

CD-R on demand: the long and short of a new business model 2

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You walk over to the photocopy machine, feed in your document, and watch it spit out 20 clean, professional-looking copies. It's something you take for granted. You forget that in the past, people either to settle for a smudged carbon copy or take their documents to a print shop, where only orders of 1,000 or more were accepted.

The photocopier became a huge commercial success because it filled a huge void--specifically, the void between needing a couple of copies and a couple thousand. For a long time, the same sort of void existed in CD-ROM publishing. You either burned CD-R discs one at a time, or you paid big bucks to a replicator who, like offset printers, only accepted orders of 1,000 or more. Fortunately, today, that tremendous gap is being filled by CD-R duplication systems from Rimage, MircoTech, Champion, Cedar Technologies, MediaFORM, Microboards, Cygnet, Costas Systems, Cutting Edge, and others. [See Hugh Bennett's "The New CD Duplication System Scene: Something for Everybody," November 1997.]

While the comparison of CD-R duplication systems and photocopiers is a useful one, these systems actually go beyond simple copying. Perhaps a stronger parallel exists between CD-R duplication systems and the new copier/printer/ scanner technology represented by Xerox's DocuTech line. Regardless, when tied to PCs running sophisticated software, these machines offer complete publishing systems, providing automatic two-sided page printing, collating, scanning, extensive color image manipulation capabilities, and even stitching and thermal binding. For many purposes, duplication-based production systems bridge the gap between one and 1,000 so well they virtually eliminate the need for offset printing.

Similarly, many high-end CD-R duplication systems use robotics to automate the whole CD duplicating process, including label printing. Best of all, their automation features--when tied to multitasking computers--make possible something that was never before economically feasible--short-run custom publishing.

CD-R PRODUCTION FINDS ITS NICHE

In the chasm between one CD-R copy and 1,000 lie the needs of untold numbers of companies worldwide. And now that prices for production-ready CD-R duplication systems have fallen below \$10,000 (considered the magical price point by many), sales have been brisk. "Everyone is surprised by the level of demand," says Dale Brown, Vice President of Marketing for Livermore, California-based Champion Duplicators, Inc., and Jonathan Bradlee, President of Exton, Pennsylvania's MediaFORM, Inc., marvels that "just a year ago, only one or two hundred CD-R copiers and printers were being sold monthly."

"Today," he continues, "that figure has risen to four or five times that, and will go even higher in the next year."

So who is buying CD-R duplication systems, and why? Advertising agencies and graphic arts professionals are sending large graphics files to clients on CD-R, as are marketing and sales professionals. Companies and government agencies with branch offices use CD-R to distribute all kinds of documents, including Powerpoint presentations, Acrobat and HTML files, product catalogs, and annual reports. Public relations departments and agencies send product release and merger/acquisition announcements to the press on CD-R. Accounting firms send out quarterly payroll and tax reports on CD-R. And computer software publishers like Electronic Arts use CD-R to shorten the cycle for beta releases or to distribute CBT courses.

Other types of businesses are finding their way to CD-R, too. Fledgling bands hoping to be discovered are duping CDs for radio stations. And record companies are taking more chances on offbeat or avant-garde bands because they no longer need to invest in a large replication run; they can simply dupe a few CD-R discs and see how they are received by critics and consumers alike. Even the U.S. Postal Service is involved, having turned to CD-R to streamline its massive, \$1.5 billion campaign to manage 130,000 change-of-address cards each year.

Champion's Dale Brown believes people are turning to CD-R in unprecedented numbers because of the floppy diskette's impending obsolescence. "The size of data is growing by leaps and bounds. It started with Windows 95, and now almost nothing fits on 1.44MB diskette. That's why you see so many Zip drives being sold. CD-R makes big files portable. And you can't beat the CD's cost per megabyte."

Stan Phillips, president of Soquel, California-based Media Integration, Inc., agrees. "The key to the success of CD-R duplication is that CD-ROM is a standard," he says. In his job as a mass storage systems integrator, Phillips sees a lot of software developers using CD-R as they "cross over" from the Mac to Windows NT. "CD-ROM has become the transport media to bridge operating systems," says Phillips.

