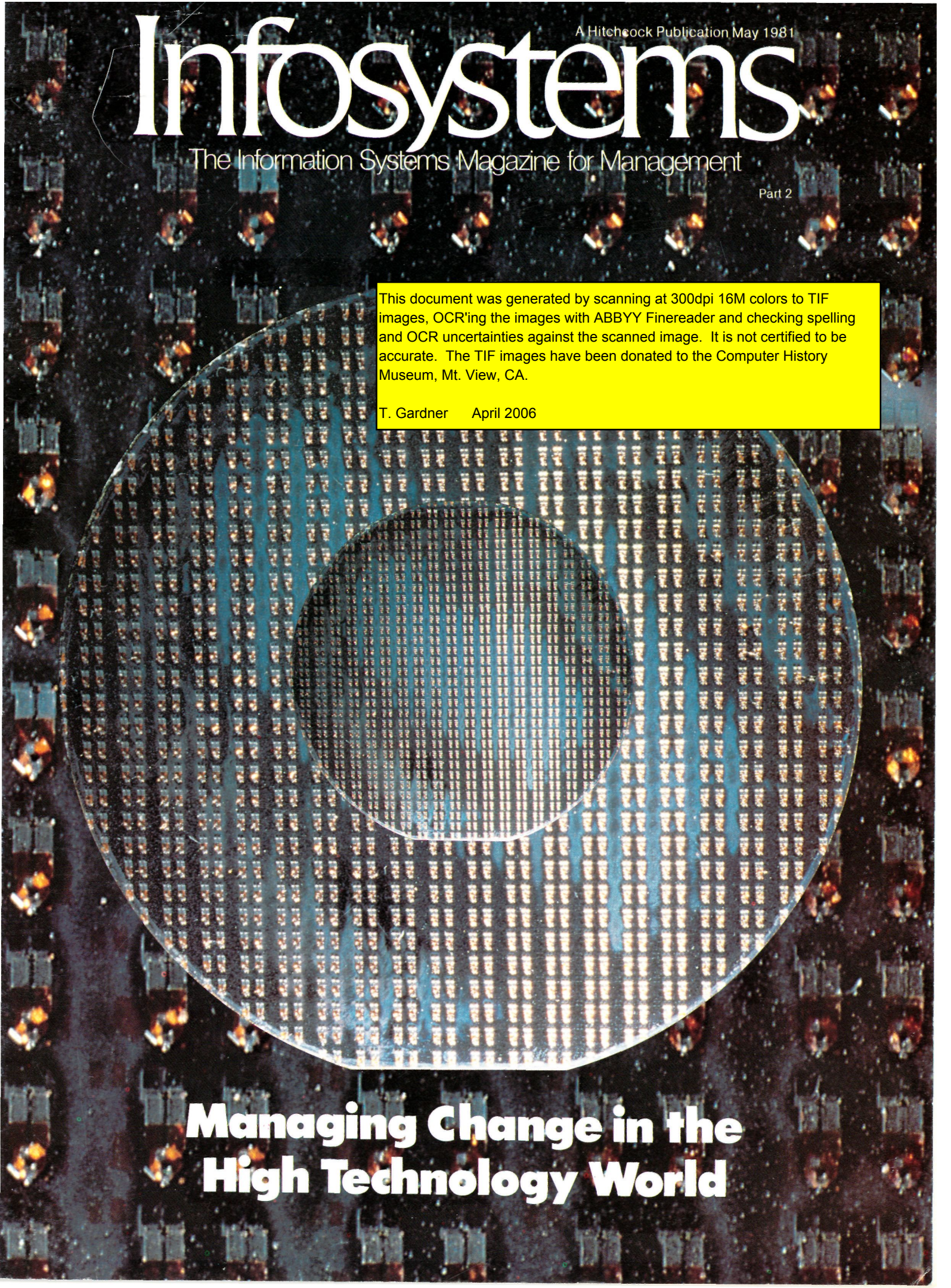
A Hitchcock Publication May 1981

Infosystems

The Information Systems Magazine for Management

Part 2



Managing Change in the High Technology World

SMARTER.

In 1961, the Memorex® Corporation began to produce high-quality instrumentation and computer tapes—with just a handful of employees in one small building in California. Over the past twenty years, Memorex has grown to become one of the leading manufacturers of information storage, retrieval and communications products-with 11,000 employees in scores of facilities around the world.

We've managed this astonishing growth during a time when the world of information processing was becoming constantly more sophisticated, constantly smarter. Products became smarter, performing difficult tasks at ever-greater speeds. Markets and customers became smarter, demanding product changes to help them keep up and keep ahead in a highly-competitive environment. That meant that Memorex, too, had to become smarter in order to meet the challenges of today's technological wonderworld—where words like faster, smaller, smoother, stronger-are mandates for change.

Memorex can compete in this world only if its people are smarter—and they are. Intelligent, hard-working, committed people give life to our company, because they know that life is change-and they know how to respond to, initiate, and mar age change. The competition for the best people in our industry is fierce, but we've managed to attract the best-people who are alert to new opportunities people who are willing to look forward into the future, people eager to give more and to expect more

Finally, Memorex people are smart enough to know that simply celebrating our past twenty years is not enough. It's the next twenty years they are looking toward, years in which mastering and managing change will become even more difficult—and ultimately more rewarding.

MEMOREX

For twenty years, the 20 1961-1981 *expression of excellence.*

San Tomas at Central Expressway, Santa Clara, CA 95052 (408) 987-1000

Infosystens

The Information Systems Magazine for Management

May Volume 28 Number 5 Part 2

editorial offices
Headquarters: Hitchcock Building
Wheaton, IL 60187, (312) 665-1000

Eastern: 964 Third Ave.,
New York, NY 10155, (212) 486-9300

New England: 110 Fulton St.,
Boston, MA 02109, (617) 723-8970

Southwest: 2308 N. Griffin,
Dallas, TX 75202, (214) 651-8224.

Washington: 5310 Glenwood Road,
Washington, DC 20014, (301) 657-2555

Western: 14140 Beach Blvd., Suite 202,
Westminster, CA 92683, (714) 891-2633
1021 S. Wolfe Rd., Suite 275
Sunnyvale, CA 94086, (408) 730-0131

Features

This special issue of INFOSYSTEMS is sponsored in its entirety by Memorex Corporation. The advertising material on the inside front cover, on pages 2, 7,9 and 13, on the inside back cover and on the back cover was prepared by Memorex Corporation and its advertising agency. All other material was prepared by the editorial staff of INFOSYSTEMS with the cooperation of the marketing communications department of Memorex Corporation.

INFOSYSTEMS (USPS-711-000) is published monthly.

One year subscription rates: $40.00 in the USA, Canada and Mexico. Single copy rate: $3.50 (USA, Canada, Mexico). For subscriptions outside the USA, Canada and Mexico, contact the Circulation Department. Printed in the USA. Controlled circulation postage paid at Waseca, MN. Postmaster: Return Form 3579 to INFOSYSTEMS, Hitchcock Publishing Company, Hitchcock Building, Wheaton, IL 60187.

EASIER.

One of the latest innovations from the Memorex® Communications Group, the 2078 Display Station, serves as a good example of how one company works to respond to and anticipate the demands of its many marketplaces. Demands for products that perform faster, last longer, are built smaller and smarter. But most important today perhaps, for products that make life and work easier on the people using them.

To that last point, the 2078 is particularly noteworthy. And human engineering is the key, with features designed-in to make the operator's job less fatiguing and the operator more comfortable and productive. The non-glare screen reduces eye strain, while the tilt-screen design allows positioning for easy readability. "We've included a line and column indicator, a status line, a switch-selectable unprotected field indicator, a choice of keyboard layouts and other features that make the 2078 a much easier display station to use.

But it is much more efficient and flexible as well. The detachable monitor can be located on a shelf or bookstand to conserve space and allow use by more than one operator. The 2078 incorporates an automatic dimming feature to preserve the quality of the display. The unit also generates less heat and uses less power. And teamed with the small, smart-looking 2076 Remote Cluster Controller, which can be conveniently located separately, the 2078 delivers more configuration flexibility.

The 2078 Display Station is, of course, just one expression of excellence from our Communications Group. But it certainly helps explain why we're so proud of our twenty years of making better products for the tough, rapidly changing marketplaces of high technology. And we look forward to the next twenty years, during which time we'll be working harder than ever to make things easier.

Independent alternatives

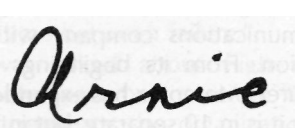
Given a continuing reasonable growth rate, it's a good bet that, by the year 2000, information processing will be the dominant industry of the world. And before we dismiss that forecast as some "way-out" crystal balling, be reminded that we are only looking ahead by 19 years. And if we mark the real beginning of information processing as the introduction of the ENIAC computer, we are looking back just some 35 years.

When one reflects on the remarkable achievements of this industry in a rather short time frame, one sometimes tends to overlook where the significant contributions came from.

The facts are that many of the cost-effective benefits brought to the end user have not come from the giants of the industry. They have been, and continue to be, the results of dedicated independent firms with a genuine understanding of the needs of the marketplace and the willingness to meet those needs in an affordable fashion, despite tremendous competitive pressures.

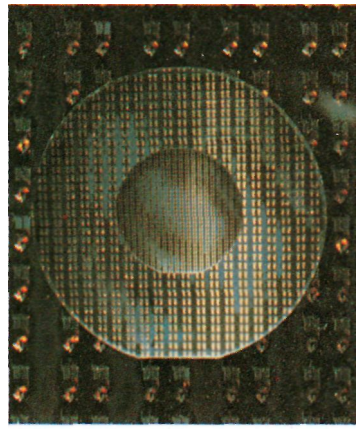
Whether the product be software or hardware, these independents have a long history of bringing to the market dramatic breakthroughs in price and performance. And they have set industry standards for product support and service.

Were it not for the alternatives to problem solutions offered by the independents, we simply wouldn't have the explosive growth we are witnessing today in information systems. It is encouraging that, more and more, management is turning to the independents for affordable solutions to their systems problems. They can do so with confidence that the independents too have a long history of pioneering leadership in the dynamic information systems industry.



Managing Change in the High Technology World

Memorex Corporation is a worldwide information storage and communications company with 1980 revenues of $769 million. From its beginnings as a magnetic tape manufacturer, Memorex has expanded its product lines so that today it is in 10 separate, but interrelated, businesses.



It weighs less than one ounce and measures just three inches across. Through advanced semiconductor technology, in just a few hours, more than 1,000 read/write heads have been deposited on its surface. And in just a few minutes, each head has been tested and completely documented with computer-aided graphics terminals and digital and hardcopy maps.

For its creators, Memorex Corporation of Santa Clara, CA, this wafer represents a staggering investment—in time, facilities and people. It represents a perceptible payoff as well, a very practical innovation called thin-film heads—by any measure, a quantum leap beyond the ferrite heads currently in use.

The wafer is also a symbol of the daily pressures at work in the world in which Memorex competes ... a world of constant change where words like "smaller," "smoother," "faster," "stronger" and "smarter" are more than mere product boasts. They are the relentless realities of doing business in the marketplaces of high technology.

In December of 1960, this constancy of change was much in the minds of four men at Ampex Corporation in Redwood City, CA. This quartet of Laurence L. Spitters, Arnold T. Challman, Donald F. Eldridge and W. Lawrence Noon felt they could develop, manufacture and market a more precise magnetic tape for computer systems of that day.

With two dozen other people and space leased in a garage in nearby Mountain View, the four left Ampex and launched an enterprise based on product quality and reliability. They picked a name that combined "memory" and "excellence" and thus gave birth to Memorex Corporation, in February, 1961.

Today, Memorex is a worldwide information storage and communications company with 1980 revenues of $769 million. From its beginnings as a magnetic tape manufacturer, Memorex has expanded its product lines so that today it is in 10 separate, but interrelated, businesses. They all fall into either media or equipment categories.

The media portion of Memorex is embodied in the Media Products Group headed by President Richard W. Martin. It includes the Consumer Products Division that manufactures and markets a wide variety of audio and video tape cassettes; the Computer Tape Division that makes and markets the Memorex family of computer tapes under the trade names of MRX IV for day-to-day processing; Quantum for critical data processing or long-term storage usage; and Cubic HD for use on high-performance, 6,250 bpi tape drives; the Rigid Media and Components Division that makes and markets disc packs, disc cartridges and data modules for removable Winchester-type disc drives; the Flexible Disc Division that makes flexible discs and markets them to distributors and OEM firms; and the Precision Plastics Division that designs and molds a wide range of enclosures for Memorex tape products and discs and CRTS as well as serving as a custom molder for OEM customers.

