never broke its competitors' hold on the market.

Focus on Specialized Strengths

The venture did yield a niche in which Hitchiner could excel—thin-wall, high-strength and superalloy aerospace products. The company moved that business to the Milford CLV Division (reorganized in 1986 as the Gas Turbine Division).

The '80s boom and a clear growth path in high-volume golf and automotive business led to accelerated automation and a 63 percent production increase in 1984.

The dearth of available labor in southern New Hampshire again sent the company north. In 1984, it bought a 110,000-square-foot factory on 14 acres in Littleton, New


PRODUCTION ORDERS SHIPPED ON TIME
1969

Viewing the 1969 results in "Production Orders Shipped on Time" (previous page) are representatives from each of the manufacturing departments. The results show a better than 90% score for on-time deliveries.

Jack McDonald (above) inspects the company's first computer. The Honeywell 120, installed in 1966, featured 12 kilobytes of memory and no operating system.

Ed Rainville (below) runs a wax pattern for one of the O'Fallon plant's first jobs, an aircraft fuel system component.

The highly adaptable investment casting process (right) is ideal for producing components weighing just a few ounces or many pounds.

Hampshire, for its wax and finishing operations. In 1988, all operations at Plymouth were consolidated in Littleton, and the Plymouth plant closed.

The launch of Metal Casting Technology, Inc., a research and development center jointly owned with General Motors Corp. and the beginning of plans for Hitchiner S.A. de C.V. of Mexico in 1986 were strategic initiatives. Babich called them "the building blocks for Hitchiner's future."

With Chandley as president, MCT nearly doubled Hitchiner's R&D muscle. It is widely regarded as the world leader in investment casting research. Since it opened in 1987, it has saved both companies millions in process improvements, obtained 20 significant U.S. patents, and driven the growth of the licensing business.

Hitchiner S.A. de C.V. opened at Santiago Tianguistenco in April 1988. Hitchiner's Mexican strategy differed from the offshore tactics taken by others at the time. Rather than using old machinery and counting on low wages for cost advantages, the company built a state-of-the-art facility and recruited the best local managers and workers. The world-class combination enabled Hitchiner to not only recover golf business from Pacific Rim manufacturers, but to establish a strong hand tools market position and generate more U.S. operations business.

The plant produced sales of over $4 million per year by December 1988. Sales for 1996 topped $29 million.

Turbulent Times to Come

Peak sales for the Nonferrous Division in 1988 were an ironic by-product of the times—increased share of a shrinking defense market. Hitchiner's determination to prevail in a seven-year consolidation succeeded in 1995 when the division began to see rising sales volumes for the first time in seven years.

But in 1988, the results signaled that the high tide of the early '80s was going out. Recession began to threaten demand across all markets. Now was the time to test the company's strength in a sea of global competition.

Hitchiner Then & Now

Factor	1946/49	1996/97
Capability	Foundry casting; tool and die making	**Full service: From rapid design prototyping to ready-to-use product**
Processes	Solid mold investment casting, new to industry, but not exclusive	**Countergravity investment casting: CLA, SSCLA, CLV, SSCLV, CV, CLI, CLIX; exclusive to Hitchiner and licensees**
Materials	Brass, bronze	**Hundreds of ferrous and nonferrous alloys, including stainless steel, Cu, Al, and Ti**
Volume	Low per job; e.g., a few hundred pieces per day	**High per job; e.g., 40,000 automotive engine rocker arms per day**
Automation	Virtually none	**Highly mechanized, automated, computerized**
Major Markets	Early electronics, textile machinery, firearms	**Automotive, sporting goods, aerospace, defense, hand tools, medical, food processing, transportation**
Market Sphere	United States only	**Global, serving customers throughout the Americas, Europe, and the Pacific**
Sites	One, at the Amoskeag Millyard, Manchester, NH–12,000 ft² total	**Seven: Five at Milford, Amherst, and Littleton, NH; O'Fallon, MO; Santiago Tianguistenco, Mexico–635,000 ft² total**
Employees	Variable; about eight core employees	**Over 2,000 employees**
Ownership	Privately held	**Privately held corporation**

The Milford White House

It is rare, but it sometimes happens that the personal interests of a chief executive can benefit both the community and the company.