THE ON-DEMAND ADVANTAGE: WHEN CUSTOMIZATION COUNTS

All of these changes have given rise in recent years to a whole new industry known as "on-demand" publishing. Whatever a consumer wants or needs is ripe for the picking with on-demand publishing systems. And the technology that is making it possible is the CD-R duplication system.

The most visible example of on-demand CD-R publishing is the "make-your-own, favorite-hits" song compilation disc. Currently offered by companies like Custom Revolutions and superSonic BOOM, these custom-made discs give consumers their favorite songs burned on a personalized CD-R disc.

But music on-demand is just the tip of the iceberg. In fact, on-demand CD-R publishing is worming its way into just about every vertical market in American business.

With on-demand publishing, every type of product is potentially

unique. More importantly, it's both time- and cost-saving. Consider this: If a user had to burn each disc individually, on-demand CD-R publishing would consume tremendous amounts of time and money. But computer-controlled CD-R duplication systems maximize the multitasking/multithreading operating system's ability to handle more than one job simultaneously. Job orders can be queued up to run automatically--just as your computer sends bulk faxes or email at night while you're sleeping. And some systems even operate in a "lights out" environment, where robotics replace high-priced human labor. In these settings, discs are barely touched by human hands, requiring attendants only during initial loading into the duplicator and, later, during removal for manual insertion into jewel cases.

SHORT-RUN CUSTOM: ECONOMIES OF SCALE, HEART OF THE SALE

Though on-demand applications represent one extreme of the CD-R publishing spectrum and ordinary bulk duplication lies at the other end, the real action happens somewhere in between. Many companies, for example, will run 50 copies from a master, change that master slightly to tailor the material to a different audience, and then run another 50 copies. Although many people refer to this as on-demand publishing, it is probably more accurately termed "short-run custom publishing."

The software industry is just one of many markets embracing custom CD-R publishing, having used it for internal data distribution, beta testing, and even short-run end-user fulfillment. Oracle, in fact, is just one of many companies using CD-R duplication to keep its endusers happy by supplying software solutions on CD, on demand. For instance, if a user has a problem with Oracle software and calls technical support, he or she may get the solution sent out on a custom-made CD-R disc.

"CD-R has changed the way we do business," says Oracle's Michael Hodos. As Director of Information Systems Operations for Oracle Support Services, Hodos' business is "supporting technical support." Specifically, Hodos manages Oracle's "TapeCut Services" division, so named because in the old days, the group "cut" emergency software patches on tape. Today, more and more emergency software patches (usually bug fixes) are being cut on CD-R--at the request of customers--using a duplication system purchased from Belmont, California-based MicroTech Conversion Systems, Inc.

With Oracle software running on 85,000 licensed CPUs in the U.S. alone, keeping up with end-user needs is a big job. Hodos' TapeCut group sends out 1,000 to 2,000 patches per month, a growing number on CD-R. Not all of those discs go to an individual customer to solve an individual problem, however. In many cases, one particular bug will plague a number of users at the same time, so TapeCut Services puts a set of patches (including the one needed to fix that particular bug) on a master and copies it maybe 50 times. This, in turn, gives them a stock from which to draw as phone calls come in requesting help with that particular bug.

By grouping together patches in "patch sets," TapeCut Services tries to minimize the number of individual discs they have to burn. For example, they will put bug fixes "A," "B," "C," and "D" on a single master disc and duplicate a certain number. Then, users calling in with problem "B" can be sent the same disc as users experiencing problems "A," "C," or "D." And because Oracle software runs under more than 90 different operating systems, the patch sets are often grouped according to operating system. The company has also begun making patch sets

available on a regular basis in an effort to head off possible end-user problems--an initiative Hodos calls "proactive customer support."

Hodos credits the growing complexity of software--and the resulting growth in file size--as the impetus for distribution on higher-capacity media. "When problem fixes started requiring 20 or 30 diskettes, we became interested in CDs." Thanks to CD-R's universal compatibility with CD-ROM drives and the dollar-a-disc cheapness of CD-R media, Hodos says it's worth it to use CD-R, even if the fix doesn't require CD's entire 650MB capacity. He also notes that Oracle needs these duplication systems to keep up with volume. "Burning on single CD-R players would be too slow to keep up with the demand. We would ultimately have to triple our staff," he says.