These five divisions produced worldwide revenues of $275 million for Memorex during 1980.

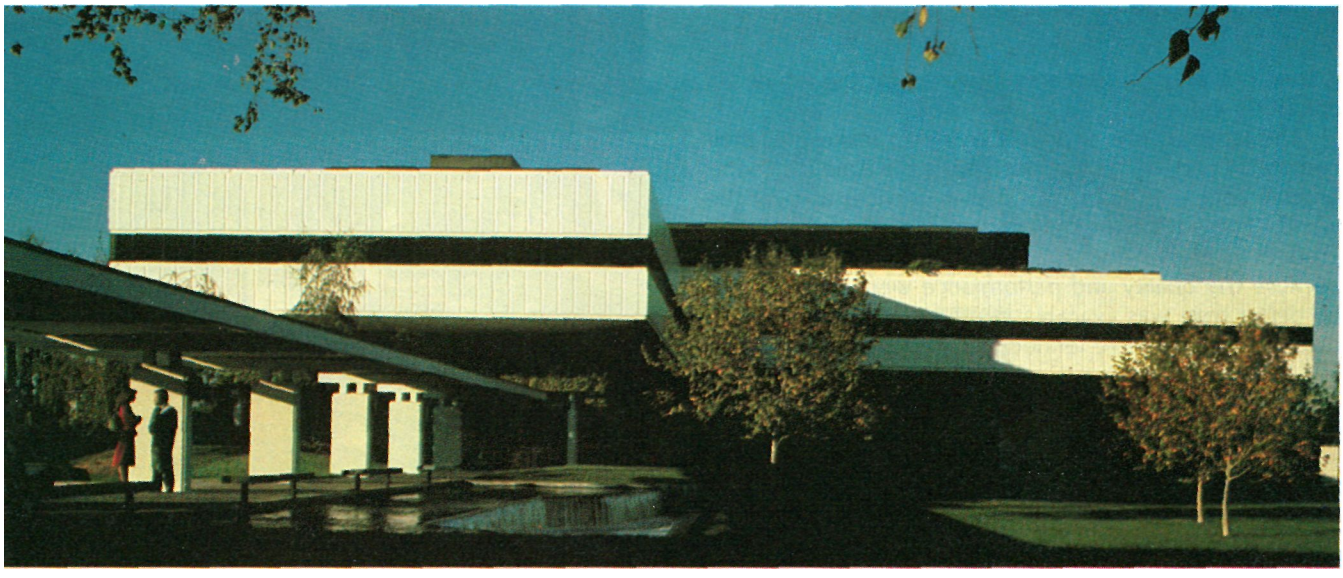
Through a recent joint venture with Dainippon Ink and Chemicals Inc. of Japan, Memorex transferred its sixth media business, word processing supplies, into a new company called Memorex DIC Corporation.

The equipment side of Memorex is made up of four businesses: OEM disc drives, end user storage systems, communications equipment and the customer engineering service functions.

Organizationally, the domestic end-user marketing function is divided into two groups, the Storage Systems Croup under President James Simpson that markets the 3650 and 3670 families of IBM plug-compatible disc drives and 3220 family of 1,600/6,250 bpi magnetic tape drives; and the Communications Group under President Paul L. Klein that manufactures and markets a family of video display terminals, controllers and terminal-oriented printers.

Memorex, according to Klein, is one of only four firms that make "plug-compatible" video display terminals, and he added that another five firms make "functionally compatible" CRT terminals. "Memorex has been very innovative above and beyond the base product and is poised for the future," Klein said of the firm's Model 1377 and newer Model 2078 Display Stations.

An increasing share of the firm's revenues is coming from its original equipment manufacturer (OEM) business. Memorex has increased its emphasis, of late, on marketing its 14-in. disc drives and newly developed 8-in.



World headquarters for Memorex at San Tomas and the Central Expressway in Santa Clara, CA, is a campus-like setting that includes a four-story structure, development labs and manufacturing facilities, all tied together with covered walkways and close-cut lawns.

Winchester-type mini-disc drive unit to minicomputer, mainframe and small business computer manufacturers, as well as word processing firms, for integration into their own end-user products. Although a Memorex disc drive product is an important part of these OEM customers' systems, it isn't recognized by that name in the user community.

In the more than 12 months that C.W. Spangle has been chairman and chief executive officer of Memorex, he has moved the company to place greater emphasis on its OEM products and OEM marketing efforts, yet at the same time maintain its strong position in its traditional end-user and consumer markets.

In an interview with INFOSYSTEMS that touched many subjects, Spangle spoke about longer lead times needed when marketing to OEM firms. He said: "The prospect first has to decide if your device is what he wants; then he has to decide how he is going to use it in his system; then he has to qualify his system; then he's got to sell it.

"People don't change very quickly from something that is satisfactory until they come into a new product generation, or a new family of products," Spangle added. "It's hard to get something rolling, but when it's big enough and it's rolling, it keeps on rolling for a long time. The price of admission probably is higher than anticipated by a lot of people."

Memorex is one of several firms, many of them in or near Silicon Valley, that has developed an 8-in. rigid disc drive for incorporation into smaller systems. The Memorex Model 101 stores and retrieves up to 11.7M bytes of information, and the Model 102 is double that, or 23.4M bytes.

"We think we are one of the companies that has a really reliable product that we can, in fact, ship in quantity now," Spangle emphasized.

This small, rigid disc drive which represents a "new business opportunity for Memorex," according to Edward L. Marinaro, vice president and general manager of the Memorex Mini Disc Drive Division, is designed to provide from 10 to 20 times the information storage capacity of floppy disc drives now found on personal and desk-top computers, small business systems and word processing systems. But that market has been slow to develop, despite the product availability.

In the past few months, Marinaro's division has taken a giant step with its 8-in. disc drive that reflects a renewed emphasis on product quality by Memorex, an emphasis particularly evident since Spangle became chief executive.

The Model 101 and 102 drive units carry a "90-day, return it with no questions asked" warranty. Both products are built with an "out-of-the-box quality," which Marinaro said means that each can be taken out of the shipping carton, plugged in and run immediately, without any problem, by the OEM purchaser. Memorex even markets the new drive units with a "try it, you'll like it" approach, knowing the Memorex drive will surpass competitors in both quality and reliability.

"One of the things that we are impressing on our people is that what they do can affect the performance of a very complex, important system," Spangle explained. "As customers put more and more of their computer activities on-line, downtime becomes even more critical than it used to be.

"System availability has become more obvious and becomes a bigger issue with the whole using organization than it did when they were operating in a batch mode," said the Memorex chief executive, who spent more than 20 years in key management jobs at Honeywell Information Systems, including a term as general manager of its United Kingdom subsidiary and president of its worldwide computer operations before joining Memorex in March, 1980.

"We are trying to impress on our people that whatever they do is going to be critical to someone's installation, and, therefore, they've got to do it well," Spangle continued. "And we've got to, of course, design in higher reliability, lower mean-time between failure."

When Spangle was asked about high quality in workmanship within Memorex, he answered: "We've got to make it (quality) permeate the organization. I think people's expectation of quality also has gone up. But they are ready to pay for it, providing you can deliver it."

Product quality, he said, "starts with the attitudes of the people, and it includes both the original design specifications and the execution of the product. And I think this

. .. *continued on page* 6

is true, not only of Memorex, but also for the whole US computer industry.

"The Japanese are definitely trying to make that their competitive edge, and that used to be the American competitive edge—American goods and services all over the world. I know that when I first went overseas in 1955, the product that was made in the US had a certain acceptance because the quality and performance were perceived to be better than was available in other parts of the world. Over the years, we've tended to let that drift away from us," Spangle said.

Asked whether product quality or the perception of product quality has drifted away, Spangle replied: "Some of each. I also think that the Japanese have tended to do a pretty good selling job in pre-empting the quality ground."

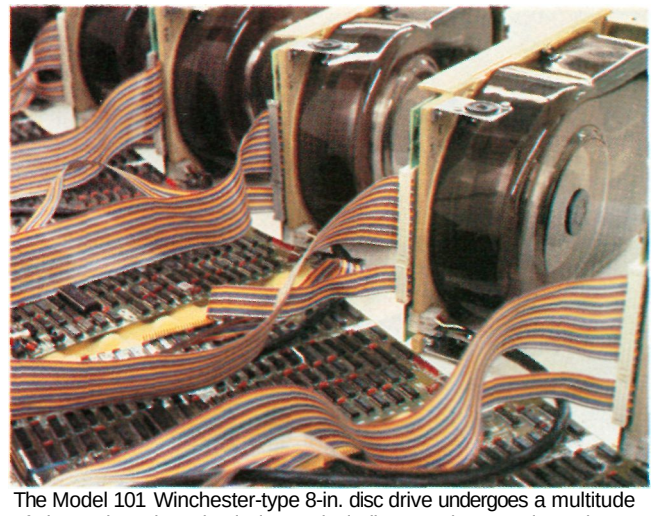
When Memorex was founded in early 1961, its principal target market was installed computer sites in the US. But it was only four years later, in 1965, that Memorex shipped magnetic tapes to International Computers Ltd. (ICL) and the British Broadcasting Co. (BBC), the firm's first European customers.

The first Memorex employee to work outside the US operated out of his home in England, and was responsible for the first two European sales.

Within another two years, additional markets were entered as Memorex sold magnetic computer tapes to Bendix/Tempo in Australia, and to the South African Railroad, both in 1967. Memorex continued to expand abroad and set up offices in many of the major industrial nations, a company spokesman explained.

"Nearly half of our business today is outside the US, so international is a very important part of Memorex," Spangle said in his recent interview. "We have really strong positions in the major countries, and we have a strong position, on an import basis, in Japan that very few other American computer companies have."

Memorex, it was noted, sells more than 300 products in 90 percent of the free world. Fewer than 50 US citizens are among the 2,000 persons employed in Memorex international operations. The firm has regional offices in Milan, Italy; Paris, France; Frankfurt, West Germany; Stockholm, Sweden; and Tokyo, Japan, to support its sales and service offices in 60 cities in 22 countries. The firm also has more than 100 distributors in another 125 cities.



The Model 101 Winchester-type 8-in. disc drive undergoes a multitude of electronic and mechanical tests, including a 24-hour run-in, at the Memorex manufacturing facility prior to shipment to OEM customers.

In addition, Memorex makes computer media and communications equipment in Liege, Belgium; wiring harnesses in Nogales, Mexico; audio and computer tapes in Clondalkin, Ireland, and has a flexible disc manufacturing plant in Mihara, Japan, that is jointly owned and operated with Teijin Ltd., a company often referred to as the "DuPont of Japan."

International operations, which are headquartered in London, England, were recently reorganized. Reto Braun, President of Memorex International, reports to Charles S. Strauch, president and chief operating officer of Memorex. Strauch, who joined Memorex in 1979 from Gould Inc., served as executive vice president of Memorex before being named president in May, 1980.

Because about half of its revenues are derived from international sales, Memorex earned the coveted President's "E Star" award for making a positive contribution to America's balance of payments. It's only one of a select group of companies to earn the award, Memorex officials pointed out.

In addition to the sales and manufacturing operations in the international marketplace, Memorex also has several affiliation agreements and joint ventures with international firms.

Memorex imports Fujitsu magnetic tape subsystems to

... *continued on page 8*

Packaged Leasing Another Memorex Benefit

One of the little-known benefits of acquiring end-user peripherals from Memorex is the Memorex Finance Company.

Founded about two years ago, this subsidiary is involved in "package leasing" for Memorex customers who might want to refinance a total computer installation. Such an arrangement usually includes acquiring Memorex disc storage subsystems or magnetic tape subsystems, or combinations of both, in a medium-to-large IBM data processing environment.

"In this kind of transaction, they tend to bring together the users of the equipment and someone who wants to make an investment," explained C.W. Spangle, Memorex chairman and chief executive officer.