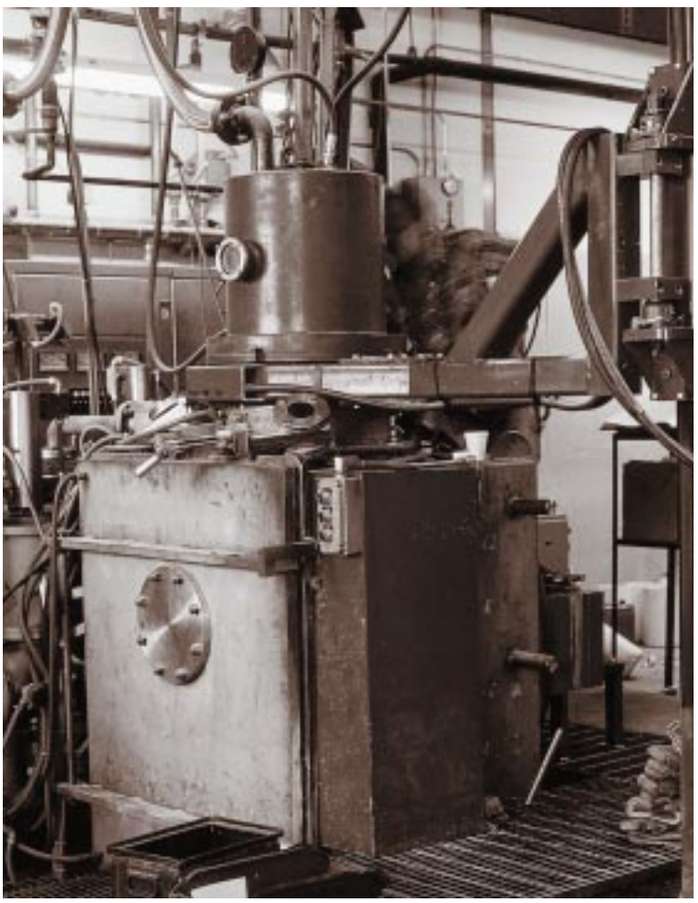
John H. Morison, first president and now chairman emeritus of Hitchiner Manufacturing Co., Inc., has always deeply loved and respected the history of New Hampshire. Even before construction started in 1951 on the first Milford plant, Morison had his eye on the old farmhouse and barn that came with the property.

Built in 1789, Hutchinson House first belonged to Nathan Hutchinson, Revolutionary War veteran, town founder, and tavern keeper. In the same family for generations, the buildings carried significant historical value. Morison hoped to restore and renovate them for company use. He had a long wait coming.

Eighteen years later, probate court released the parcel and Hitchiner finally took title. Despite the advice of architects to demolish the buildings, Morison found an experienced local contractor to take on the job.

The work took another five years. The contractor preserved many of the pre-Colonial features, including the original brick chimney; wide, soft-pine floors, and hand-planed paneling. The house became the new corporate offices, and the barn serves as the Milford complex cafeteria. A shed built in 1994 in the same style as the barn is the corporate training center, where classes are held in subjects ranging from GED preparation to advanced computer skills.

The renovation of the "White House" gave the company a new facility below the cost of new construction. More importantly, it preserved an important part of New Hampshire history and Milford's identity, two values inextricably linked to Hitchiner's character.



The Hitchiner Technical Center developed the revolutionary CLA casting process (left), generally conceded to be the most significant advancement in the investment casting process since the shell process.

The CLV process (right) applies countergravity casing techniques to alloys that must be cast in an inert or vacuum atmosphere. Development of this process led to the establishment of the Gas Turbine Division.