CD-R DUPLICATION: AN EQUAL OPPORTUNITY STORAGE ALTERNATIVE

For large, mainstream software companies like Microsoft, nothing less than replication makes sense. For wall software companies with an up-and-coming product that fits a small niche, though, CD-R duplication is a useful product fulfillment alternative.

Though Dataware is not a small company, it sells very specialized, high-end tools that address specific niches. As a result, the company relies on CD-R duplication for on-demand publishing of most of its products. Quantities of product are duplicated as they are needed, based on orders submitted from the sales force.

Dataware also uses CD-R for sending out evaluations to beta testers and journalists and, like Oracle, for patch releases. "We're in a dynamic business where source code can change on a weekly basis," says David Schubmehl, Director of Information Access Products for Dataware. To manage these constant changes, Dataware uses a Rimage Perfect Image Producer capable of running four separate dupe jobs simultaneously. Schubmehl says he likes the way the system automatically labels the discs, since having the shipping date and version number printed right on the disc helps with tracking. And the printer provides good graphic quality, too. Says Schubmehl, "It's not four-color, but it's a nice compromise." Though Dataware occasionally sends product to replication and CD-R duplication service bureaus, Schubmehl prefers to keep things in-house. "It's more cost-effective to do our own. We have more control and can respond to customer needs faster."

Another company finding its way through the complexities of "on-demand" CD-R publishing is Pitney Bowes. While not typically identified as a member of the software industry, many of its shipping systems, including Ascent--are indeed PC-based. According to Dave Greenwood, Staff Engineer for Pitney Bowes' Software Systems Fulfillment division, this software is often just too big to fit on floppies. Therefore, it is frequently sent to customers on CD-R discs.

Because Pitney Bowes often assembles systems on a "build-to-order" basis--through which customers can pick and choose which features they want--the CD-R discs are typically burned on a build-to-order basis as well. For example, if a customer orders a mailing system with features "A," "B," and "C," he gets a CD with software "A," "B," and "C" on it. At Pitney Bowes, even this fulfillment process is computerized. A customer sits down with a salesperson who fills out an electronic form that stipulates the desired features, creating what Greenwood calls a "feed file." The feed file goes to an order configuration system, then to the Rimage duplication system, where the disc is automatically built and labeled.

Greenwood is particularly impressed by the integration of the label printer into Rimage's Image Producer system. In non-integrated systems, the user must move the discs manually from recorder to printer, which increases the chance of mixing them up. But with the Rimage system, "There's no chance of error, because there's no manual handling of non-printed CDs." In fact, Greenwood is so content with the CD duplication system that he resists thinking about the alternative. Given the large size of the files he works with, "Doing this with diskettes would be a nightmare," he says.

MUSIC TO SOOTHE THE SAVAGE, TRAVELING BEAST: CD-R TAKES TO THE SKIES

Even in the air, CD-R is making its mark. The headphones available on most major airlines offer a variety of musical choices to those inclined to listen. Most passengers, in fact, do listen, and think they're switching between several radio stations when they change channels. In reality, though, they are choosing from a given number of sub-Red. Book-quality audio tracks streaming from a CD-R disc. Companies like AEI Music Network, Inc. and PACE Communications, which supply these discs to the airlines, only duplicate enough copies to handle as many airplanes as they service, but they do this on a regular schedule to vary their music selections and keep up-to-date with modern favorites.

Travelers to Europe, once they're on the ground, may be familiar with a popular European radio program called "U.K. Hot 30." Similar to Casey Kasem's long-running show, the "U.K. Hot 30" counts down the week's top pop music hits. Although the show is distributed on CD-R by a London company using duplication equipment from MediaFORM, it's actually produced in New York by Sony's SW Networks, a division of Sony Music Entertainment.

SW Networks' audio engineers assemble the show using digital audio editing equipment to intercut the music with the announcer's narration. Every week, six different versions of the show are sent to eight different countries across Europe, Africa, and Asia. The different versions are necessitated not by the need to change languages--all the narration remains in English--but by the need to change commercial content. In the old days, the show was distributed on duplicated reel-to-reel tapes, which proved so arduous that only two different versions could be done. "With digital technology, though, we can do things we couldn't do before. It opens up a whole new world," says Dino Tortu, Director of Production Services.