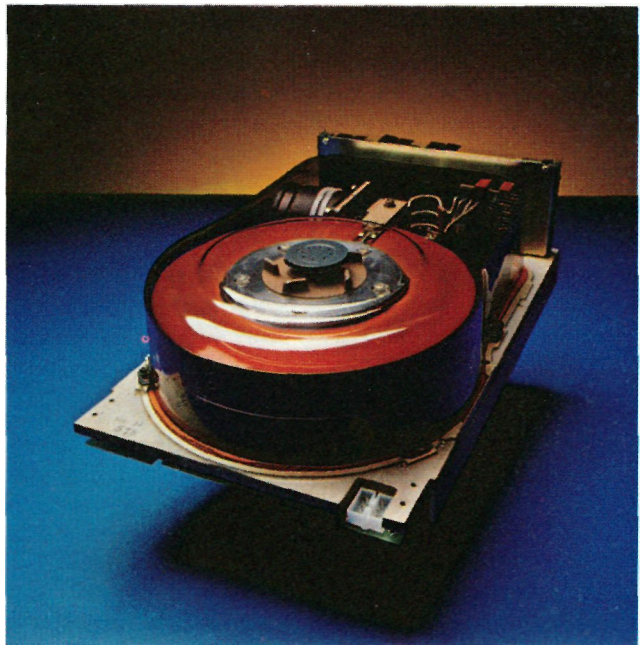
"Memorex Finance Company doesn't use Memorex money as a source of funds for the leasing. There's Memorex capital in it, but the source of funds comes from lenders who want to be involved in a computer lease that they feel will be reasonably well administered, with equipment servicing looked after, and equipment re-marketed when necessary.

"I don't know if it's unique or not, but it's a service that we're able to offer where others aren't," Spangle added.

With a Memorex Finance Company lease, an end user is able to obtain a longer lease term, maybe four, five or seven years, on the equipment; or obtain a lower interest rate, maybe half as much as would be charged by other commercial lenders, a Memorex official explained.

The principal Memorex peripheral products are a family of disc storage subsystems and magnetic tape subsystems. These disc and tape subsystems are plug compatible with and run on IBM and compatible medium-to-large computer systems.

SMALLER.



It weighs just 12 pounds. It stores 11.7 megabytes of data on two eight-inch rigid discs, all housed in a sealed Winchester-type environment. It boasts features such as integral data separation, absolute-filtered drive enclosure and a heirless, direct drive, DC spindle motor. It is the Memorex® Model 101, and it is, quite simply, one of the finest eight-inch rigid disc drives around.

But the 101 is also an example of how Memorex has responded to a major mandate in the marketplaces of high technology, that of ever-smaller sizes. A mandate that has brought us desk-top computers more powerful than the room-sized machines of a few years back. Millions of bits of information packed into one square inch of magnetic media. And a mandate that has meant smaller energy use, smaller costs, smaller space requirements. For twenty years, Memorex has operated successfully in this environment, where the imperatives of change -for making things smaller, faster, smarter, stronger-are relentless. And during that time we have become a leader in the information storage, retrieval and communications industries.

Tough customers and tough competitors have made the 101 a winner-so much so that we have built the largest manufacturing facility in the country totally dedicated to eight-inch disc products. But it is just one of the many drives Memorex manufactures-for both rigid and flexible discs, from kilobyte to gigabyte capacities. We have disc drive experience spanning six product generations. We manufacture the key components ourselves-the media, heads, PCBs. And we are committed to future products that will serve the very distinct needs of both the end-user and OEM marketplaces, be those products larger—or smaller.

the US for marketing to medium-to-large scale IBM and IBM-compatible computer users; and has as agreement with Nippon Peripherals Ltd. for disc drive subsystems.

With Kores of England, the largest distributor of office supplies in the United Kingdom, Memorex jointly produces typewriter ribbons at a manufacturing facility in Summerville, SC.

Memorex has completed two other joint activities, both of them in the US. With Bell & Howell, the firm is jointly producing home video cassettes. With Control Data Corp., it has a technical information exchange agreement covering the research and development of thin-film recording heads and thin-film head-arm assemblies for use in data storage products.

"The agreement (with CDC) should benefit users of large computer systems by further enhancing the capabilities of Memorex and CDC," Spangle explained. "After some discussions with them, we found that they were ahead in some areas, and we were ahead in other areas. We felt that by working together we could, in fact, bring products to the market sooner than if we had proceeded separately.

"That doesn't necessarily mean that either company will spend less money in that area than they had planned to. Hopefully, we'll spend it smarter," he said.

In the US, Memorex operates manufacturing facilities and administrative offices in its headquarters city of Santa Clara, CA, and in six other California communities, Cupertino, San Jose, Mountain View, Santa Ana, Fullerton and Irvine. It also has a printed circuit board manufacturing facility in Eau Claire, WI; a wiring harnesses facility in Tucson, AZ; and a joint venture home video tape plant in Chicago, IL. Total employment is more than 11,000 persons.

During 1980, under Spangle, Memorex invested $34 million in research and development, which is about $6 million more than the previous year and 46 percent more than two years ago. Memorex introduced 32 new Memorex products in 1979—a banner year for the company—and a nearly similar number of new products and product enhancements during this past year, 1980.

Investments in research and development to produce new products to meet market demand has been a hallmark of Memorex since its founding. After mastering the techniques required to produce precision magnetic tapes for computers, instruments and video machines in the early 1960s, Memorex personnel turned their attention to the design and manufacture of (removable) disc packs for computer systems.

That was in 1967, near the dawn of an era in the computer industry that now is taken for granted—the recording of data on 14-in. diameter, phonograph record-like devices.

"As customers put more and more of their computer activities on-line, downtime becomes even more critical than it used to be."

The success Memorex had with its original IBM-compatible disc pack and the in-house need for a highly accurate disc drive to test its disc packs, led Memorex management to further develop and market two variations of that drive unit—first the Model 610 to OEM customers, and later, in 1969, the Model 630, to users of IBM System/360 computer systems.

Some of the R&D funds about which Spangle talked resulted in development of the Memorex 3652 disc drive subsystem. It is a large-capacity subsystem that is being shipped in quantity to users of medium and large IBM and compatible computer systems, such as the System/370 Models 158 and 168, the Systems 303X, 4341 and all Amdahl 470/X systems and equivalent processors.

. .. *continued on page 10*

Providing a Bridge for Software Vendors

With a sales force calling on end users in an IBM data processing environment, it seemed logical for Memorex to equip its sales staff with a full bag of wares to sell. Utility software was chosen.

"We feel we have one of the best distribution organizations serving the end-user market, and particularly the IBM environment," said C.W. Spangle, chairman and chief executive officer of Memorex. "In fact, I think it's probably the second largest serving that market in the world.

"These customers have a need for software—special software that is not provided by IBM, or by others in some cases," Spangle explained.

"There are a lot of software houses around the world who develop software—utility software, not complex applications software—and have no way to take it to the market. We think we are a pretty good bridge for that," the chairman added.

The software products currently number four, but Spangle told INFOSYSTEMS in an interview that Memorex has personnel actively seeking software products that it can market to its customers.

The four software packages are:

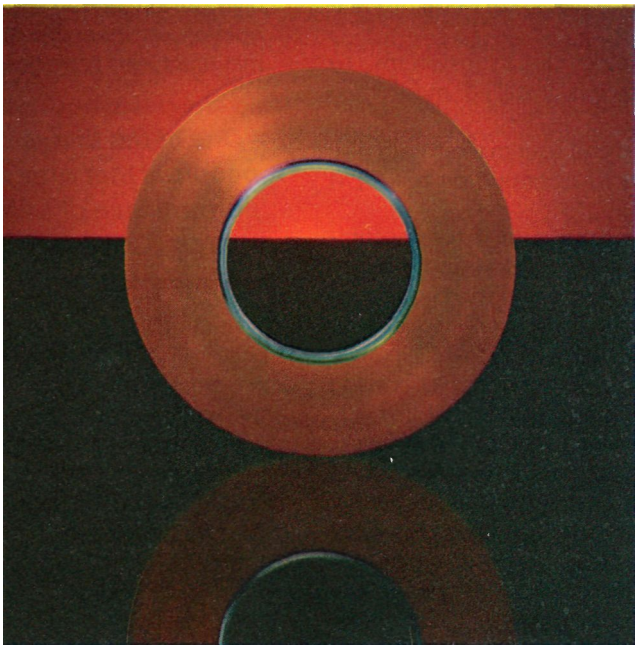
• Shared Data Set Integrity (SDSI), a software package developed by Duquesne Systems of Pittsburgh, PA, for OS/VSI and MVS users with multiple CPUs. The software provides integrity for data sets that are shared by multiple IBM and compatible computer processors without the overhead of hardware reserves. No program modification is required.

• MRXPRINT is a utility software program for the IBM MVS environment that allows users to reduce their printing workloads at the central computing site while improving output turnaround at remote input/output locations. Printer output can be queued from TSO terprograms and printed on IBM 3284, 3286, 3288 and Memorex 2089 printers.

• Memorex Direct Access Space Manager (MRXDASM) is an advanced dump/restore software package. It provides backup, recovery and space management functions for high-capacity disc drives. It can reduce backup time on 3350-type disc storage devices by as much as 50 percent, compared to other software products. Space management functions performed include disc-to-disc copy, data set control by group name, disc-to-tape or tape-to-disc compress, device independent copy/restore and an archiving facility.

• Shared Tape Allocation Manager (STAM), also developed by Duquesne Systems, is a software product that automatically allocates magnetic tape drive resources among multiple CPUs. The software runs on IBM Systems/370 computers under the OS operating system. D

SMOOTHER.



The Memorex® M Formula Rigid Disc, newly introduced by our Media Products Group, has literally redefined the standards by which disc performance is measured. Since a recording head must fly just microinches above the disc surface, smoothness is one of the most critical of these standards. The M Formula coating, featuring the new Hi/Oxide™ formulation, has created a new industry benchmark for smoothness. Hardness has also been improved, thus reducing wear and increasing durability. Higher performance margins result from M Formula's higher signal-to-noise ratio, tops in the industry.

Smoother, harder surfaces mean greater data integrity. For twenty years, from our first computer tapes through our current line of tapes, disc packs, disc cartridges, rigid and flexible discs, data integrity has been the primary motivation of our surface recording engineers and scientists. And for twenty-years, we have proven our superiority where it counts— in the marketplaces of high technology. Marketplaces where change— with its mandates for smoother, smaller, smarter, faster— is an uncompromising reality. And it is a reality we continue to respond to, anticipate and, as with the M Formula breakthrough, a reality we initiate. In fact, it was the pressure to support innovations occurring in our equipment area, specifically our new generation of high-density, high-performance disc drives, that helped bring M Formula rigid discs to market so quickly.

The M Formula Rigid Disc. The latest expression of excellence from the Memorex Media Products Group. But certainly not the last.

The 3652 subsystem consists of two drive units, or spindles, each with a storage capacity of 635M bytes, for a total capacity of 1.2 gigabytes (billions of bytes). This is double the capacity, and provides significantly faster access, than the equivalent IBM disc subsystem products, according to Rich McCraney, vice president sales, Storage Systems Croup. Four strings of four modules each, or 32 spindles of 635M bytes each, would provide on-line storage capacity of more than 20 billion bytes of information in a computer environment.

Since it first began shipping disc subsystems to customers in 1969, Memorex has installed more than 30,000 disc spindles.

This long-term success in the end user market with disc drives led Memorex to refocus its attention on the OEM firms for disc drives.

Although Memorex may be known best for its computer peripherals business, some confusion may exist, according to Spangle. "I think there is a perception of Memorex being only a plug-compatible peripherals company. Only 40 percent of the business is that," Spangle said. "Over its history, a much larger percent has been in the nonplug-compatible peripherals business.

"We have, for instance, already a large OEM business on the 14-in. disc drives. Again, it's not the major part of Memorex but it's an important part."

The product that formed the basis for the founding of Memorex just over 20 years ago is computer tape. That still is a very viable product line within the company today.

During an interview with INFOSYSTEMS, Fred Koehler, vice president and general manager of Memorex's Computer Tape Division, was asked about changes in tape over the past 20 years.

"The state of the art 20 years ago was 800 bits per inch (bpi); today it's 6,250," Koehler answered. "And I might add that it's been 6,250 for a number of years. Associated with this increase in the capacity, or the recording density of computer tape, there also have been increases in terms of the speed and tension at which the tape is pulled. All of these have impacts on the recording technology that is used, the read/write technology, as well as the encoding technology."

And then he talked about the role that equipment manufacturers play in developing newer, high-speed and high-performance magnetic tape subsystems. "I hold the opinion, incidentally, that in years past, the equipment manufacturers have been inhibited by the media," Koehler continued. "I believe today that Memorex is very well postured, if not uniquely postured, particularly with our premium formulations, such as Cubic HD, in advance of the equipment. In fact, our tape now is not fully taxed or exercised by state-of-the-art equipment.

"One of the things we are impressing on our people is that what they do can affect the performance of a very complex, important system."

"In addition to electrical, physical and mechanical properties of the tape, there are some mechanical considerations," Koehler continued. "As we have gone to higher tensions, there have been significant improvements in reel technology. Memorex has its own proprietary SuperReel that is an 'I-beam' construction specifically designed for the newer, higher technology tape drives. It's about 90 percent stronger than conventional computer tape reels.