The 1980 management team (next page), included: (seated, l to r) Edward Broad, vice president, international; Robert Grasty, executive vice president; John H. Morison, president and chairman of the board; John Noga, treasurer, controller and clerk; G. Dixon Chandley, vice president, technology. (standing l to r) Charles Wirtz, vice president, operations; A. Waller Howard, vice president, sales and marketing; Robert Cummings, Jr., vice president, market development.

Imagination in Metallurgy

1946/49	Solid-mold investment casting process adapted for industrial use.
1957	Ceramic shell molding introduced.
1961	First shell-building machine installed.
1970	Milford Technical Center completed. CLA (countergravity low-pressure air melt) process developed. Designed to facilitate greater automation and lower costs, the method uses vacuum to draw melt up into mold instead of gravity-pouring into it.
1971	CLA in production. CLV (countergravity low-pressure vacuum melt) developed. Metal melts in vacuum rather than air, reducing slag and enabling casting of thin (0.015 in.) sections in Ni-based superalloys. Both CLA and CLV established exclusive Hitchiner advantages—improved grain structure, fewer inclusions, increased sprue loading, and better thin-section mold fill-out.
1974	CLV in production.
1975	CLA and CLV patented.
1978	Less-expensive resin-shell molds developed and process patented.
1979	CLAS (countergravity low-pressure air melt sand) pilot plant opened to develop applications for the process and explore its economic viability.
1980	World's first computer-controlled CLV casting unit installed.
1982	CLAS patented.
1985	Two CLAS process enhancements patented.
1986	Metal Casting Technology, Inc. launched with General Motors Corp. The joint venture doubled Hitchiner research capacity. CV (check valve) process, a CLA enhancement enabling greater size, patented. New CLAS patent. CLAS process sold to GMC, which renamed it the VAC process. Hitchiner became licensing agent.
1987	Additional CLA patent.
1988	CLI (countergravity low-pressure inert gas), a CLV enhancement lowering the production cost of thin-wall, near-net-shape vacuum castings, patented. CLA enhancement patented.
1989	Expert engineering system developed. VACF patented. Two VAC process enhancements patented.
1990	LSVAC (loose-sand vacuum casting), a VAC development for cost-effective casting of lightweight and hollow parts, patented. No-snout SSCLA patented.
1991	SSCLA and SSCV (supported-shell CLA and CV) patented. Supported-shell technology cuts material costs and increases number of pieces per mold. First multi-station, automated rotary SSCLA casting machine installed. CLI development patented.
1993	Multipurpose casting machine, a highly adaptable, multichambered, fully automated, high-volume system, patented and installed. CLIX (countergravity low-pressure inert gas exothermic) patented; process uses exothermic reaction to achieve rapid Ti aluminide melt. Metal matrix composite casting technology developed. HIP (hot isostatic pressing), a process to eliminate casting porosity at lower cost, patented. Additional LSVAC patent.
1994	Rapid prototyping technology adopted. LHIP (liquid hot isostatic pressing) patented; process eliminates porosity at lower cost than HIP. Additional LSVAC, CV and SSCV patents awarded.
1995	CLIX process extended to high- (70 to 90 percent) titanium alloys.
1996	Process to cast amorphous metals developed.

Knowledge-Based Earnings

There are two ways to make money out of a technology-based company," says Morison: "using the technology to make products for other people and selling it." Licensing has been a productive endeavor at Hitchiner for more than 30 years, enabling the company to build its expertise and extend its reach into global markets as well as generate income.

Hitchiner secured its first licensee, Oy Sako AB, a member of Finland's Nokia Group, in 1964. In the '70s, the advantages of countergravity processes drove an expansion of the licensing business that continues to this day. Daido Steel of Japan, Rudi Cajavec of Yugoslavia, and Shivaji Works Limited, India, were just a few of the major licensees in that period.

Long-Term Value

The opening of a pilot plant at the Technical Center in 1979 proved the long-range licensing worth of research and development. CLAS, a method for countergravity pouring of resin shell molds, generated great interest internationally and in the automotive market. The company launched the CLAS Division in 1983. The division performed well, but over time supporting the technology diffused Hitchiner's investment casting focus. Consequently, it sold the technology to General Motors Corp. in 1986 and closed the division in 1989. GMC renamed the technology "VAC" and made Hitchiner its licensing agent. Metal Casting Technology, Inc. continued development, patenting the LSVAC (loose sand vacuum casting) process in 1990. Licensing activity, already strong, picked up considerably over the next five years and now generates growing income that should continue into the next century.