Even the notoriously slow-paced U.S. government is cashing in on the benefits of CD-R duplication systems. For example, the U.S. Department of Housing and Urban Development (HUD) is doing on-demand short-run publishing on CD-R. Go to any of the agency's 80 field offices throughout the country and you can order the Communities 2020 disc, which contains GIS mapping information, census statistics, and other data meant to benefit community planners. "Mapping information files are large and tend to tie up networks. Therefore, it makes a lot more sense to put information like this on CD," says HUD Project Leader Joe Duffy. There are actually four different versions of the disc, covering states in the country's four major regions: Northeast, Southeast, Northwest, and Southwest. Though Communities 2020 isn't exactly a mass market title, HUD duplicates about 50 discs at a time in anticipation of future demand.

WHERE ARE MY SHADES? CUSTOM CD-R PUBLISHING'S BRIGHT FUTURE

It seems virtually everyone is turning to custom CD-R publishing. "Recording studios are making copies of a new piece of music, insurance companies are making copies of their new rates for all their reps, even banks are making update copies of data/interest rates for all their branches," observes MediaFORM's Jonathan Bradlee. "Historically, these processes involved transferring data from paper to diskette or cassette. Today, all types of businesses are using CD-R media for these applications, and I believe even more will convert as the price of CD-Rs drops below one dollar." And with distributors selling systems to government agencies, and into the corporate marketplace and entertainment industries, "the vertical markets," Bradlee says, "are endless."

RELATED ARTICLE: Rimage Corporation

The People's Republic of (Satisfied) On-Demand Publishers

Like Cambridge, Massachusetts-based Dataware--which duplicates large quantities of its products on CD-R as they are needed--and countless other companies, Chase Manhattan Bank is currently engaged in high volume, on-demand CD-R publishing. For relief from the mountains of paper generated each month when cancelled checks and statements are sent to its customers, Chase Manhattan began scanning its paper documents as TIFF images for storage on CD-ROM, the most cost-effective storage medium for large numbers of images. Today, the bank sends out between 3,000 and 5,000 CD-R discs per month to individual corporate clients, according to Sand Leong, Vice President of Chase Manhattan.

Of course, Chase Manhattan's experience with CD-R duplication differs from traditional mass replication projects because each individual disc is unique. To coordinate its efforts, Chase Manhattan purchased six Perfect Image Producer system from Minneapolis, Minnesota-based Rimage Corporation and configured them at branch sites in Wilmington, Delaware, Arlington, Texas, and Syracuse, New York. Leong is particularly pleased with the Rimage system's reliability and scalability. In the past, he says, he had to piece together equipment from different manufacturers, which wasn't as convenient or as efficient as the "fully integrated" Rimage solution. "I like the accuracy of the one-pass process, which helps reduce the error rate," he notes. Plus, Leong continues, the system "allows us to increase output volume without having to increase human resources."

Some of the independent telephone providers are solving similar problems with on-demand CD-R publishing. Pacific Bell, for example, must send itemized phone bills known as "call detail reports" to its 10 million customers every month. While bills to private residences might consist of a few pages, bills sent out to big corporations can consume thousands of pages. For instance, the company has one corporate customer that makes 900,000 phone calls a month and another that makes 1.2 million. Using a Rimage system, Pacific Bell now sends out individual call detail reports to its largest 1,200 customers on CD-R discs. Though some bills are still sent out on floppy disks--which hold about 600 pages each--the company has discovered that it can fit 230,000 pages on a single CD-R disc.

Another service company dealing with unique customer data is ProBusiness, Inc., of Pleasanton, California. ProBusiness outsources payroll processing for large corporations and has begun offering payroll data on CD-R. Each disc contains 19 different kinds of reports, including Deduction Register, Payroll Register, Garnishment, Check

Distribution, and Job Cost reports. "We hope to eliminate some paper ad save some trees," says ProBusiness' Jerry Zickirck, director of network services. Zickirck sees CD-ROM as "another enabling technology" that will benefit his company's clients by allowing users to store and instantly search mission-critical data in a fraction of the space needed for paper documents.

ProBusiness' business, it seems, is indeed "true one-to-one publishing." "ROMs go out to whoever requests them," Zickirck says, and each disc is unique. For instance, ProBusiness' clients can custom-order discs with any payroll cycle they choose, or request "consolidation discs" which combine data from, say, a year's worth of payroll reports. And the product they use to do all of this? A Rimage Perfect Image Producers, of course.