"One of the parameters is that if you go back 20 years, the recording was typically on seven tracks," he added.

Meeting Customers' Needs For Word Processing, Copier Supplies

What started 10 years ago as a small business to supply toner to users of copiers has grown into an international operation that supplies a broad line of word processing, copier and typewriter supplies for Memorex.

The markets for these products are growing at an annual rate of 15 percent. However, the independent manufacturers of products in these markets, such as Memorex, are growing faster than that, and are providing an alternative to having to obtain supplies from the hardware manufacturers, according to James F. Ottinger, president of the newly formed Memorex DIC Corporation.

"Our strategy is to feed the end user through our distributors," Ottinger said. "We can provide better service of an equal or better quality product, and the price probably will be a little lower."

Memorex DIC, which was formed in February, 1981, as a joint venture with Dainippon Ink and Chemicals Inc. of Tokyo, Japan, has about 200 distributors in the US. They are of four types: 1) stationary distributors, 2) paper merchants and distributors, 3) office machine dealers, and 4) product specialists that handle only word processing supplies.

The joint venture will provide Memorex customers worldwide with a key product line—single component toners and liquid toners for Japanese-technology copiers, such as Minolta, Canon, Savin and others. The venture also provides for an exchange of technology, a cross-licensing for future technologies, and reinforces Memorex's research and development capability, Ottinger said.

Dainippon Ink and Chemicals is a $1.3-biliion-a-year diversified manufacturer of inks and various chemicals. The agreement gives that firm a worldwide product distribution channel, via Memorex, for its products.

Memorex DIC provides products in three principal office supplies areas: first, supplies for copiers, duplicators and printers, i.e. toners and developers; second, text editor supplies, such as flexible discs, printer ribbons for Qume and Diablo letter quality printers; and third, typewriter ribbon products and supplies, such as ribbon cartridges for IBM correcting Selectric typewriters, lift-off tapes, correction fluids in a variety of colors to match those of the universal order form, and a full line of IBM-compatible ribbons, he continued.

The supplies company maintains its own R&D staff, operates a toner/developer plant in Santa Clara, CA; a typewriter ribbon assembly and packaging plant in Summerville, SC; and a joint venture plant, with Kores Manufacturing Co. of London, England, to provide coated correctible film for IBM-compatible products, also in Summerville. •

"Most all recording on today's tape drives is on nine tracks."

Koehler also looked into the future with computer tape. "I expect in the future that we'll still stay with half-inch tape. We expect recording performance to be doubled, if not tripled from what it is, namely, to 12,000 or 18,000 bpi," he continued. "We expect the number of tracks to probably double, from 9 to 18.

"We believe a change, such as doubling the recording performance, going to 12,000 bpi, can be accommodated without any significant change in our current Cubic HD formulas.

"Finally, there could be some different packaging, such as cartridges or cassettes. Our vertical integration and our relationship with the Precision Plastics Division postures us well to respond to those kinds of technological advances."

An almost obvious transition in products for a company such as Memorex is from magnetic tape and disc to the newer flexible discs. After all, these flexible discs are made on an endless tape roll using the same equipment that produces computer tape. Then the flexible disc is cut into circles and packaged into individual cardboard envelopes.

Mike Rogers is vice president and general manager of Memorex's Flexible Disc Media Division. He talked about the growth of that division and the market potential for flexible discs.

"We are one of the smaller divisions within the group, but also the fastest growing," Rogers said. "Last year (1980) we doubled sales in our division and are looking to grow this coming year at something less than that, probably in the 60-to-70 percent range.

"We are dealing in a market that is really one of the dynamic growth markets—a 38-to-40 percent compounded growth rate in the shipment of mini flexible disc or flexible disc, as a whole, for all companies," he continued. "We are not talking about a tremendous market size today, roughly somewhere in the $200-million range, but by 1985 it will be a $1.3-billion market. We are looking at a six-fold growth, in total market, over the period.

"Nearly half of our business today is outside the US, so international is a very important part of Memorex."

"Some companies are growing faster than others. The companies that are a little bit quicker, a little bit smarter and make investments in this business are the ones that are going to hold the plum downstream in a few years," Rogers emphasized.

"Where's the market going to go in the future?" he asked. "Only where everybody's imagination takes it. But we certainly are positioned very well in this business. Memorex has made an investment in this business. We have a new plant in Mihara, Japan, which is a joint venture with Teijin Ltd., which will do its own coating of material, and all of the converting and finishing of the products.

"The plant here (in Santa Clara, CA) has been doubled in size in terms of volume output, and we have our plant in Ireland which is scheduled to come up late in the third quarter. Our plan is to have the Irish plant satisfy the European market; the plant in Mihara finish product for the Asian market; and the plant here, with perhaps some assistance from Mihara, satisfy the US market. The US market is still, by far, the largest piece of the flexible disc business in the world," Rogers continued.

Over the very short history of flexible discs and drives, the products have moved from a single-sided, single density unit on an 8-in. surface, to a double-sided, double-density unit on a 5 1/4-in. surface. This has imposed more stringent requirements on product developers and chemists.

"We have our own engineering development staff," Rogers boasted. "About a year ago, Memorex hired a number of senior engineers, brought them into the Flexible Disc Media Division and chartered them with a number of different tasks, one of which was to develop a superior oxide formulation that would take us into the 1980s.

***"I think** there is a perception of Memorex being only a plug-compatible peripherals company. Only 40 percent of the business is that."*

"The formulations that developed in the past were good for the initial devices, but as the technology has grown, and is expected to grow, it's not going to fill the bill," he continued. "The packing densities are too much. The heads are getting too sensitive. As the head manufacturers improve their products, they also make them softer, much easier to wear out," Rogers concluded.

"So, Memorex does have a lot of strengths that are not related to the plug-compatible business," Spangle continued. "On the other hand, the PC market is one that has a certain amount of glamour. It is a market that many people feel to be a difficult one. It has some tough competitors.

"There are several companies which have been in the business and are no longer in it. It has the complexities of rental; fast product obsolescence; high-powered, high-technology change and all the characteristics, really, of the mainframe computer business," said Spangle, who guided mainframer Honeywell, which had worldwide mainframe and minicomputer revenues of nearly $1.5 billion when he resigned to join Memorex as chairman.

The disc drive business, he continued, is on the "leading edge of technology" and represents the information storage part of any computer system, and therefore "Memorex is looked at as being really only in that business, and its destiny rides or falls on that."

But he quickly added, "our density is very much dependent upon success there (in the peripheral disc drive subsystems market), but it's not exclusively dependent upon that. We are in the information storage and communications businesses," he emphasized.

Spangle was asked, at the conclusion of the interview: "Where do you think the computer industry is headed now after 30 years?"

He responded: "On the path of continued growth—it will be the largest industry in the world by the end of the 20th century.

"The price of computer power is going down while the price of energy is going up. But I think the computer industry will be the largest.

"And, it's certainly still growing," Spangle concluded. •

Parallel developments in thin-film read/write heads and magnetic recording surfaces help keep Memorex competitive with its media products and its plug-compatible peripherals.

When Frank Sordello talks about his applied research work at Memorex Corporation, he compares flying magnetic recording heads to giant Jumbo Jetliners flying one-quarter inch above the ground. He also talks about "thin film."

And when Eric C. Daniel talks about his related research work at Memorex, he compares magnetic tape surface to a 246-ft.-wide river that is so smooth that there is nary a ripple on its 2,728-mile-long surface greater than six-hundredths of an inch, nor a piece of floating debris rising higher than 24-hundredths of an inch above the surface. Both talk about microns.

Sordello and Daniel work in the two principal fields of applied research that are critical to the continuing success of Memorex. Sordello, at age 44, holds more than 35 patents in his field and directs the R&D function that specializes in all of the recording technologies for the firm's family of disc storage subsystems. Daniel, who carries Memorex Badge No. 7 that signifies his joining the 20-year-old company on May 4, 1961, directs an R&D function that specializes in magnetic coatings for audio and videotapes.

Both have something else in common: they are current members of the Society of Memorex Fellows, an honor bestowed on each for his contributions to the technology base that undergirds the worldwide, $769-million-a-year company.

In the early days of disc information storage systems for computers, the disc platters were assembled into disc packs that were mounted on a drive mechanism the size of a top-loading washing machine. There were extremely close tolerances achieved to make the read/write heads "fly" over the disc surface to ensure accurate reading and writing of information, without crashing onto and damaging the recording surface.

Memorex was among the magnetic recording pioneers and established a leadership position in perfecting disc storage subsystems using the magnetic recording technology and marketed its units as the model 3670/75 disc subsystems. These are plug-compatible replacements for the IBM 3330 disc systems, with data storage capacities of 100M bytes and 200M bytes per drive, or 200M and 400M bytes per two-drive subsystem.

Then came Winchester technology, in which the disc pack was replaced by an H.D.A. and was not removable, but "fixed" with its read/write head and positioning assembly in a sealed, "clean" environment. This change pushed the scientists, engineers and product developers to design new read/write heads and magnetic material coated surfaces to achieve closer flying tolerances, smoother surfaces, more tracks and more bits per inch packing densities.

Applied research and product development at Memorex rely heavily on work performed in many separate laboratories in the Recording Technology Center that concentrates on read/write heads and head/disc assemblies for the firm's disc drives and subsystems.

The work of Sordello's group in rigid discs and head/disc interfaces brought to market those products to the IBM systems users. Those users wanted lower priced, plug-compatible systems that contained the Memorex quality and reliability that became known throughout the marketplace.

Memorex has in excess of 30,000 disc subsystems installed.

With continuing emphasis by IBM and Memorex and others on increasing the amount of information that can be stored on a disc, it's no surprise—at least in retrospect—that higher capacity units were moved out of the labs into the users' environments. When IBM introduced its 3350 disc systems, Memorex responded with 3650. Both store 317.5M bytes of data per spindle or 635M bytes per two-spindle system.

Capacity doubled

Then Memorex introduced a double-density version of that system in 1979 and began shipping it to end users in volume in 1980. The Memorex 3652, with total storage capacity of 1.2 gigabytes (billions of bytes), provides IBM users something that IBM doesn't provide in on-line

. .. *continued on page 14*

FASTER.

The business of data processing has become an important facet of modern life-and that business continues to set demanding criteria for success. These criteria call for constant innovation to meet the need for faster, smarter, smaller, finer information storage and retrieval products. Take the Memorex® 3652 Disc Storage Subsystem, for example, a product that combines a series of advanced features which meet and even exceed the critical standards of our fast-paced industry.

The Memorex 3652, the double capacity version of our popular 3650 disc drive, features 1270 megabytes of data storage, available at faster access speeds than equivalent large storage products. Innovations like Intelligent Dual Interface and a unique HDA switching technique assure data integrity by providing built-in backup-and increase performance dramatically by reducing CPU workload. High reliability is assured by Memorex's years of experience in disc drive manufacture- and by the recent M Formula breakthrough in disc media coating which sets new standards for sensitivity and durability. Memorex engineering has helped meet other criteria of the ever-changing world of data processing as well- for compatibility, for space and energy savings, for overall cost efficiency.

The world of high technology is a world of change, a world which asks for more and better, and will not compromise on its demands. That's the world in which Memorex has been competing for twenty years, responding to and managing change at the very heart of these sophisticated marketplaces. For twenty years, we've manufactured everything from computer tapes to rigid discs, from disc drives to communications equipment, that have measured up, and set new measures. And if those twenty years have been years of rapid change, we expect the next twenty to go by even faster.

storage, plus data access twice that of the comparable IBM subsystems, according to Memorex.

And when IBM again announced its newest, high capacity disc device — one with thin-film read/write heads — Memorex already had a similar thin-film head project underway in Sordello's Recording Technology Center labs and engineering. The Memorex response was that it, too, was developing a "high-performance, high capacity thin-film-technology disc storage subsystem to compete with IBM's recently announced 3380 direct access storage device."

Making read/write heads with thin-film technology is said to represent a "quantum leap" beyond mechanically lapped and ground ferrite heads wrapped with tiny copper wires. Thin-film heads, according to Memorex, are smaller, more precise, less expensive to make for a given higher bit density, more efficient and provide for higher density information storage and subsequent retrieval.

Using semiconductor manufacturing techniques, Memorex expects to "deposit" up to 3,000 read/write heads simultaneously on a ceramic wafer surface only three inches in diameter. Although this disposition process takes hours, testing the entire lot of 3,000 heads takes minutes, according to the company.

Sordello worked for IBM and was chief engineer for Sperry Univac in disc drive engineering development before joining Memorex about three years ago to establish the Recording Technology Center. He explained his reasoning: "I saw the opportunity and the excellent decision that Memorex had made to establish the applied research function. Memorex had grown to the level of where it required three levels of scientific endeavor.