Hitchiner leveraged its technologies in other ways, too. An association with Investment Castings Pty. Ltd. of Australia in 1971 and the formation of Brazilian-based Fupresa-Hitchiner S/A in 1980 also sent Hitchiner technology overseas and gave the company much of the expertise needed to fuel growth in the global markets of the '90s.

Leadership Profile

Nelson J. McDermott Jr.

- *Executive vice president, 1968-73*
- *Board of directors, 1968-78*
- *President, 1973*
- *President and chief executive officer, 1974-78*

"When I think of Hitchiner, I think of the many talented people whose efforts resulted in the increase of company net worth and company sales during my years there. These results included new plant start-ups during some very tough casting industry recession years, reflecting particular credit on the many people involved."

Hitchiner's success begins and ends with the people who bring to their jobs an uncompromising commitment to quality and service. The dedicated long-service work force at Hitchiner-O'Fallon (previous page) assemble for a group portrait in 1990.

The installation of Unimate shell-building robots (above) introduced a new level of state-of-the art sophistication to the investment casting process.

The continued growth of the company led to northward expansion (below), first to Plymouth, NH, in 1979 and then to Littleton, NH, in 1984.

Chairman John H. Morison and President Nicholas Babich (right) inspect an assortment of castings from the late 1980s.

Leadership Profiles

Nicholas Babich

- *General manager, Ferrous Division, 1967-68*
- *General manager, Ferrous and Aerospace Divisions, 1969*
- *Vice president operations, 1970-72*
- *President and chief executive officer, 1981-95*
- *Board of directors, 1981-95*

"In 1994, Hitchiner completed the transition from foundry to full-service manufacturer as a result of the dedicated execution of the company's long-range strategy. This four-point plan is based on international manufacturing capability serving global markets; maximizing the use of Hitchiner's countergravity technology to reduce costs and open new markets; becoming a single-source supplier of finished parts; and establishing the company as the leading supplier to high-volume markets."

John H. Morison III

- *Ferrous Division production control manager, 1983-84*
- *Ferrous Division order administration and customer service manager, 1985*
- *Director, new business development, 1986-87*
- *Regional sales manager, 1988*
- *Board of directors, 1989-present*
- *Acting production control manager, Hitchiner S.A. de C.V., 1989*
- *Vice president, sales and marketing, 1990-93*
- *President and chief operating officer, international, 1994*
- *President and chief executive officer, 1995-present*

"Our success in the past has been due in part to our ability to devote resources to continually develop competitive technologies like countergravity casting and to identify new markets or growth opportunities in existing markets that benefit from these technologies.

"We will continue to invest in improving existing casting technology and developing other new technologies that will distinguish Hitchiner from the competition while we expand our capabilities to supply and service existing and new markets around the world."

G. Dixon Chandley

- *BS, metallurgy, Massachusetts Institute of Technology, 1953*
- *MS, metallurgy, MIT, 1954*
- *MIT staff foundry research, 1953-55*
- *Watertown Arsenal Foundry, 1956-62*
- *Chief engineer, TRW Metals Division, 1962-66*
- *Technical director, TRW Metals Division, 1966-67*
- *Vice president, technology, Hitchiner Manufacturing Co., Inc., 1967-present*
- *President, Metal Casting Technology, Inc., 1986-present*
- *Publications, 1955-present: 37*
- *Patents: 35*
- *Application to Practice Award, The Metallurgical Society, 1987: For remarkable achievements in applying scientific theory and modern technology to development of new casting processes.*
- *Outstanding Contribution Award, The American Foundrymen's Society, 1991: For outstanding contributions to the investment casting industry.*
- *Board of directors, 1994–present*

G. Dixon Chandley has led research and development at Hitchiner Manufacturing Co., Inc. since 1967. According to John H. Morison, chairman emeritus, "Dick Chandley has been the greatest single contributor to the company in its history. He brought an immediate surge in brilliant ideas that has just kept going."