RELATED ARTICLE: And in the Center Ring... the Service Bureau

Duplicating CDs with the Greatest of Ease

You'll hear few complaints from today's CD-R duplication service bureaus. The market has matured, and business is booming, says Michael Hyatt of Sunnyvale, California's Coptech West. "People have gotten more comfortable with CD-R, reached a certain comfort zone. There's now a greater willingness to accept CD-R as an alternative to replicated discs. And people have lost the fear-of-handling factor; they realize these things are just as durable as stamped discs." Thanks to packet writing and easy software, says Hyatt, "CD-R has become a consumer product."

At the same time, CD-R duplication systems remain the proverbial doubled-edged sword. On one hand, service bureaus are buying them and taking advantage of them to streamline their operations. On the other hand, the public's increased comfort level with CD-R translates into more companies buying their own duplication systems for in-house use, thus cutting out the middleman--the service bureau.

Systems manufacturers report that roughly 80 percent of their sales are going to individual companies, while only 20 percent are going to service bureaus. (One must remember, however, that these figures are to be expected, since there are so many more individual companies than service bureaus.) Nonetheless, buyers in both camps get the same advantages. The systems integrate functions that were formerly done as separate steps, and those with built-in label printers minimize mix-ups and simplify Quality Assurance procedures. What's more, the fully automated systems run unattended.

Despite the trend towards in-house duplication, most service bureau owners and operators remain blithely unconcerned. They insist that the factors that made people come to them in the past have remained constant.

Bill Fields, President of Richardson, Texas-based Media Duplication Services, says there's so much demand for CD-R duplicating that his company doesn't even have a full-time sales person--and doesn't need one. "People come to us," he says, noting that business has remained steady despite the growth in in-house systems purchases.

Hyatt voices similar optimism. Crediting CD-ROM's position as the

world's reigning champion in the transportation of data, he states that the only trend that would worry him would be "if everyone woke up tomorrow with a TI line."

PACKING THE HOUSE: WHAT BRINGS THE CUSTOMERS IN?

The public's continued reliance on service bureaus begs the obvious question: Why do people use them? "The initial monetary outlay required to buy a duplication system is the most obvious reason," says Sam Hondros, owner-operator of Haverhill, Massachusetts-based DiskCopy. Though pricing for these systems continues to fall, they're still not cheap, and many companies simply cannot justify the investment in such specialized hardware. Some systems retail for \$10,000 or less, but the really impressive, multidrive, super-automated systems still list in the \$25,000 to \$35,000 range. "Companies that don't plan to use these systems every day may be better off going to a service bureau," he notes.

There are other considerations, too. Space, says Hondros, is a big constraint, as is the unwillingness of many companies to invest in extra staff to operate the equipment. Frank Veloz, president of Coptech West, says that some companies often mistakenly buy equipment without first thinking about their staffing situation. "You don't want to tie up an expensive programmer or graphic artist on a mundane task like burning CD-Rs," Veloz says. "That could cost you more money in the long run than using a service bureau."

And then there's the knowledge factor. Although the software that runs these systems is getting easier to use, CD-R duplication still requires a level of expertise not held by the average user, according to Walt Friedrich, Vice President of Hatfield, Pennsylvania's Star-Byte, Inc. "To solve problems quickly," he notes, "you need expertise. That's what you go to a service bureau for." In fact, Friedrich says that many of his clients openly admit they don't have the expertise, and don't want it. "Lots of time, an insurance company, for example, will say, 'Manufacturing CDs is not our business. Our business is insurance.'"

Also important to some service bureau converts is convenience. Specifically, a service bureau can handle the entire publishing process, from mastering to sleeve stuffing to fulfillment mailing. "We offer a whole turnkey package," says Media Duplication Services' Bill Fields. "It's one-stop shopping." Plus, service bureaus offer enhancement like silkscreen label printing, for situations in which the graphic look of the disc is a concern.

Veloz points out that time, more than anything, may influence a company's decision to use a service bureau. "The focus of our business has always been 24-hour turnaround," he says. "If you only need a couple of copies every so often, buy your own equipment. If you need 1,000 copies and can wait ten days or more, use a replicator. But if you need between 50 and 1,000 copies in three days, your only real choice is a duplication service bureau."