"Mature, established companies have three levels of engineering and scientific groups," Sordello explained. "They are the development group, the advanced development group, and the applied research group, whose mission is to investigate and develop future technologies that can be percolated into products."

Management **foresight**

For more than three years, Sordello and his RTC group have been working on thin-film magnetic recording heads for disc drives, using semiconductor disposition processes and manufacturing techniques. In an interview with INFOSYSTEMS, he commented: "Memorex identified this technology in 1976-77 and made provision to start working on it so that Memorex would have the leadership position that we have right now.

"As a result, in 1979-80, thin-film recording heads became the way of the future. IBM announced products with them. Many independent companies found themselves scurrying to look at this new technology. We feel very good about the investment that Memorex management made and the foresight they had to allow us to achieve this prime position that we're in right now," Sordello added, noting too that the firm recently signed a joint technology development agreement in thin-film head technology with Control Data Corp.

This joint technological and development work, he feels, will result in both higher capacity disc storage systems and greatly improved magnetic tape systems for both Memorex and CDC.

"Some day in the future, we're going to see the announcement of a tape drive with a magneto-resistive thin-film head." Sordello predicted. "The result will be a tape drive that is simpler and smaller because one won't have to design and manufacture all the complexity to get the tape up to speed, as now with inductive read/write heads ... and the tape drive will require less power. Power consumption by computer peripherals is becoming a critical issue now because the customer pays for power two times — first to run the system and second to run air conditioning to get rid of the heat that the system generates."

"Some of the improvements we will see directly from thin-film magnetic head technology will be tape drives that have as many as 18, 36, or more heads across the tape, utilizing more of the tape. They will be able to record on both new tape reels or older tape reels," Sordello explained.

Sordello was asked to explain the benefits of thin-film recording head technology to the current and future families of disc storage systems, and he said, without hesitation, "More bits per inch and the ability to have more tracks per inch."

"We feel very good about the investment (thin-film technology) that Memorex management made and the foresight they had to allow us to achieve this prime position that we're in right now."

Although a standard size disc drive has a 14-in. diameter platter, only a two-inch-wide band around the surface is used to record data. The industry's first disc drive around 1957, the IBM 350, recorded data at 20 tracks to the inch. That has been increased, over time, to 100, 200 and 370 tracks and then in 1975-76 to 480 tracks per inch. Memorex, however, has increased that to 936 tracks per inch in its newest disc drive units, the Model 3652, Sordello added.

But he indicated that recording head technology using ferrite/copper wire heads has reached its limits. "I can tell you that the fabrication of read/write heads to those dimensions by mechanical techniques is a technology that has been polished to a brilliance that outshines the sun, and all of the easy improvements have been made."

"In thin-film technology, we will go to 2,000 tracks to the inch, maybe 4,000, even as high as 8,000 tracks to the inch, as far as head manufacturing is concerned. Suddenly there is no longer a major problem of dimensional control of track width. We have tracks per inch in reserve. In our first effort, we were making a head that is in the order of 1,000 tracks to the inch," Sordello continued.

The other measurement aspect of disc technology is the number of bits to the inch, he explained. On the Memorex 3650 disc drive with ferrite heads and total capacity of 317 megabytes, the device "lays down 6,400 bits to the inch (bpi)," Sordello said. "In the thin-film devices we're making, we will be able to lay down 15,000-plus bits to the inch. So we've gone up almost a factor of three. We are headed, by 1985, to as many as 25,000 bits per inch at improved track density."

Sordello pointed out two other constraints in de-

veloping new high capacity disc systems: developing advanced servo systems, or other read/write head positioning systems that can locate more than 800 tracks per inch of recorded data and remaining plug-compatible with newer and future IBM disc products.

He also predicted that Memorex will continue to use its technology to "extend the performance" of its products over that offered by IBM and yet remain plug-compatible to serve that customer base.

"By 1985, we expect to be recording at 25,000 bits to the inch and 2,000 tracks to the inch, giving a 16 times improvement in capacity over the 317-megabyte devices that are in mass production today," Sordello predicted.

These improvements also will apply to the smaller disc drives like the 8-in. product that Memorex now sells on an OEM basis.

Comparing 1985 technologies with those of today, Sordello said a Memorex 3650 disc H.D.A. of today could store five billion bytes of information vs. 317 million bytes today; and an 8-in. OEM Winchester-type like Model 102 disc drive could store from 50 million to 150 million bytes, or many more times the 12-to-25 megabytes of today.

In the R&D world at Memorex, development of read/write heads and related disc mechanisms and perfecting new magnetic oxides and recording surfaces for discs and tapes is almost like a chicken-and-the-egg problem: which comes first? At Memorex, the answer is both! It's a parallel development.

One ingredient in the higher storage capacity of tapes is the ultra-smooth tape surface that Daniel talks about. "The magnetic coating that we put on these tapes is just like a paint, except instead of the color pigment, its a magnetic pigment," Daniel told INFOSYSTEMS in an interview. "It has resin components to stick all of the particles together when it is dry. And it's got a lot of solvent in it that evaporates and leaves you with a dry coating."

Water-based coatings

A research project conducted at Memorex over the past three years, and continuing, is to study the feasibility of replacing the organic solvents with water, he explained. "The obvious reason for doing so is to reduce the usage of these organic solvents, which are mostly derived from oil. They're getting more and more expensive. One day, the source may dry up. There's a tremendous cost savings involved; and it doesn't pollute the air as much.

"As far as I know, there are no products on the market yet using a water-based magnetic coating on tapes. We think we're possibly further ahead than anyone else we know," Daniel said. "We have shown that you can achieve all of the performance characteristics and durability required with water-based coatings, plus achieve distinct performance advantages."

Regarding smoothness of the coating on the tape surface, Daniel explained: "We have to orient the little, needle-shaped particles. Ideally, you want to have them all regimented in line. The second major technology is a combination of the processing and formulations. The coating has to be very tough because it's moving over the head at very high speed. The tape takes a lot of beating."

Memorex is continuing to experiment with a coating formulation process and an electron beam curing process

Smoother and thinner coatings of magnetic metal oxide are required for disc surfaces in order to pack more bits to the inch on high-capacity disc subsystems. Among the state-of-the-art coatings is the "M" formulation that Memorex developed.

that Daniel calls "the ideal system." And then he added why: "There are immense cost savings potentials for this — less energy, cheaper materials, much less down time on the surface treating equipment. In addition, the process holds distinct performance advantages."

More bits for video

Although computer, audio and video tapes have been developed, manufactured and marketed by Memorex for 20 years, each has its own requirements. With computer tape, the R&D manufacturing emphasis is on data reliability—"you want to have a computer tape that is free from any defects that could give rise to an error," Daniel continued.

"Going to video tape, things are a bit the other way around," he added. "You have to have a certain reliability, but there's a tremendous emphasis on squeezing the lemon of magnetic performance down to the last drop. One index you can use is how many bits of information you are trying to squeeze into each square inch."

For current computer tape, the density is 200,000 bits per square inch. For home video tape, it's approaching 50 million bits per square inch. And among high density, rigid disc drives, it is about 6 million bits, Daniel explained, adding that over the years, video tape, in performance alone, has 100 times the density of the corresponding computer tape.

Memorex, which was founded in 1961 as a manufacturer of high quality magnetic tapes for computer systems, introduced its first video tape, for closed circuit television use, three years later, in 1965. The firm added Memorex audio cassettes and open reel tapes in 1970.

Earlier this year, Memorex introduced a line of audio and home video tapes, each of which uses "greatly improved" formulations. These include the MRX I normal bias audio tape; High Bias II; and Metal IV, a state-of-the-art formulation using metal particles rather than metal oxide; and its T-120 VHS home video cassette with improved RF and Chroma output especially for six-hour recording, the company said. Memorex also introduced its first Betamax video cassettes in the four most widely used sizes. D

Huge computer network is key to future

The tenth largest healthcare plan in the nation paid out more than $1 billion in 1980 while processing over 20,000 claims a day.

The president of Blue Cross and Blue Shield of North Carolina (BC/BS) acknowledged that the computer is a vital part of the company's future in his long-range plan submitted to the board of trustees. That recognition laid the foundation on which the senior director of information systems stands when he proudly asserts, "We are innovators in North Carolina as far as using data processing in paying claims for medical care."

The tenth largest healthcare plan in the nation, BC/BS of North Carolina paid out more than $1 billion in 1980 while processing over 20,000 claims a day. The company's rolls list more than two million names. "Thirty-three and eight-tenths percent of the people in North Carolina are covered by our insurance," says John E. (Buddy) Dye, senior director of information systems. "Eighty percent of the acute short-term general beds in the state are hooked up to us by CRT. That covers most of the major hospitals in the state."

Dynamic growth

In addition, BC/BS has 11 district offices tied into its corporate headquarters in Chapel Hill and the state Medicare Part A processing is administered there. "We're also in the process of hooking physician clinics and offices up to us remotely," Dye says. "We anticipate dynamic growth in our remote network next year."

Such tremendous processing demands, coupled with such ambitious expansion of services, repeatedly forces Dye to cope with resource shortages. The company runs a mixed shop. CRTs are Telex, printers are Decision Data, remotes Raytheon, discs Memorex, tape IBM. Disc capacity used to be IBM, but business demands forced a change to Memorex just over two years ago.

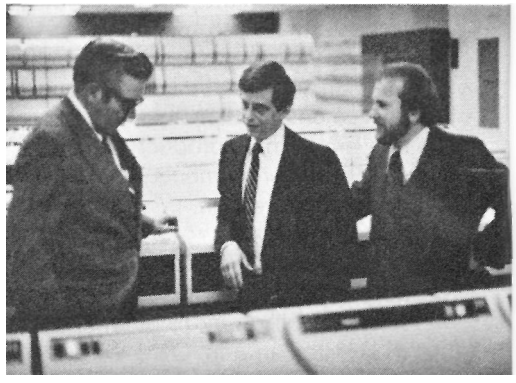
"We are installing a major new software system for claims," Dye says. It required quite an expansion of disc capacity. Cost and delivery are two important factors to us. We started an evaluation process to see who could satisfy those best. We considered all of the five major suppliers: IBM, Memorex, Storage Technology, Control Data and Calcomp."

Dye emphasizes that his concern is with ways to do a quality job. "We're in an extremely competitive business. The bottom line is important to us. We don't just buy because something is cheap," he stresses. "It has to be economical and perform."

Memorex won the battle for that upgrade late in 1978 when the 3033 was brought in. BC/BS sold its IBM disc equipment to a third party and saved $255,000 in the switch to Memorex, according to J. Gil Long, director of technology. Dye adds that those savings were just in the first year and there have been additional savings since because there is a lot of difference in the cost of the two systems.

BC/BS has gone through two more upgrades since that time and Memorex has won both of those, bringing its capacity to 12 billion bytes. "Each time we've gone through an upgrade," Dye says, "we've gone back and looked for availability and price. The difference between then and now, we didn't have any idea of the reliability of the Memorex equipment. We do now and we know it is very reliable."

In the interim since Memorex first gained entry at BC/BS, the Memorex Intelligent Dual Interface ODD has been introduced. The feature provides two data transfer paths for each drive in a string and thus speeds up data access. "We're obviously concerned about performance of the disc," Dye says. "Except for channel speed, it is the bottleneck today.



Standing among the Memorex disc facilities at Blue Cross and Blue Shield of North Carolina are, from left, Thomas W. Hicks, director, operations; John E. (Buddy) Dye, senior director, information systems; and J. Gil Long, director, technology.

Memorex came to us with the fact they have IDI capabilities in the product. We told them we would like to benchmark it."

Faster response

BC/BS ran several jobs, both with and without IDI. The insurance company picked the jobs itself and didn't do just one job. Dye says his department "wrung it out." The benchmark showed an average 33 percent faster response running under IDI than without it. Dye points out that this is an average with some jobs doing better and some worse. But the results were so satisfactory that BC/BS has now begun installing IDI on all of its disc strings.

This spring, BC/BS began adding one and a half strings of IDI double density disc drives which Long predicts should handle all of the firm's data expansion for 1981. In keeping with its philosophy of checking performance, however, the firm plans to benchmark the double density disc drives to make sure they are not going to slow down throughput.

