The Gear Industry and Y2K

Charles M. Cooper

If you think Y2K will mean the end of the world, forget it. General Vladimir Dvorkin recently said, "I'd like to apologize beforehand if I fail to realize someone's hopes for the Apocalypse." The general was, of course, discussing Russian nuclear missiles, making the point that they are not going to launch or detonate when the calendar rolls over to January 1, 2000. General Dvorkin's American counterparts are similarly optimistic. While all that is a relief, it raises the question: will Y2K be as kind to the rest of society? And more specifically, will it be as kind to the gear industry? According to AGMA's president, Joe Franklin, the answer is a resounding "yes." According to Franklin, the AGMA Board considers Y2K a non-issue within an industry that is well ahead of others in its preparedness for January 1, 2000. But is it really? Does the gear industry understand the problem any better than other sectors of society? It's a relief to know that the nuclear bombs are not likely to fall within the first moments of the year 2000, but how about the computers and machines that keep the worldwide economy together?

The Y2K Problem

The Origin of Y2K. As anyone who has had his PC's memory upgraded can tell you, computer memory costs money. We pay tens of dollars per megabyte today—the lowest cost in history. Fifty years ago, when computers filled whole rooms and worked on thousands of vacuum tubes, and then later on still-clumsy solid-state technology, the cost of memory for these machines was orders of magnitude higher than it is today.

Because of that, and other costs, computer engineers had to cut corners wherever they could, and one place they did it

was in the way computers handle dates. This, of course, has created a problem.

Computers that were built to this standard didn't understand the concept of a century since they deal only with two-digit years—lower numbers for the past, higher numbers for the future. Therefore, they will not understand that with "00" they will be in a new century. When the dates roll over to 00, these machines will consider the year to be 1900. The computer designers understood this, and over the years computer experts have raised the issue from time to time, but the problem was always seen as something that would happen sometime in the future, not something to supercede current issues. It has simply never been a priority until now.

"Foreign countries trail the United States in addressing Y2K problems by at least several months, and in many cases much longer. Y2K remediation is underfunded in most countries."
– Lawrence Gershwin, National Intelligence Council

The Panic Industry. Today, if you watch TV or listen to talk radio, and take what they are offering on the subject of Y2K to heart, you might be tempted to buy a little house in the mountains and then equip it with a generator, lots of bottled water, canned goods and enough beef jerky to reshingle your roof. A whole industry has sprung up catering to the fears surrounding Y2K—the power grid will go out, financial institutions will go under and take our money with them, airplanes will fall out of the sky, ships will sink, the list goes on and on. There will be problems with Y2K, you can be assured. But, as Gen. Dvorkin implied, it will certainly not be the end of the world.

General Worldwide Preparedness. Most experts agree that Americans will greet the year 2000 without noticing much of a change. Some small businesses that do not have the funds are considered to be at risk, but the government, the financial sector, transportation, major industry—in fact, the overwhelming majority of the U.S. economy—will go on. The United States, Canada and the Netherlands are the most prepared for the coming century. Close behind are a number of industrialized nations including Great Britain, Ireland, Canada, Denmark and Israel. Other nations lag behind to a greater or lesser degree.

According to Lawrence Gershwin, the national intelligence officer for science and technology for the National Intelligence Council, in a January 20, 1999 report to the Government Management, Information and Technology Subcommittee of the House Government Reform and Oversight Committee, "Foreign countries trail the United States

in addressing Y2K problems by at least several months, and in many cases much longer. Y2K remediation is underfunded in most countries."

The problem this poses for American business is one of linkage. On a strictly local level, things should go fairly smoothly. But in broader areas such as telecommunications, financial systems, air transportation, the international manufacturing supply chain, oil supplies and trade, all of which are global, we will see Y2K problems. This means that no country in the world, no matter how well prepared it is domestically, will be immune.

The American Gear Industry and Y2K

"The Y2K issue has been discussed by the AGMA Board of Directors. The directors see it as a non-issue because all the companies in the industry are so well positioned," says Franklin.