RELATED ARTICLE: Something Special in the Air

Among the frequent flyers who benefit from on-demand CD-R publishing is Vice President Al Gore. Like the thousands of commercial airline passengers who listen to music on headsets as they fly, Gore has access

to an in-flight audio entertainment system aboard Air Force Two. (President Clinton also has access to audio aboard Air Force One, but this music is supplied via old-fashioned tape.) The music and audio entertainment aboard Air Force Two, as well as aboard United Airlines' entire fleet, is supplied by Hollywood, California-based Crest National Digital Media Complex, in association with partners Disc Marketing and PACE Communications.

In-flight audio systems, which have become very popular in recent years, provide what appears to the listener to be live radio shows. However, they are actually "canned" programs stored on CD-R discs. Crest National is responsible for burning music selections and audio programs onto CD-R and duplicating and distributing the resulting CD-R discs to the airlines.

The number of different radio shows (or channels) available to passengers depends on the number of Audio Reproducer Units (ARUs) installed in the airplane. According to Bob Freedman, Crest National's Vice President and General Manager of Disc Manufacturing, "ARUs look like black boxes and are built into the airplane's avionics bay." Specifically, they are robust multiplatter CD players made primarily by Sony And Matsushita and employ a Sony-devised format called CD-Inflight. This format, says Freedman, is "a variant of CD-i," which uses ADPCM Level B compression. Compression allows a single disc to hold up to 120 minutes of four-channel music.

Each ARU—which holds four CDs, consisting of four mono channels or two stereo pairs apiece—is capable of providing 16 separate mono audio channels. Though talk shows are delivered in mono, most music programs pair together channels to provide stereo sound. United Airline's Boeing 757s have one ARU, while the more advanced Boeing 777s have two ARUs installed avionics bays, making them capable of delivering 32 separate mono audio channels.

Every two months, audio entertainment programmers update the audio content of the shows, requiring Crest National to initiate another duplication run of 1,700 CD-R discs. Freedman says music varies according to the airplane's destination. A plane on its way to Japan, for example, would feature slightly different music from a plane bound for Hawaii. Customization like this means that Crest National has to duplicate CD-R discs, using equipment from MediaFORM, in many short runs. Freedman says that CD-R runs for this job can range from three to 260 units with typical order sizes of 14, 44, or 63 pieces. The shortest run is the one for Vice President Gore.

So does the company really tailor its music selection just for one person, particularly when that person is the Vice President? "We'll tailor it a little bit, but not much," says Freedman. "The jazz show on Air Force One once featured Saxophone Greats, but that's about the extend of our customization efforts," says Freedman.

RELATED ARTICLE: Equipping Your On-Demand Enterprise

A Guide to CD-R Duplication Systems

While the systems and economics have changed dramatically, short-run CD production is really nothing new. Going back even eight years, Yamaha and Sony understood the need for multiple disc creation and

offered recorders that could be chained together in backs to produce small quantities of the same disc as needed.

Chaining capability, however, fell away as recorders were groomed to chase the mass market, even though the demand remained. Thus the opportunity for reproduction products fell to third parties and integrators. Several solutions emerged in 1993, including the first standalone duplicator from Alea Systems and multi-drive towers from JVC. The biggest step forward was seen in 1996 when the majority of manufacturers of traditional floppy diskette duplication equipment reoriented their businesses toward CD-R and that trend continues today.

RECORDING TOWERS

Found in both standalone and host-based arrangements, by far the most common configuration of current CD duplication systems is the multi-recorder tower. As a chain of like recorders writing the same disc image in parallel, towers distinguish themselves mostly in terms of bang-for-the-buck and the greatest raw throughput.

Typical, host-based systems consists of hardware and software components that install and connect to an existing computer or to one provided as part of a system package. In addition to simple recording, these systems typically offer premastering, logging, and verification features and network functions. Configurations are varied and range from home-brewed chains of multiple recorders controlled by off-the-shelf programs like Prassi's CD Rep and Padus' DiscJuggler to integrated solutions such as Plextor's five-recorder RePleX, Ultera Systems' Multi-Master, or JVC's scalable Personal RomMaker Multi-Drive.