Having the current contract at BC/BS does not guarantee the next. When IBM recently introduced its 3380/3880 disc, Dye became interested. "It's a good product with a good price, but it didn't meet our availability." •

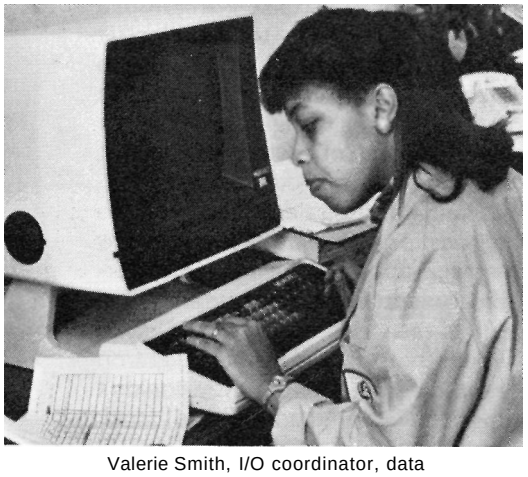
Futures market exchange expands user network

On-line terminal system provides fast analyses of the commodities, prices, quantities and times of transaction critical to the operation of the futures market and the overall growth of a clearinghouse.

One of the fascinating sights at the Chicago Mercantile Exchange is watching the constantly changing prices of the commodities as they are flashed on a moving display through the trading day. A central clearinghouse for brokers dealing in the commodity markets is operated out of this Exchange. Its role is to provide the facilities for futures trading, to establish and enforce trading rules and to collect and disseminate information about the respective markets.

What makes all this possible? Obviously, the computer and data communications equipment play an increasingly vital role. The administration of the Exchange is supervised and carried out by a staff of more than 200 salaried, nonmember professionals and employees, among whom is Robert A. Becker, manager of data processing operations.

Becker and his department have responsibility for the day-to-day operations, as well as the long-range operations of all of the data processing facilities. As trading takes place throughout the day, the details of each individual trade must be entered to show the commodity, the price, the quantity and the time. As these individual entries are accumulated, they reflect and report changing price trends for each commodity. "We are providing the information that makes hedging and speculating possible," said Becker.



Valerie Smith, I/O coordinator, data processing operations, enters details of a trade on a Memorex display station.

"When I started over a year and a half ago, we had no on-line (DP system) at all. In fact, we only had one machine and it ran batch," said Becker. "We had a lot of close calls because the volumes on the Exchange had been growing exponentially. The volume increase over the last year was 22 percent. This past year we were up another 10 percent," he continued.

Now, the Exchange has IBM 4341 and 370/148 computers that support an on-line network of some 20 display stations.

Expansion plans

"I was using IBM 3270s and what happened was that I needed additional units at a time IBM couldn't deliver. I went out looking," said Becker. "Expansion plans called for an incremental number of terminals over the next year and a half. I contacted Memorex since the department used Memorex 3650 disc drives and I was familiar with them. Memorex's rep was able to secure 10 display stations right away," emphasized Becker.

Memorex 2078 Display Stations are used for several applications under the Taskmaster terminal control system, including on-line data entry and deliveries inventory control. The computers also are used in conjunction with on-line program development and three remote job entry sites.

If the brokerage firm is large enough, it will often have terminals in its own offices. However, some of the firms trading are very small, perhaps just two individuals who trade, and without any back-office accounting support or data processing. In such cases, they may merely write down by hand the details of each trade and use the Mercantile Exchange facilities to enter their data. The Exchange charges for this data entry in the same sense as would a service bureau.

So long as their volume of trade is small, it costs the brokers less per month to use this service than it would to lease a terminal. As volume rises, however, it becomes more practical for the brokers to install their own display stations. Since the brokers then would enter their own data, it spares the Exchange from potential errors of entering data incorrectly from handwritten records.

Robert A. Becker, manager of data processing operations: "Memorex's rep was able to secure 10 display stations right away."

Some firms that are a little larger may have a small keypunch operation for which they are paying a monthly lease and maintenance charge. Switching to a display station may save money for them as well.

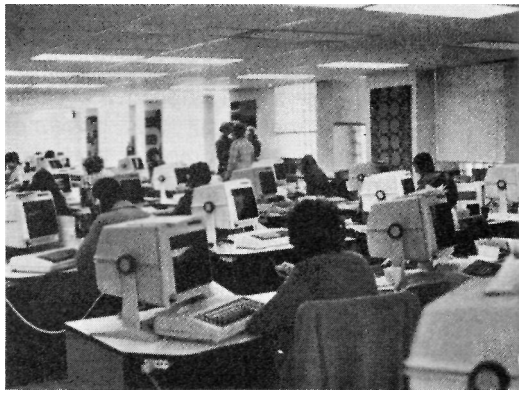
These groups constitute the potential "user" network. The Exchange is in a period of expansion, inside and outside, putting display stations in such users' offices—eventually planning to have 115 different users of this type. Since the Exchange is not planning to go into a subleasing business, it will assist brokers in choosing display stations that are plug-compatible with its system in place.

Besides being able to get display stations delivered in the time frame needed, the Exchange chose

... continued on page 18

On-line system helps energy company expand its role

Large holding company supports its subsidiaries with a timesharing environment that enables end-users to use packaged software or even to devise their own programs.



In the Customer Relations Department of Peoples Gas, 120 of the company's 250 Memorex 1377s are in constant use as representatives answer customer inquiries about service and billing.

There may not seem to be a relationship between a coai mine in Kentucky and the local municipal refuse center, but they both might hold part of the answer to our nation's future energy needs. The Peoples Energy Corp., a diversified energy company, includes eight subsidiaries which produce, deliver and sell three forms of energy: natural gas, oil and coal. The company is also involved in activities related to acquiring gas supplies from nontraditional sources, including coal gasification and the extraction of methane gas from waste matter.

The Chicago office is headquarters for Peoples Energy Corp. as well as for three of its eight subsidiaries: Natural Gas Pipeline of America Co.; Peoples Gas Light and Coke Co.; and North Shore Gas Co.

New energy sources

While Peoples Energy is expanding its role in finding and developing new sources of energy for the nation through exploration and development in the Rocky Mountains, mid-continental region and Gulf Coast, Peoples Gas Light and Coke Co. supplies gas to 900,000 Chicago customers and is involved in a local conservation program to fuel 70 of its fleet vehicles with compressed natural gas. If anticipated fuel and maintenance expense savings are realized this year, many more of the company's vehicles will be converted to use the compressed natural gas fuel.

Peoples Gas is also cooperating with the City of Chicago in a federally funded weatherization program to inspect home heating systems, and it will soon embark on a five-year energy audit program to inform customers of ways to save energy in their homes.

William Weprin, manager of information systems at Peoples Gas, said "the parent company is a holding company with a number of subsidiaries and all have programming areas that we support with timesharing, 1) for the development and maintenance of computer programs, and 2) as end users who write their own programs or use packaged software or specially developed programs, such as for our budget and financial areas, for financial modeling and forecasting. These applications are done on Memorex display stations."

The company had been using IBM terminals exclusively before it purchased Memorex display stations. Weprin said, "There was no technical difference from the user standpoint, which left us with an economic decision ... it cost less money. The features of the IBM 3277 and the Memorex 1377 Display Stations were identical for us. If the features were very different, we might have been hesitant to go that route ... we didn't want to have different things to teach what is fundamentally the same job."

Systems analyst Andrew Lombardi remarked that "With Memorex display stations, it was like going from a manual typewriter to an electric typewriter ... the keyboard on Memorex was a little more sensitive and in the beginning people had to get used to it. But if we were to take it away now, they would complain."

Lombardi also said that "one of the reasons for going with Memorex was service support. When an IBM terminal went down, IBM would send out a service representative who would try to fix the terminal right on the spot. And at times, they couldn't do this. Rather than try and repair something on the spot, Memorex will replace it and take the down display station away to be fixed."

The Peoples Gas headquarters office maintains an IBM 370/168 and a 370/158 AP. "The principle of operation in our shop," said Weprin, "is that any one job can be done on either of the two systems. All the billing, accounting, dispatch, input of completed orders, management control for the service people, the service pipes, the mains ... and human resources management—it's all the same system. And," he said, "the Memorex display stations are used for every application that a terminal is designed for—they're for data entry, inquiry ... everything.

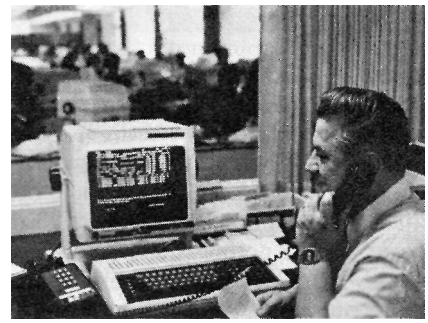
"The same system is used for emergency dispatch too," said Weprin. "If somebody calls up and says they smell gas... the message is put into the Memorex display stations immediately—we key in the code that says, 'this is a leak call' —BINGO. The first thing that happens is verification of location. Immediately after it is verified, the computer will send the information to a terminal in a radio dispatch room and people there are alerted to the nature of the message." Weprin said that the dispatch room staff is always keeping track of where the service vehicles are, and upon receiving the emergency message, they contact the appropriate service vehicle.

The Chicago location has approximately 250 Memorex 1377 Display Stations and, in addition to the applications mentioned by Weprin, the Memorex 1377s are used in the Customer Relations Department, in the computer room by the staff of operators and in what the company refers to as its "stores." These are five locations in the city where customers can come in to pay their bills, ask questions about billing and service, and ask to take part in one of the programs Peoples Gas has implemented to help customers on low and fixed incomes meet their energy use costs through extended payment plans, budget billing and special flexible credit and collection arrangements.

According to Lombardi, "The Customer Relations Department (CRD) is our 'bread and butter' operation," and that's where 120 of the 250 Memorex 1377 Display Stations are located.

The CRD is divided into two areas forming an L-shape with a glass-enclosed control room at the point where both areas are joined.

During each shift, a CRD supervisor sits in the control room at a Memorex 1377 Display Station, ready to pick up the phone and handle any problem calls that might be referred to him by one of the CRD representatives. When a representative transfers a call, the supervisor brings up the customer's record on the display screen and continues the conversation with the customer where the representative left off.



Al Sparks, CRD supervisor, calls up customer information on his Memorex 1377 Display Station located in the department's control room.

According to Lombardi, CRD, which handles customer inquiries, requests and complaints, averages "between 11,000 and 13,000 calls on a typical Monday, with a weekday average of 11,500 calls per day. At least 80 of the Memorex display stations are in use at all times during the day. As far as reliability," he said, "if I have one Memorex terminal out of 250 go down in a day, that's a lot." •

Serving the small business computer market

A large manufacturer of business forms and distributor of various products for users of information processing systems selected a line of magnetic media products to match its own well-known name.

"Memorex has been a good company to work with, and the name is well-known," said John R. D'Ambrose, marketing manager for Special Products, Moore Business Forms Inc., Glenview, IL. He was asked by INFOSYSTEMS why his company sells Memorex magnetic media products as part of its broad line of stock and custom forms, binders, forms handling equipment and many other products to handle the needs of information systems users.

Moore Business Forms is the US subsidiary of Moore Corp. Limited, a Canadian firm which is also listed on the New York Stock Exchange. Worldwide sales for Moore is approaching $2 billion with the US being the company's largest single market. The US operation has a base of 400,000 customers and claims a 28 percent share of the forms market.

Moore covers this huge market with 2,700 direct sales representatives that work out of hundreds of district and provincial offices throughout the country.

According to D'Ambrose, Moore recognizes the importance of the small business computers to this market. He said, "Our philosophy is that we want our sales people who are calling on small businesses to be a single source of information systems supplies to include not only forms, but binders, printer ribbons and magnetic media."

It was with this in mind that five years ago, the company first took on the Memorex magnetic media line as part of its sales offering. At that time the line was sold only at the local option of the various sales regions of the country. The trial period worked so well, according to D'Ambrose, that Moore added the Memorex line to the national sales book just two years later.

According to Debbie J. Kobak, specialist for magnetic media products, "we probably carry the most complete flexible disc line" to match the needs of practically any small computer or word processor being marketed. She bracketed the size of the market being served by Moore: "When the program went national three years ago, we decided to gear all our products for the IBM/3 and

. . . continued on page 20

below." The product line includes disc cartridges and disc modules as well as flexible discs.

She said, "Even now we're analyzing the market to see if we should be offering computer tapes and disc packs. We're getting quite a few inquiries from our sales people about these products."

D'Ambrose pointed out that Moore stocks magnetic media products at two locations. One is at Perrysburg, OH, and the other at San Leandro, CA.

He said a sales representative can teletype or wire an order into either location and expect a shipment within 24 hours.

Retail **outlets**

The company also set up retail outlets under the Moore Business Centers name to serve small business and personal computer users. D'Ambrose said there are 10 outlets now with more to be added by the end of this year. Established locations are in Boston, Birmingham, Chicago, Dallas, Detroit, Denver, Houston, Kansas City, St. Louis and Miami.