And so far, we haven't found anyone here in the United States to disagree with him. According to John Zukowski, the engineering manager for Perry Technology Corp., "As for the whole Y2K problem, it has been blown out of proportion, especially for many smaller manufacturers. Huge companies, like Gleason, with older systems and custom, often "in-house" software will have a more significant problem tracking down the bugs than a small company that can rely more on its computer providers."

Still, even if small firms are ahead of the game in terms of remediation, the national trend in terms of Y2K preparation favors large firms with greater resources and, more importantly, awareness as to the extent of the problem. Speaking of small business at a press conference held with his Mexican and Canadian counterparts, John Koskinen, White House chief Y2K coordinator said: "Our problem thus far is not that small companies seem to lack resources. Our real problem in terms of the information we have is small companies have decided they're just going to wait, see what breaks, and then try to fix it. We would feel better if we had more small companies saying 'we need the resources' or 'we need the technical support, can you help us?'...What we have is a lot of people deciding they're going to wait and see. And we're trying to advise them that that's a very high-risk strategy—that if they wait until it breaks and then try to fix it, they may be with a large group of people in a long line waiting for these fixes, and that's a high risk."

In spite of the government analysis that spells trouble for small businesses counting on fixing the problem after the fact, the belief that larger companies will have a harder time seems to be conventional wisdom in the gear industry. Bourn & Koch Machine Tool Co.'s vice president and general manager, Tim Helle, says, "Smaller companies will have the advantage in fixing these problems. They tend to have simpler systems and more alternatives. Large companies have complex systems that will be difficult to fix in time." When asked if customers will see problems on January 1, 2000, both Helle and Zukowski believe that they will not.

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"Most customers will not notice a problem," says Helle.

Internal Problems. According to Helle: "It is likely that if a problem should arise it will be in the scheduling area. That is a key area we are concentrating on and one that all companies should look at closely."

Scheduling is not the only internal area that companies should look at. According to Bob Fowler, materials manager for Reef Gear Manufacturing, "The greatest impact on the gear industry will come from problems with business operating systems, especially in accounting and inventory control." Problems in these areas could adversely affect the company's ability to process and fulfill customer orders and should be addressed before they break down. However, simply addressing the internal problems may not be enough for a company doing business in today's global marketplace.

External Problems. Imagine that you are 100% Y2K compliant. Each and every one of your computer systems is up to date and capable of handling the change to January 1, 2000. Does this mean you are immune to the sting of the Y2K bug? It does not, not in the least.

Industry does not exist in a vacuum. There are suppliers to be considered as well as shippers and the customers themselves. These three, very broad external segments are key areas of concern when confronting the Y2K bug.

Most of the larger firms and many smaller ones have audited (or at least communicated with) those companies that supply them. This is especially true in the automotive industry. "We have surveyed our suppliers and are satisfied with their preparations," says Fowler, "especially those that also directly supply the auto industry—they are the most advanced." Checking on customers' Y2K readiness is also taking place. According to Helle, "We see that many of our customers have already been upgrading their systems. Our critical suppliers are almost 100% compliant."

On the local, and even national levels, this is all good news. The industry seems to be ready. But what about transportation, financial systems, oil supplies and trade—all factors that affect the U.S. gear industry to a greater or lesser extent? Because these sectors of the economy are globally linked, they must be taken into account when determining the true effect the Y2K bug will have on the American gear industry.

Y2K Across the Globe

As mentioned above, the rest of the world gets somewhat mixed reviews when it comes to Y2K preparation and remediation. Generally, the industrialized countries of Western Europe are more prepared than most, with Russia, Asia, the Middle East and Latin America lagging behind to greater or lesser degrees. According to the National Intelligence Council's Gershwin, the troubles these countries face can be broken down into five areas.

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2. Governments in many countries have begun to plan seriously for Y2K remediation only within the last year, some only in the last few months, and some continue to significantly underestimate the cost and time requirements for remediation and, importantly, testing. Because many countries are way behind, testing of fixes will come late, and unanticipated problems typically arise in this phase.

3. The largest institutions, particularly those in the financial sectors, are the most advanced in Y2K remediation. Small and medium sized entities trail in every sector worldwide.

4. Most countries have failed to address aggressively the issue of embedded processors. While recent understanding is that failures here will be less than previously estimated, it is nevertheless the case that failure to address this issue will still cause some highly dependent sectors with complex sensor and processing systems to have problems, centered right on the January 1 date.