As totally self-contained entities, standalone towers only perform duplication functions, but enjoy a number of benefits including not trying up a computer, physical compactness, and extreme ease-of-use. The dizzying numbers of available systems speaks to their popularity. Standalone towers vary significantly in size, shape, and capability. Between units that use common controllers, such as those by JIS or R-Quest, features are very similar or identical as opposed to those using proprietary controllers, such as Hoei Sangyo. When it comes to the number of writes installed, mid-range units such as Alea's CD-Forge II typically offer for recorders or up to the seven recorders found in systems like JIS' fully configured Encore! Some standalone tower systems can also be chained together to simultaneously record from the same master disc or image. For example, for MediaFORM seven-recorder CD-4600 duplicators can be connected parallel writing and clusters of Hoei Sangyo DSR8000 duplicators can be slaved to a maximum of 160 recorders for massive throughput of 480 full discs per hour.

AUTOLOADING SOLUTIONS

One area of production technology that has evolved rapidly is the world of automated disc loaders. Really coming to life only a few short years ago, this key component for unattended disc production has matured from repurposed 3.5" floppy diskette duplicators to elegant second and third-generation disc-handling systems. Available in both standalone and host-based configurations, caddy-loaders are largely a thing of the past, with attention now focused upon pick-and-place robots, turntables, and shuttles that offer greater reliability as well as improve ease-of-use for the operator.

Disc capacity has also improved, permitting longer uninterrupted production runs. Fifty-disc systems like MediaFORM's CD-2701 and CopyPro's CD-R3500 are now common, while larger units like the 75-disc Eastman Kodak Disc Transporter, Trace's 300-disc PowerWriter Pro/SL +, and CopyPro's 450-disc CD-R5000 behemoth are also available.

In addition to providing a larger disc capacity, integration of multiple recorders is used for increasing system throughput. Several two-recorder systems currently populate the duplication landscape, such as in Traxdata's TraxCopier (based on Champion's [Stellar.sup.2]) and Trace Digital's PowerWriter SL/PC. Costas Systems' superscalable CD-R Row can accommodate nine or more writers.

The other growing trend in autoloading systems is the inclusion of inline disc label printing as in, for example, Flore Storage's Para*Disc 8000 which incorporates thermal transfer printing via Rimage's Perfect Image printer; and Cedar's Desktop Publisher, which offers the integrated inkjet capability of Fargo's Signature CD Color Printer.

TURNKEY PRODUCTION SYSTEMS

Although there are a number of pretenders, in the world of centralized network disc creation, large-scale unattended duplication, and high-volume custom disc publishing only a few systems credibly compete. Micro Tech Conversion System's ImageMaker MJ and ImageAutomator [See Hugh Bennett's review, May 1998--Ed.] and Rimage Corporation's Perfect Image Producer fall into this category.

With capabilities far exceeding simple disc autoloading and printing elite systems are defined by scalability, multiple simultaneous job capability, project scheduling, premastering, statistical and logging functions, and software tools and scripting languages that permit a high level of system customization. Even in the area of printing, a system like the Perfect Image Producer goes the extra mile by correctly aligning the printed label with silkscreened images already present on the disc.

RELATED ARTICLE: Audio CD-On-Demand Case Study

A new company in Northern Virginia, superSonic BOOM, gives fans two good reasons to put their headphones on. With an innovative blend of technology and marketing, superSonic BOOM lets consumers surf its Web site and create custom audio CDs entirely composed of tracks of their own choosing.

In June 1996, superSonic BOOM first launched its Web site and began the pilot phase of the business. The tracks licensed for sale via the site came from local bands based in the Washington, DC area. During July and August 1997, the company signed the label TKO and added 30,000 titles to its growing catalog. Subsequently, they have signed two dozen other independent labels for a total of about 50,000 titles available so far.

superSonic BOOM lets customers build their track lists online, and then records the discs offline using a semi-automated production system based on CD-R duplication technology. The exact configuration

superSonic BOOM uses, which combines CD-R technology with a Web-based electronic commerce engine, is not only original, but has received a patent. The custom audio company has just signed an exclusive licensing agreement with Ergon Technology Associates for U.S. Patent Number 5,592,511, which covers the process of manufacturing customized audio CD products. Under the terms of the agreement, superSonic BOOM will have exclusive rights to use the patented technology and to offer sublicensing to other custom audio product providers.