Edward M. Broad

- *Metallurgist, 1947-48*
- *Foundry foreman 1948-50*
- *Chief metallurgist, 1951-54*
- *Chief engineer, 1955-62*
- *Technical director, 1963-67*
- *Vice president, Brico Metal Products, 1968-72*
- *Vice president, international, 1973-86*
- *Board of directors, 1986–present*

"It was a very shaky beginning for me when I joined Fred Hitchiner back in 1947. He had learned to cast brass and aluminum base alloys with some success and was now trying to cast steel. We melted 17 pounds of steel at a time, one melt about every half hour.

"Wax eliminating was done in small pizza ovens, and the wax was collected in tubs that frequently caught fire. Knock out was done by hand with hammers, and no fume extraction was used. Scrap rate averaged about 50 percent.

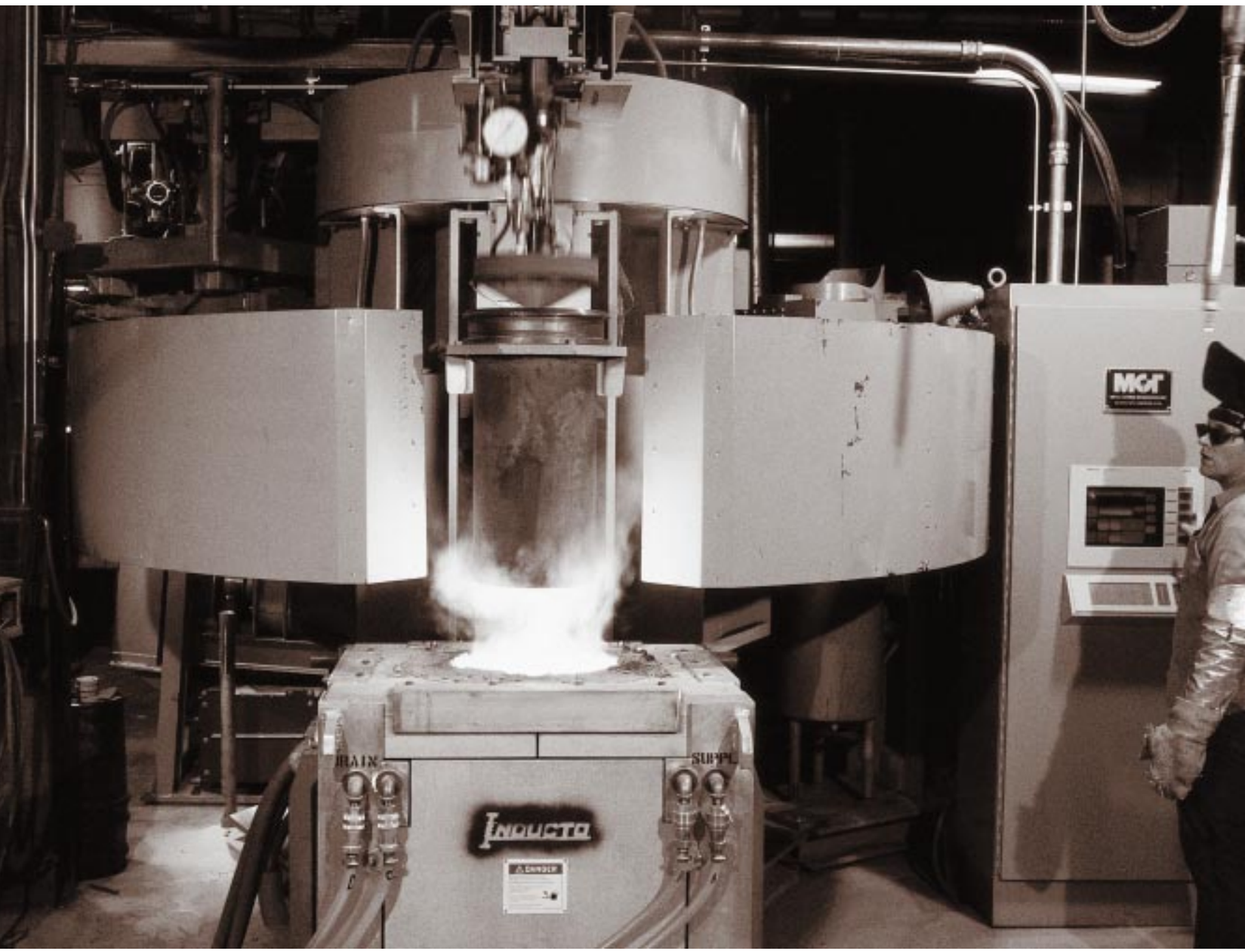
"It was touch-and-go all the way, but slowly, ever so slowly, progress was made. The big step for us was the move to Milford after the Morisons arrived. We began to melt in 50-pound induction furnaces, put in a heat treat facility, and started a wet chem lab."