5. The lowest level of Y2K preparedness is evident in Eastern Europe, Russia, Latin America, the Middle East, Africa, and several Asian countries including China.

For American industry, including gear manufacturers, that means that foreign suppliers, customers and shippers could easily have problems that their American counterparts have managed to avoid. If your suppliers or major customers are in any of the countries that are lagging significantly in Y2K preparedness, you could be in for problems. China, Japan, Poland, Russia, South Africa, Venezuela and Yugoslavia are some of the major players falling behind in their Y2K preparation, but there are a number of others (see sidebar) identified as showing significant shortcomings or being highly vulnerable to disruptions.

John Koskinen, White House chief Y2K coordinator, said: "Our problem thus far is not that small companies seem to lack resources. Our real problem in terms of the information we have is small companies have decided they're just going to wait, see what breaks, and then try to fix it."

This means that the doom-and-gloom predictions made for the United States, which are not likely to come true here, are very likely to come true in many of these other countries. Companies in these countries doing business with American firms are probably going to have major difficulties within their businesses and with the surrounding infrastructure. For example, it won't do any good for a gear shop in Shanghai to be Y2K compliant when the Shanghai electrical grid shuts down because it isn't also Y2K compliant. With no power to run its hobbers, the shop is out of business, and if it is one of your suppliers, then you have a problem.

The problems in these countries do not stop there. Areas that are already experiencing economic hardships such as Russia and the countries of the former Soviet Union, as well as those countries troubled by the Asian economic crisis, will be even harder hit by the effects of the Y2K bug. According to Gershwin: "The coincidence of widespread Y2K-related failures in the winter of 1999-2000 in Russia and the Ukraine, with continuing economic problems, food shortages, and already difficult conditions for the population, could have major humanitarian consequences for these countries." As for Asia, Gershwin states: "The Asian economic crisis has hampered the Y2K remediation efforts of all of the Asia-Pacific countries except Australia. While the lines of authority for China's Y2K effort have been established, its late start in addressing Y2K issues suggests Beijing will fail to solve many of its Y2K problems in the limited time remaining, and will probably experience failures in key sectors such as telecommunications, electric power and banking." Neither of these analyses bode well for companies that do business in these areas of the world, and they are highly indicative of problems in other countries as well.

Shipping. The question of foreign suppliers and customers may be moot, however, in the face of the problems with ocean shipping and foreign ports—a vital issue for machine tool manufacturers who sell and ship overseas. Gershwin reports that the U.S. National Intelligence Council has flagged both ocean shipping and foreign ports as being among the least prepared for the Y2K bug. Given just the number of embedded microprocessors on a modern cargo ship, not to mention the on-board computer systems and software, the remediation of a country's cargo fleet becomes a daunting task. According to Lloyds of London, the International Maritime Safety Agency notified governments all over the world about the dangers Y2K poses to maritime shipping in 1997. However, work on the embedded chip issue has only recently begun.

These embedded chips, which are the key to automation, are critical on modern ships in that they control so many shipboard operations—from the engine room to the bridge communications, navigation, control and alarm systems. In port, these chips also control various aspects of cargo handling operations, elevators, security and other vital systems. Failure of these embedded processors could leave a ship adrift or without navigation, or it could shut down the operations at a port.

In a marine guidance note entitled "Marine Electronic Systems and the Year 2000 Problem," the British Maritime and Coastguard Agency states: "There has been considerable publicity about the potential failure of computer systems, which are unable to process the changes in year date from 1999 to 2000. This publicity has often focused on systems, which are recognizable as computers (e.g. a 'PC' or mainframe). However, the prob-

Y2K Compliance, Progress and Readiness

GartnerGroup, an information technology research and publishing corporation headquartered in Stamford, CT, has defined a scale called COMPARE (COMpliance Progress And REadiness) that enterprises can use to judge their own or their partners' efforts for year 2000 compliance. The COMPARE scale features the following levels:

- **Level I: Begin.** This is the stage at which all enterprises begin preliminary activity.
- **Level II: Problem Determination.** This level indicates that a complete inventory of technology and business processes has been taken, and preliminary costs and resources have been determined.
- **Level III: Plan Complete and Resources Committed.** Achieving this level indicates that mission-critical systems have been identified and needed resources have been committed for that technology.
- **Level IV: Operational Sustainability.** At this level, mission-critical technology has been remediated from year 2000 risk.
- **Level V: Fully Compliant.** At this level, all technology within the enterprise and within business partners has been made compliant.