The Centers handle stock forms developed for specific small business computer software programs, computer paper, as well as such products as the Memorex magnetic media line. The Centers are also equipped with instant print, photocopy and collating services to provide customers with quick turnaround times on single sheet forms.

Company officials point out that each Center is designed to be a "retail showroom." It's equipped with display panels that exhibit the products and demonstrate applications in the office or small systems environment. The panels inform small business computer users of the availability of all the products required to run an efficient system. D'Ambrose explains that the Centers are a companion development to the many computer retail stores that "are popping up across the country."

When asked why Moore chose the Memorex magnetic media line, D'Ambrose also answered with "quality." He added that Memorex has extensive research and development capabilities. He feels Memorex keeps abreast of the market. He explained, "They keep their line tuned to what is needed in new disc drives and computer hardware."

In addition, he said, "Memorex provides extensive backup and support for technical problems that are related to compatibility and other problems that may develop with the use of the product." According to D'Ambrose, "it's very important to us that Memorex does understand how to market through distributors, such as Moore. They're very much in tune with distributors. They're always working on programs to help the distributor deal with user problems."

Kobak added that the Memorex name is certainly well-known in the industry. On the other hand, she said since we are dealing with many first-time users who may not be aware of Memorex's role in the computer business, "they do know Memorex because of Ella Fitzgerald (of television commercial fame) and the audio side of the industry." •

Memorex flexible discs that are marketed through 2,700 Moore Business Forms sales representatives are examined by John R. D'Ambrose and Deborah K. Kobak.

Railroad tracks freight cars with CRTs

With a computer and communications network spanning 1 2 states, this freight carrier finds that CRTs and printers located in key user areas provide instant access to a data base of more than 90,000 freight cars, locomotives and cabooses.

Anyone who thinks the US railroads of today are operating as they did back in the early days of that industry hasn't taken an inside look lately at the Missouri Pacific Railroad (Mo-Pac), or similar freight carriers.

Many of the operations of this $1.7-billion-a-year rail carrier serving customers in 12 midwestern and southwestern states are handled by two large IBM 3033 computers and more than 190 Memorex video display terminals clustered in high-use areas throughout the 22-floor general office headquarters of Mo-Pac on the edge of downtown St. Louis, MO.

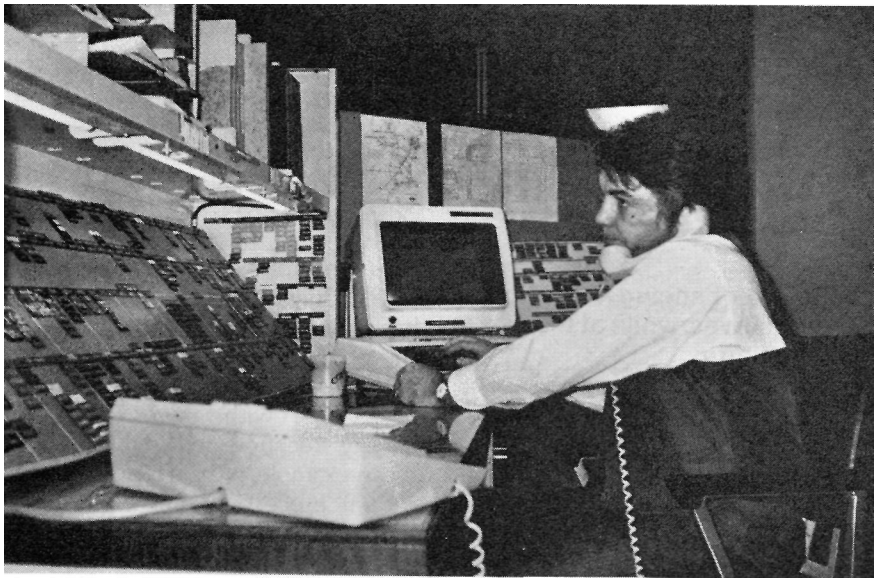
"I don't know whether we're pioneers, but we're certainly in the forefront of using technology and maximizing it when we select something," said William M. Alexander, an advisory systems analyst in the Information & Control Systems Dept. of Missouri Pacific Railroad Co. We like to get the most bang for the buck, keep it in as long as we can and have the flexibility to grow, either with that vendor or someone else."

"We want flexibility in contractual arrangements so that if we're going to keep equipment four or five years, we're going to buy it," Alexander continued. "Or if we're going to keep it an unknown period of time, we may lease it initially and then exercise the purchase option. Even though it's going to be a short period of time, we like the capability of being able to rent or lease."

In describing Mo-Pac's system, he said the railroad has one of the most extensive computer and communications networks of any railroad in the US. In addition to the two large central computers in St. Louis, Mo-Pac has PDP-11 minicomputers in its 20 largest freight yards, Honeywell/Incoterm intelligent terminals in its medium-size yards and IBM 3774 systems in its small yards.

In all, Mo-Pac has more than 1,250 devices — printers and CRT video display units — operating on an interactive mode on the network, Alexander explained in an interview with INFOSYSTEMS.

Over the past 10 years, the railroad has spent more than $45 million on its computerized Transportation Control System (TCS) to meet two goals: highly reliable railroad service to its shipper-customers, and maximum



In the central car control group of the Missouri Pacific Railroad, Memorex display stations are used to follow railcars from their starting points to their destinations.

efficiency in railroad transportation operations without reducing the quality of service, according to a statement by John H. Lloyd, vice chairman of Mo-Pac.

"TCS is as vast in scope as the information system used to send man to the moon and back," Lloyd said. "It may be the most ambitious undertaking of its kind in the private business sphere."

Railcar data base

The customer waybill, or shipping document, is the starting point for most transactions handled by the Mo-Pac TCS. Once the waybill information is entered into the system through one of the video display stations, railroad personnel use the display stations to track empty and full freight cars on the 12,000-mile system.

"We have a data base that contains every car that's on our railroad, plus access to every car in the nationwide fleet, identified by a car identification number," Alexander continued. "We know where a car is, how long it's been there, and where it's going to go next. That's part of the freight car scheduling system to increase productivity and freight car utilization."

One of the computers is dedicated to the on-line system that includes Memorex display stations and printers in the general office building, and data communication links to the distributed computer systems in the three sizes of freight yards. The other computer runs in an off-line mode and is used for batch processing and program development under TSO, Alexander explained.

"When selecting display stations for these two systems about five years ago, railroad personnel "looked at alternatives and found that Memorex offered the price and delivery we wanted," Alexander said. "They offered the same performance at a reduced price.

"When we started up our TSO (timesharing option software on IBM computers) and our in-house Transportation Control System, we found that we had a requirement for a number of tubes (CRTs)," he said. "We ended up with a purchase deal with Memorex for a number of display stations, and we could get good delivery. They functioned well and they had all the niceties that are required for people who are operating them during a large portion of their daily work."

Three principal users

Since Mo-Pac first acquired Memorex Model 1377 Display Stations, the railroad has purchased 91 and leased another 84 of them. In addition, Mo-Pac has leased 18 of the newer Memorex Model 2078 Display Stations as well as four Memorex Model 2089 printers that operate at 300-lines-per-minute, Alexander said.

The display stations are used in three principal areas within the St. Louis general offices of Mo-Pac. First, by the Information and Control Systems Department staff of programmers and analysts; second, by the revenue-rating group of users who work with customer waybills and related information; and third, by the central car control group and the railroad service bureau, both on the 16th floor.

This last group also has requirements for printed output, as well as displaying information on the display stations, Alexander explained. "We recently installed Memorex 2089 printers up there, and just rearranged the interrelationships of the facility," he continued.

These Memorex printers are used in three ways. Users on the 16th floor have an individual print command on their display stations that routes output to any one of the three printers. There also is a "default print command" within certain application programs that directs output to a designated printer. Additionally, an event, or unsolicited output, is routed to a specific printer automatically so that action can be taken, Alexander explained.

Principal uses for the display stations are for making inquiries into the data base of railroad cars on the system, looking for a specific car, he continued. "Since we're a service-oriented company, we are constantly monitoring the status of car movements in our effort to provide our shipper-customers the best possible service," he said.

"There is a multitude of things going on, and these display stations are being used by a variety of people throughout the general office building, sometimes in control of these (car movements) directly, and other times, more or less in a management role," he added.

He was asked about the importance of service when considering a vendor, such as Memorex. "Very substantial," he replied. "One of the problems in running an on-line system is that your reliability has got to be good. One of the things we've experienced with Memorex is good maintenance support."

He also related that Mo-Pac has a great deal of static electricity in its building, especially where the new printers were installed. This caused paper jams. When brought to the attention of Memorex, the vendor modified that Model 2089 printer to include a static guard and also made it a standard feature on all future shipments of that printer, Alexander said. •

.. . continued on page 22

Firm conserves computing energy for itself and utility clients

A disc system assists computer service firm in enhancing its on-line DP capabilities for the 70 utility companies it serves, while at the same time actually reducing energy consumption.

A growing number of utility companies are now devoting their energies to areas other than in-house data processing, thanks to the wide range of specialized computer systems and services offered by Network Computing Corp. (NCC). At the same time, NCC is reducing its own energy consumption and enhancing on-line data processing capabilities with the aid of high-capacity disc storage equipment.

"By installing Memorex 635-megabyte disc drives," reports Jim J. Jones, chairman of NCC, "we have been able to meet our requirements for added storage capacity without adding to our existing facilities. In the process, we have also further enhanced the cost-effectiveness and reliability of our data processing system."

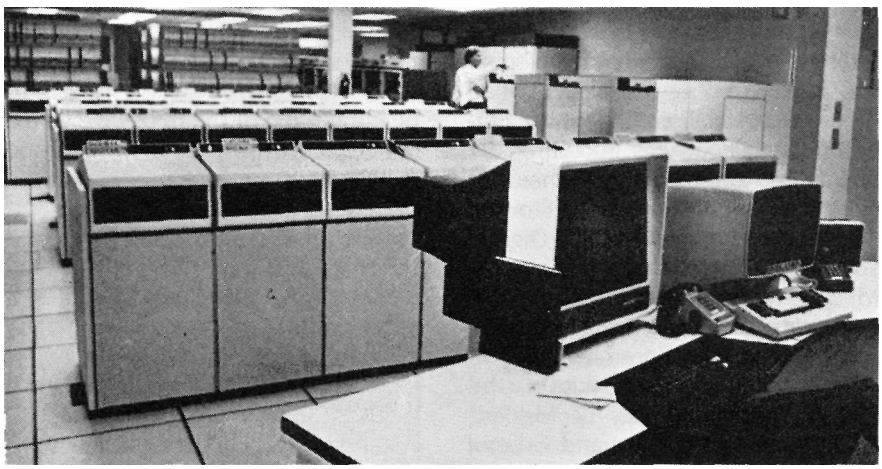
Formed in 1971 specifically to supply on-line computer services to electrical cooperatives and municipal utility departments, NCC has grown into one of the nation's leading computer service companies. It now serves more than 70 clients in 13 states, representing some 1.5 million utility accounts. NCC also serves a wide variety of timesharing and remote job entry customers on a nationwide basis.

Through NCCs computer center in Charlotte, and its branch office in Nashville (TN), clients have access to a very broad spectrum of processing systems and resources which have been tailored to the particular needs of the utility industry. Software programs range in scope from personnel and payroll processing to highly sophisticated financial forecasting and cost of service modeling.

"One of the major benefits offered by NCC," Jones explains, "is that our advanced systems and resources are immediately available to clients with no capital investment on their part."

Rather than commit hundreds of thousands of dollars to develop in-house data processing capabilities, NCC clients use computer terminals which link their operations directly to NCCs central computer in Charlotte.

To ensure its ability to serve both present and future customer needs, NCC maintains an extensive computing and telecommunications capability. The center is already one of the largest computer installations in the Carolinas, encompassing an on-line data base of more than 22.8 billion bytes, and a network totaling some 14,000 miles of data communications lines. And the system is still growing.



Row-upon-row of Memorex 3652 disc subsystems store more than 22.8 billion bytes of information for the electrical cooperatives and municipal utility departments that are clients of Network Computing Corp. in Charlotte, NC.

The Charlotte center, for instance, has gone through a continuing series of performance and capacity upgrades over the past ten years to keep pace with newer data processing technologies and products. As an example, NCC has upgraded its central processing unit eight times since 1971. Beginning with an IBM System/360 model 40 computer, NCC now has an Amdahl 470 V-8 CPU with 12 million bytes of processor memory.