Chairman John H. Morison unveils Hitchiner's monument to "Imagination in Metallurgy" (left) on May 2, 1991.

Hitchiner S.A. de C.V. (above), the company's first offshore production facility, was built from the ground up in 1987. It turned a profit in less than two years.

A modern 28,000-square-foot facility in Amherst, NH (below) was purchased early in 1983 and was completely refitted as the new Hitchiner Tool and Die Division.

The Rotary Casting Machine and Supported Shell CIA process (next page), developed and built by MCT, ushered in a new era of automation and process control to the foundry.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Ramp-Up to the Next Century

The year 1989 was a watershed for Hitchiner Manufacturing Co., Inc. The company posted over $75.6 million in sales; employed 1,600 in New Hampshire, Missouri, and Mexico; had 11 process licensees; and operated two major joint ventures—a dramatic contrast to the insolvent brass foundry of 1949.

Strategic Edge

Most significant, 1989 was the year in which the company publicly articulated its business strategy, marking the launch of rapid '90s growth and industrial leadership.

Babich recognized the need for the company to evolve into more than an investment casting foundry when he rejoined the company as president in 1981. Customers were demanding more from their suppliers and at the same time reducing their supplier base by selecting only those companies that had the capacity and technical capability to offer single-source, complete assemblies at ever-lower prices.

The vision: to become a global, full-service, high-volume/low-cost investment casting manufacturer.

The path to this goal lay in aggressive pursuit of golf and automotive business and new markets. The twin engines driving the effort: leading-edge automation and state-of-the-art processes.

While the company posted a 7.8 percent increase in net sales and productivity-enhanced earnings for 1990, a drop in bookings augured a two-year downturn.

"Defense business picked up with Desert Storm," recalls John H. Morison III, then vice president of corporate sales. "But the recession hurt the rest of the company. Our traditional golf customers were adjusting inventory. Metalwood replacements had reached market saturation; golf industry sales not only stabilized, they went down."

Building '90s Muscle

Hard times called for strong measures. The company took onetime restructuring losses to fully gain new automation benefits. It cut prices to boost market share. Sales representatives chased down new opportunities yielded by automotive technology that required investment casting. MCT sped up new-generation golf product development to restart growth.

The tactics worked. In 1991, BMW named Hitchiner the sole-source supplier for two engine rocker arms. Order bookings strengthened in late 1992. The year 1993 brought an unprecedented 85 percent sales gain in Mexico as well as a massive contract with industry hot-shot Callaway Golf. General Motors Corp. named Hitchiner the sole-source supplier of rocker arm parts for its ER V6 engine program.

For the first time in its history, the company posted over $100 million in order bookings.

Much of the breakaway growth in 1993 stemmed from Hitchiner's ability to invest in long-term, cooperative customer relationships. The GMC and Callaway contracts alone required adding more than 500 employees and 45,000 square feet of new plant space.