GartnerGroup presents COMPARE level status by industry (Figure 1) and by geographic area (Figure 2). On each status bar showing the COMPARE level status, on average, the 25 percent of the bar farthest to the right represents large enterprises, the 25 percent farthest to the left represents small enterprises, and the middle 50 percent represents midsize enterprises. Figure 3 is a Compliance vs. Risk chart detailing where various countries and economic sectors are in terms of the probability of mission-critical system failure.

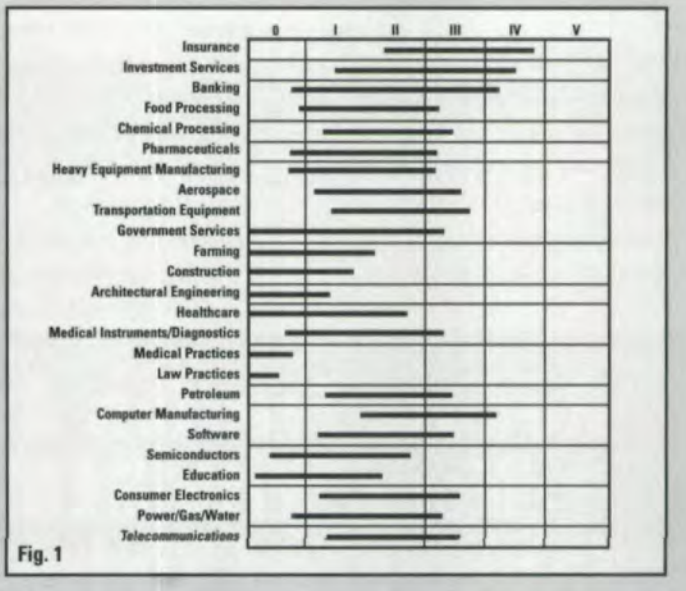

Fig. 1

Fig. 1—Status by Industry—Worldwide
In the United States, as of late 1998, large enterprises (i.e. those with more than 20,000 employees) are between 20% and 40% complete with their year 2000 compliance efforts. GartnerGroup's analysis yields a mission-critical failure probability of less than 15% (the same probability as for enterprises in "leading" industries, such as financial). Midsize enterprises (i.e. those with 2,000 to 20,000 employees) are 10% to 20% complete and have a 0.6 probability of a mission-critical failure. Small enterprises (i.e. those with fewer than 2,000 employees) are 0% to 10% done and have a 0.8 probability of a mission-critical failure.

Strategic Planning Assumption: Through the end of the first quarter of 2000, between one-third and one-half of all enterprises will experience mission-critical business process interruptions due to the year 2000 problem (0.7 probability).

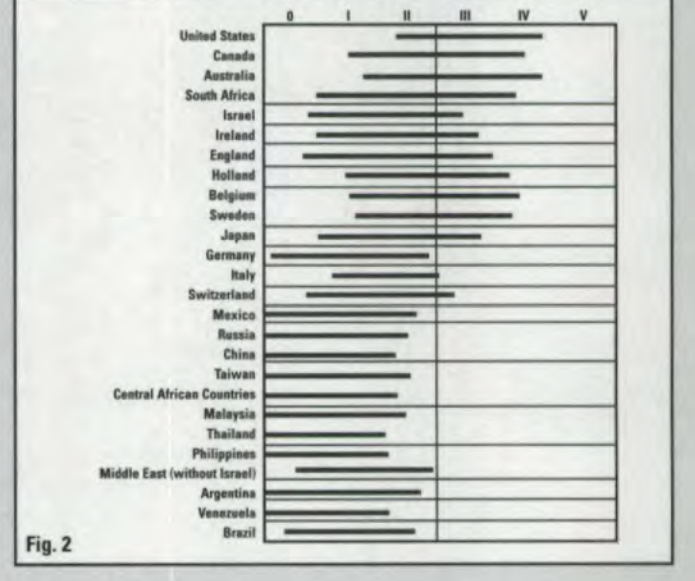

Fig. 2

Fig. 2—Status by Geographic Area—Worldwide
Australia, Belgium, Canada, the Netherlands, Sweden and the United States are leaders. Asia, Eastern Europe, India, Pakistan, Russia, Southeastern Japan, most of South America and Latin America, most of the Middle East, and Central Africa all lag behind the United States by more than 12 months.