On-line data storage has expanded rapidly, too, from the initial 87 million bytes to the present 22.8 billion bytes. NCC plans show that when conversion to Memorex's 635-megabyte, model 3652 disc drives is completed, on-line storage capacity will be nearly 28 billion bytes.

"These hardware upgrades are very important to our clients," claims Robert C. Harding, president of NCC, "because they help ensure our ability to continue to offer a full range of quality services at competitive prices. Keeping our costs as low as possible helps our clients offer lower utility bills to the consumer," he points out.

Save space, energy

Memorex disc drives have been instrumental in helping NCC maintain low operating costs, according to Marvin Jean, NCC vice president of operations. Prior to this most recent disc subsystem upgrade, NCC had Memorex 3650 drives installed (317.5 megabytes per spindle).

"Like most data processing operations today," Jean observes, "computer room floor space is at a premium. By installing Memorex's double-capacity 3652 drives, for example, we have been able to double on-line capacity within the same physical space."

The 3652s offer 4.1 billion bytes of storage per 100 sq. ft. of space. This compares to 3.2 billion for equivalent double-density disc drives, and 1.6 billion for single-density storage devices.

"Serving utility clients has made all of us here much more aware of the

importance of conserving energy," he says. "The 3652s consume about 6.3 kilowatts per one billion bytes of storage capacity compared to 13.6 for single-density units. When you consider that we operate on a 24-hour per day schedule, the potential energy savings are especially noteworthy," Jean adds.

NCC was impressed with the price/performance characteristics of the new Memorex equipment. But with all services on-line, and with more than 70 clients sharing the system, hardware reliability and responsive customer engineering support were also major considerations in the ultimate decision to install the Memorex 3652 disc subsystem.

All on-line data bases are now stored on the Memorex disc drives. More than 400 interactive computer terminals located in client offices across the country enable each client to access its particular data base in an average 2.5 seconds.

The on-line system encompasses a wide variety of keyboard/printing, video display and remote batch terminals. In addition, NCC provides a full range of supportive services from its Charlotte and Nashville offices. •

From custom software to a retail back-office system

A Monterey, CA, firm incorporates latest Winchester disc technology into a versatile data management system developed for retail operations.

CyberData Corp. was founded in Silicon Valley in 1974 and moved to Monterey, CA, two years later. Initially, the privately owned company focused on custom software development. Early efforts included the design and implementation of bank credit card processing systems; a high-level language operating system and application packages for Singer Business Machines; administrative software packages for school districts; and a variety of custom software for a variety of clients—retailers, distributors and manufacturers.

CyberData still views itself as a custom system house, but has expanded its product and marketing base to include end-user, off-the-shelf types of packages.

The company became heavily involved in the retail market in 1976, when it won a contract to design, develop and manufacture a back-office system for K-Mart Stores of Canada. The large chain (125 stores) needed a computer system that could handle high-volume ECR data collection at the store level, and then transmit that point-of-sale data to a central location via modem lines. The system also needed the capability to generate several different kinds of management reports.

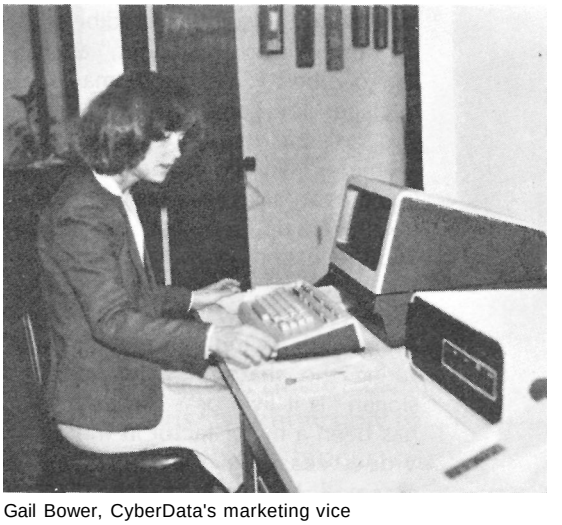
CyberData staffed up for the job and, by implementing then-state-of-the-art microprocessor technology, was able to begin delivering the CD100 back-office system six months later. Designed to operate either as a stand-alone processing center or as a terminal in a distributed processing network, the CD100 underwent two major improvements in 1979 and is now dubbed the CD200.

The first of these improvements came about when K-Mart discovered that it needed better, higher-capability point-of-sale terminals. CyberData teamed up with EFM Systems Inc., part of the EFM Group of New York, to develop the EFM 100 retail computer terminal. CyberData provided all the software and hardware design, and EFM handled the manufacture of the units.

CyberData will soon introduce its latest product—the "WAVE 80." It's an 8-in. Winchester disc memory system with a data management system (DMS) and an optional 5 1/4 - in. mini-floppy disc for backup. Starting with the Memorex 101 8-in. disc drive, CyberData created its own CPU card, controller board, interface logic board and power supply. Since the controller board is built into the disc drive instead of the host, all read-seeking is done within the drive, thus reducing the number of serial transmissions.

The DMS, in turn, is built into the 8085 microcomputer disc controller board, and offers five record structures: fixed sequential, variable sequential, indexed linked sequential, indirect linked sequential and random. Data is retrievable by file name or by physical location on the media. Sector size is 512 bytes and can be extended through the use of multiple record transactions in a file. Storage capacity is 10.996M bytes, with the optional mini-floppy providing an additional megabyte.

"What we have done," explains company founder and president Charles J. Lembo, "is move the intelligence from the computer into the disc drive. That's our marketing direction. We look at our disc drive as a peripheral device, similar to a printer or a CRT, that you can attach to a CPU. We've built it with standard interfaces and we have put firmware inside the drive itself so the user can access the disc in logical fashion. Effectively, what we have is a data management system built right into the drive."



Gail Bower, CyberData's marketing vice president, demonstrates the CD 200 that includes the 8-in. Winchester-type disc drive from Memorex.

CyberData's vice president of engineering, Howard Gay, describes the 8-in. system as "a practical, lightweight, logical progression" from the 14-in. drive. A lot of time and testing went into the development of the WAVE 80. "We've been into a six-month evaluation program with Memorex" says Gay. "We ran the new product through an extensive evaluation and quality assurance cycle, working closely with Memorex during the entire process. The company has taken steps to be compatible, and we saw some advantages in the 101 disc drive—advantages like the DC motor and the data separator." •

Home Video Tape Is Fast Growing World Market

Home video tape and audio cassette tape were a natural extension for Memorex. The company has been manufacturing computer tape since 1961, yet it may be best known by the unique advertising and promotion campaign that has been conducted for its consumer products.

The First Lady of Jazz, Ella Fitzgerald, cuts the anniversary cake with Memorex Chairman C.W. Spangle during the firm's 20th anniversary observance in February. Miss Fitzgerald has appeared in the Memorex advertising program that promotes quality reproduction on audio tape, asking the question, "Is it live or is it Memorex?"

"Last year was an incredible year for home video equipment," according to Albert P. Pepper Jr., marketing manager for consumer products in the Media Products Group of Memorex. "In the domestic market, equipment sales (averaging $1,000 each) were up 65 percent despite the 1980 recession."

Memorex, which may be best known for its now 10-year-old advertising and promotion program featuring the shattered glass and the slogan "Is it live, or is it Memorex?," has been a major factor in the home video cassette market since it emerged. Memorex has been manufacturing video tape since 1964, three years after the company's founding.

Sophisticated media

Home video tape and audio cassette tape were a natural extension for Memorex, which started as a computer tape manufacturer.

"Home video is one of the most technical processes. It's much more sophisticated than computer tape," Pepper continued. "It's the most sophisticated flexible media that's come to manufacturers. And it's the fastest-growing consumer market in the world. We see home video as a billion dollar business in about two years," the marketing manager added.

"Home video technology is the most advanced media technology that anyone's working on. It is one of the five major investments Memorex is making this year."

To help satisfy the demand for Memorex home video tape cassettes, the firm entered into a joint venture with Bell & Howell. Memorex makes the tape, and a B&H/Memorex plant in greater Chicago assembles the video cassettes, loads the tape into them and packages the finished units, Pepper explained.

"Now that home video has come out, it represents a tremendous potential, particularly for us because we have so much strength in the mass consumer market. The guy who watches TV is very much our customer," he continued.

The home video market is experiencing rapid growth worldwide, and for two different reasons. "If you're a European with an extra thousand bucks, you have one (a home video machine)," Pepper explained. "There, you buy it because you know that the world championship is only on at 2 o'clock on the BBC on Sunday afternoon and you've got to have dinner with your mom," he explained by way of illustration. "So you have one. It's a necessity of upper middle class life in Europe.

"Talk to the guys who sell the equipment, the exporters. Brazil, Argentina and the Middle East are incredible markets for this equipment. They're buying prerecorded (programs) because what's available on public television, both commercial and otherwise, is very limited for those countries.

"Here, in the US people buy the machine to deal with the problem of selectivity. The problem is too much (TV to watch). Here it's an alternative. It's a way to control your abundance."

"We're very much in a demand cycle," Pepper said. "It'll be about one and a half to two years before the industry can catch up. To scale up to make the equipment is much easier than scaling up for the media.

"All the things that have to be done with home video are done without the consumer really having to understand or control a lot of the activity," Pepper continued. The product has been engineered in such a way that the consumer would be able to enjoy the benefits of a very sophisticated product without having to be a very sophisticated consumer.

What's the market size or penetration for this fast-growing home video market? "The market right now is somewhere between two and three percent household penetration—two to three percent of all US households have a home video machine," Pepper explained. "Current projections are that in 1985 we should have about a 15 percent penetration of US households."

"The Memorex name has a very strong quality image in the US consumer market. We've spent 10 years telling people a very consistent message, symbolized by the shattered glass. The message is very clear and very simple—quality. And it's worked extremely well for us. It's translated very directly to this product," Pepper concluded, holding up a Memorex home video tape cassette. "Our message always has been very simple and direct in trying to tell people that the primary benefit they're interested in is assured by our product." •

SHARPER.

Sharper. Clearer. Richer. Those are just a few of the words that describe the quality of Memorex's® new Premium Video Cassettes. That we can so boast about one of our consumer-directed products is the result of our excelling, for twenty years now, in the high technology arena of computer-directed products. Since 1961, Memorex has led the way in the production of advanced magnetic recording surfaces, developing along the way an impressive line of disc packs, disc cartridges, rigid discs, flexible discs and, of course, computer tapes. Little wonder then that our videotape products look so good. The pictures are sharper because we are veterans in the manufacture of smoother surfaces that deliver higher signal-to-noise ratios. The colors are richer because Memorex high density oxides provide higher chroma outputs. The tapes are more reliable because we know how to make tougher binder materials and because we know how to maintain tougher quality controls.

Sharper. Clearer. Richer. Those words describe more than just the particulars of Memorex videotapes. In a larger sense, they represent the relentless demands for change in the many marketplaces of high technology. Demands for smaller sizes, faster speeds, closer tolerances, tougher materials. Our anticipation of and responses to those demands have helped us shape the industries of information storage, retrieval and communications. In the consumer field, it helped us win a leadership position in audio tapes during the 1970s. We expect to win again with our videotapes in the 1980s.

Sharper pictures from sharper people will make it happen.

MEMOREX

For twenty years, the 20 1961-1981 *expression of excellence.*

San Tomas at Central Expressway, Santa Clara, CA 95052 (408) 987-1000

SMALLER. SMOOTHER. EASTER. FINER. THINNER. TOUGHER. SMARTER.

Those words are not mere product boasts. They describe, instead, the relentless realities of doing business in the marketplaces of high technology. Marketplaces with insatiable appetites for ever-smaller sizes, smoother surfaces, closer tolerances, faster accesses, greater capacities. Marketplaces with their own uncompromising process of natural selection.

Memorex® Corporation has been part of that environment since 1961. For 20 years, we have helped to shape the information recording, storage and retrieval industry. For 20 years, we have expanded our product lines to include everything from disc packs to disc drives, from audio and videotape products to communications terminals.

And for 20 years, in an environment where change is the constant-and an unsympathetic, ever-accelerating constant at that - Memorex Corporation has done more than simply manage to change so as to keep up. We have *managed change itself and* stayed ahead.

And since ahead is where we intend to stay, we are taking those mandates for smaller, smoother, faster, and the rest and making of them points of pride, "expressions of excellence." Certainly, the accomplishments our people have made possible these past 20 years are noteworthy. And if we are not dwelling on them, it is because excellence, like change itself, moves in only one direction.

MEMOREX

For twenty years, the 20 1961-1981 *expression of excellence.*

San Tomas at Central Expressway, Santa Clara, CA 95052 (408) 987-1000