High-Technology Yields

Installation of the multipurpose casting machine signaled a new level of response to customer needs. Metal Casting Technology, Inc.'s rapid prototyping cut sample lead time from months to days. MCT also revolutionized reactive metal casting and pioneered low-cost metal matrix composite casting. Both processes constitute entry to new growth markets.

In 1994, "High-tech automation and excellent engineering yielded the fastest production ramp-up in investment casting history," wrote Babich. Net sales jumped 20 percent and bookings rose.

The results signaled Hitchiner's transition from a casting shop to a global manufacturer of complete-to-print components. Upon Babich's retirement in March 1995, the company lauded his leadership, stating, "Perhaps his greatest contributions were the development of the building

blocks of capacity, technology, global presence, and innovation, as well as his personal dedication to developing the skills which the employees and management need to continue to build on the foundation he established."

A New Generation

Morison III succeeded Babich as president and CEO (see "John H. Morison III") in early 1995. Veteran Hitchiner executives Leon E. Stillwagon, executive vice president, operations, and Frederick R. Lofgren, executive vice president, finance and administration, completed the management team.

The company completed a 34,000-square-foot addition to its Mexican facility to increase capacity by more than 50 percent. Investments in automation continued at all plants. And the company installed a new emissions control system at the Ferrous Division. The innovative system not only meets government regulations, it reduces costs through recycling.

Leading with Integrity

With such rapid growth came the need for increased vigilance to a clear set of corporate values. Recognizing the issue, Morison III launched a company-wide, ongoing ethics training program for employees, agents, and suppliers.

He introduced the program by saying, "The foundation for [Hitchiner's] success has been the creation of innovative technology, superior quality and service, and, perhaps most of all, the integrity with which the company conducts its affairs."

Bottom-line results for the year demonstrated the new team's ability. As expected, sales growth slowed but was still more than double the overall national growth rate. More significantly, earnings increased 85 percent, a company record.

Vision and Action

As the company celebrates its 50th anniversary, it can credit today's success and build tomorrow's on the clarity of vision and action that have characterized Hitchiner operations.

It started with A. Fred Hitchiner's enthusiasm for commercializing investment casting.

Morison's long-term mission, character-setting, and core philosophy for the company set a strong foundation.

McDermott's discipline enabled the company to build on the opportunities presented by the rapid emergence of new markets in the late '60s and early '70s.

Babich's long-range strategy and organizational development initiatives focused the company's naturally evolving strengths on the growth paths of the '90s.

Morison III's ethics program, started in his first full year as president and CEO, reaffirmed and reinvigorated the company's tradition of leadership with integrity.

Empowered by the clear sense of purpose provided by such management, an honored roll call of Hitchiner executives, managers, and workers has responded with an unmatched appetite for challenge, talent for innovation, and remarkable loyalty.

The Global Manufacturer

A lot has changed since Hitchiner started up in an abandoned millyard 50 years ago. Investment casting is a multi-billion-dollar industry. Manufacturing is once again a viable economic base for towns like Milford. Hitchiner Manufacturing Co., Inc. is the premier full-service, global investment casting manufacturer and its technology sets the standard for the industry.

The pace of change can only accelerate over the next 50 years, the nature of the changes become more surprising. But some things will stay the same. Just as the Morison orchard still yields a crisp harvest in the best New England tradition, so will Hitchiner conduct its business in the best traditions of its first 50 years.


HITCHINER MFG.
IS PROUD TO BE
ISO 9001
CERTIFIED
DNV

In 1993, Hitchiner became the first metal casting company in the nation to achieve ISO-9000 certification (previous page). ISO-9000 is the worldwide standard measurement for total quality management.

In March of 1995 (center) the company appointed three new executive officers: John Morison III, president and chief executive officer; Leon E. Stillwagon, executive vice president operations and Frederick R. Lofgren, executive vice president, finance and administration.

This plaque (right) commemorating Hitchiner's fiftieth anniversary of service to industry and community was presented to the company by the Town of Milford on October 30, 1996.