Although regions such as the Middle East and Russia are further behind than Germany and Japan, GartnerGroup expects the disruption to be greater in Germany and Japan because of their tight supply chains and their greater dependence on IT systems.

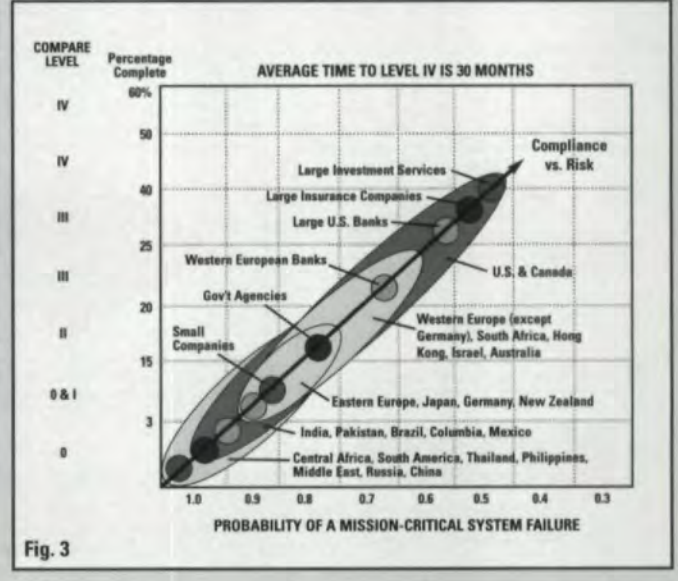

Fig. 3

Fig. 3—Year 2000 Compliance vs. Risk—Worldwide

Source: GartnerGroup, "Y2K Risk Assessment and Planning of Individuals," October 1998—Reprinted with Permission.

lem will also occur with some of the 'embedded systems,' which are used in machinery control, monitoring and automation equipment. Owners and operators (of ships) are urged to take steps to identify all systems which may prejudice standards of safety or pollution prevention by failure to process a date change, and to take corrective action in good time."

Many ship owners have followed this advice, which has been echoed by maritime agencies all over the world, by upgrading their ship's systems. The experience of Shell International Trading and Shipping Co. is an example of a shipping company (in this case oil tankers) confronting the Y2K bug.

After the original equipment manufacturers told Shell that 10% of the embedded systems would be Y2K non-compliant, an audit of their tanker fleet showed that of the dozens of embedded processors on their largest and most automated ships, 20% were non-compliant and another 10% were suspect. Shell hired an outside firm, Real-Time Engineering, to perform the test, which found problems in the navigation and communication systems, engine room, cargo monitoring and control systems, LANs, PCs, and other equipment and application systems. Shell proceeded to reprogram or replace the affected systems. Depending on the system, this meant either a cheap, straightforward reprogramming job or a complete system replacement.

However, like most industries, Y2K compliance is linked with the size of the company and the amount of preparation that company's particular country has given the Y2K issue. The example above cited a large corporation in Great Britain, one of the countries near the top of the preparedness list. Shell can be seen as a kind of ideal in this case. The company began work on the problem in the mid-1990s, dedicating the time and the resources to, as Shell UK director of corporate affairs John Mills stated, "get it right."

What Can You Do?

The answer to that question depends on where your company is along the Y2K preparedness curve. Some of you are just starting to address the issue, others have their own house in order and are now looking at their suppliers and customers, and a few are waiting to see what will break, assuming that whatever does break will be easy to fix. Wherever you fall along this line, the following advice from the Small Business Administration and a look at what Gleason Corporation is doing about the problem can help take much of the sting out of the Y2K bug.

Gleason's Efforts. Like other major corporations, gear industry giant Gleason Corporation has developed a plan of action to deal with the Y2K bug. According to its plan, which can be found on Gleason Corporation's Web site (*www.gleasoncorp.com*), The project

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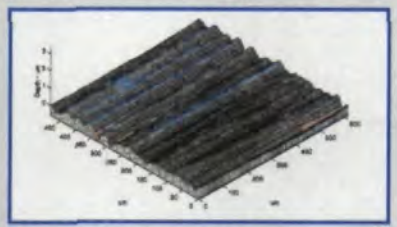
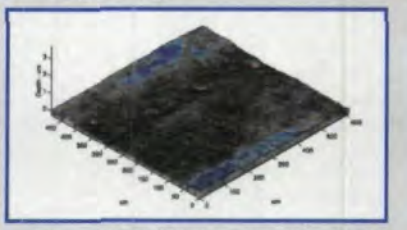


Mechanical grinding and polishing operations create linear, parallel rows of surface peaks and valleys which are difficult, time-consuming and expensive to eliminate.



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includes the following phases: inventory identification, impact analysis, risk evaluation, remediation, acceptance testing and implementation. Risk assessments are being performed to identify the systems that are most likely to be affected by the year 2000 in order to prioritize and schedule the readiness of such systems. Gleason believes that it has budgeted sufficient resources to address the year 2000 issues associated with such systems. Year 2000 readiness for such systems will be addressed in one of three ways: elimination, replacement, or conversion. In addition, the company is contacting its major suppliers in order to determine the year 2000 readiness of these entities.

Get your house in order. If you have not prepared for Y2K yet, now is the time to start. The U.S. Small Business Administration has developed a simple five-step plan for Y2K preparedness that is similar in many ways to the plan developed by Gleason.

Awareness. Educate and involve all levels of your organization in solving the problem. Create a communication strategy to make sure that everyone is informed and that management has the data it needs to make proper decisions. This can include seminars or meetings, even outside speakers to educate employees. It is also important to develop a standard for readiness. The United States Federal Reserve uses the following definition: "Systems are defined as ready if they can demonstrate correct management and manipulation of data involving dates, including single century and multi-century formulas, without causing an abnormally ended scenario within the system or generating incorrect values involving such dates."

Remember, the awareness phase never ends. As people move to other jobs, and new people are hired, they must be educated. Also, there is an ongoing need to keep your staff and business partners informed.

Inventory. Create a checklist identifying all the different computer-based systems, components, service providers and hardware containing microchips that support your business.

Each entry on this list should be ranked by how critical it is to your business. For each entry, indicate what kind of component it is, the area it supports (e.g. telecommunications), the name of the vendor and the release number. Also, some systems will fail before the January 1 date. This is due to the system performing forecasting or future processing and it is called "time horizon to failure." The "time horizon to failure" should be listed in the inventory.

Assessment. Examine how severe and widespread the problem is in your business and determine what needs to be fixed. Beginning with your most critical systems and those on the verge of "time horizon to failure," determine which ones are date sensitive. Date sensitive systems are defined as systems that manipulate or work with dates in some way, or a system that operates differently based on the date.

Test these systems to gage their Y2K compatibility. This testing can be done by

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following the logic of the program's code or by running the system as if it were already January 1, 2000. The former method may be unavailable if the system was purchased from an outside vendor. If that is the case, have the vendor perform the tests. As for changing the date to January 1, 2000, there are risks that need to be taken into account before this kind of test is performed. If possible, your staff should work with the vendor to perform these tests, especially if the system involves building or manufacturing control, or has embedded processors. Once the tests have been made and the systems in need of remediation identified, you have three options: repair, replace or retire.

Repair. There are two possible repair strategies: windowing or date expansion. Windowing involves programming that interprets year fields to determine what century the year falls into before the date field is used in comparisons, calculations or sorting. Date expansion, as the name implies, involves expanding all 2-digit year fields in your system's data files and in the programs that process those files so they can hold the century as well as the 2-digit year. Businesses often use a combination of the two methods to meet their specific needs.

"The survival of key suppliers and customers throughout and beyond the year 2000 is of critical importance."
John Mills, Shell UK

Replace. Here, you have several choices. You may rebuild the system in-house, purchase a replacement system from a vendor, or you can outsource that particular area to a service bureau or some other outside service provider. Timing is important with a replacement strategy because if the replacement can't be installed prior to the "time horizon to failure," then you could be forced into a repair strategy.

Retire. This is an opportunity to look at your systems and decide which need to be upgraded for more than just Y2K and which need to be eliminated. This was recently done at Perry Technology when they needed a general upgrade for their computer systems. "Perry has just installed a new system some 18 months ago—new software, workstations, server, that is all Y2K compliant," said Zukowski. "We only have a couple of stand alone machines in non-critical areas that will have to be upgraded, but all the essential accounting, inventory and business operations systems are already compliant."

Bridges. Regardless of which strategy you adopt, during this phase pay special attention to the interfaces that exist between your systems. If possible, develop a chart that shows the systems that have such interfaces, what they are and when they occur. Since different systems will have different schedules for assessment, correction and implementation, it may be necessary to write (or have written) programs that "bridge" the Y2K gap between compliant systems and those in need to upgrade. These bridges take data and modify it so that it works correctly with the system being interfaced. This requires careful and detailed planning to properly execute.

Correction and Testing. Implement the readiness strategy you have chosen and test the fix. Testing is one of the most critical phases in the process of Y2K readiness. It verifies whether the repaired or replaced system operates properly and that existing business functions such as accounting or inventory control continue to operate as expected. It also verifies that interfacing systems operate correctly together. Remember, this is not confined to computer software. All computer-related systems need to undergo this process.

The best way to perform the test is to take the system off-line (if possible) on a Y2K compliant platform and see if the system operates correctly when you change the date to January 1, 2000. You should also check to see if the system recognizes that 2000 is a leap year and that the date goes from 2/28/2000 to 2/29/2000 and then to 3/1/2000. If it does not, now is the time to fix it. If your system does end-of-week, end-of-month, end-of-quarter or end-of-year processing, you will want to test these functions as well. You should also test whether the system will forecast and retrieve historical data properly.

Implementation. Move your repaired or replaced system into your production environment. If possible, run the new system next to the old one for a short period of time. Develop an installation plan for your upgraded system that includes all programs and files that need to be moved into production as well as a contingency plan should problems arise. Make backups of the production files from the old systems and run this data on the new system in tandem with the old in order to compare results.

The Small Business Administration has a great deal of useful information regarding Y2K available on its Web site at *www.sba.gov*. It is also going beyond providing information in order to assist small businesses to handle the problem. According to Debra Silimeo, Associate Administrator for SBA's Office of Communications and Public Liaison, "We are about to launch a new Y2K Action Loan program to assist small businesses that need money to make Y2K-related repairs."

Other Things to Think About

Testing the interfaces between your various systems is important, but it is not enough. How does your company interface with its customers, suppliers and shippers? Assess the Y2K compliance of each company you do business with, and if they are not compliant, try to help them along in order to avoid supply chain and

fulfillment difficulties caused by problems you have no control over. If you have the time and the resources, try to make sure that the companies your suppliers and shippers depend on are also Y2K compliant since if they are depending on these companies, so are you. If you have international dealings, look at the countries where you do business and make contingency plans for any sort of disruptions that may take place in those countries. According to John Mills, Shell UK's approach to this question is that "the survival of key suppliers and customers throughout and beyond the year 2000 is of critical importance. Again, initiatives are already in place to encourage companies to tackle this problem seriously. Suppliers are being assessed on their criticality to our business and on the availability of alternative sources of supply. All key suppliers are being asked to provide us with a statement of their approach to year 2000 compliance."

Ultimately, no one really knows the extent of the problems that Y2K will cause. We can look at the preparations various companies and countries are making and guess at the levels of severity each will experience. We can also take heart in the fact that the United States is the leader in terms of Y2K preparedness and so will probably experience the least difficulties. But, in the end, all we can do is prepare ourselves and our companies as best we can and wait. Will AGMA's confidence be justified? We'll find out on January 1st, 2000. ✪

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