So, how do they pull off this feat of technology integration? The original production line included a Web solution wholly programmed by superSonic BOOM President Ted Hooban and former CIO Kris Barth. They built the site using Perl scripting and Common Gateway Interface (CGI) programming. The system allows visitors to the site as they listen to search for the tracks they are interested in, listen to 30-second RealAudio samples, and then select the tracks for the CD. Users can then move the songs up and down in the track listing to arrange them in the order they choose. Once the CD is constructed, the customer proceeds to the online cash register to finalize the order, which then travels across superSonics's internal NT network to queue up for recording.

Not all of superSonic BOOM's 50,000 licensed tracks are cached to the central hard drive at all times, so occasionally human intervention is required to copy missing songs to the hard drive from which the tracks are drawn for direct recording to CD. Once the songs are located and properly staged, the recording process begins. Since there is currently not enough hard drive storage available at superSonic for every track it has licensed, the company is currently weighing the pros and cons of placing a CD jukebox in the production system to make 100 to 200 additional CDs available online (though with somewhat slower access than on the hard drive).

When songs licensed by superSonic BOOM first arrive from their record labels, they are submitted either on CD or DAT. To prepare the tracks for uploading to the Web site, 30-second excerpts are compressed into RealAudio files. Thirty-second sound clips represent the longest portion of any song that can be served up via custom audio Web sites without violating federal "Fair Use" regulations.

Originally, superSonic BOOM used Rimages's Perfect Image Producer CD production system with four quad-speed recorders stacked on top of each other and a Rimage thermal printer for labeling the disc. superSonic BOOM has also done some testing with MicroTech's ImageAutomator, a now-NT-supporting autoloading duplication system and is considering it as an alternative to the Rimage production package. One reason the company has considered the Micro Tech system is its cost-effective expansion path. For CD recording, superSonic BOOM uses Jeff Arnold's Golden Hawk disc-at-once recordable software, a fast, 32-bit, command-line tool marketed online that's well-suited for high-end CD production environments.

superSonic BOOM has been officially in "incubation" since fall 1997. In practical terms, this means the company has more money behind it now, but another benefit is their close proximity to other high-tech startups. One of its more interesting neighbors, Morph Technologies, has developed a Web database integration tool called DynaMorph that enables site managers to track user preferences. The product requires scripting, but rather than learn another programming language, superSonic BOOM's Ted Hooban has hired Morph Solutions to integrate their technology with superSonic's Web engine for them. The technology is helping Hooban create "Club BOOM," in which users agree to have

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their preferences tracked so that in the future, they can be alerted to new recordings that may prove of interest. DynaMorph also comes with a sophisticated search engine that lets end-users search for any words in the title of a song. By keeping records of consumer preferences, superSonic BOOM plans to develop some cross-marketing efforts. For example, if you purchase all the tracks of a particular musician, Club Boom might direct you to other artists with similar sounds.

It is only technology that makes supersonic BOOM's custom CD publishing solution unique. Their marketing approach does not require customers to surf to their Web site, but instead they will happily clone their electronic commerce engine, customize it, and place it onto other Web sites designed as vehicles for selling custom CDs.

Central to this plan is working with media outlets that promote particular lifestyles. One of the first of these sell-through partnerships is with Maxim magazine, reportedly the fastest-growing men's lifestyle magazine on the market. In the January 1996 issue of the magazine, Maxim's custom CD shop advertises a title called 50 classic tunes "Every Guy Should Know." The Maxim online shop uses superSonic BOOM and DynaMorph technology, but is customized to retain the Maxim look and feel. The discs, shipped in Maxim packaging, help the magazine increase brand identity. Another market that superSonic sees as an ideal outlet for its technology and publishing model is the college market. The independent network "Burley Bear," which delivers programming to colleges across the country, agrees and now offers six different CD titles that will carry the Burley Bear name.

As the Christmas 1997 selling season approached, superSonicBOOM launched its largest promotion. To prepare for the event, the company licensed such popular holiday as Bing Crosby's "White Christmas," Rosemary Clooney's "Silver Bells," and Nat King Cole's "The Christmas Song." During the height of the promotion, the superSonic site's hit counts average 15,000 per day; post-promotion on a typical day brings 15,000-20,000 visitors to the www.supersonicboom.com/site. However, the company says that they charted a 1,000 percent increase in sales by running the promotion. If they can keep up such sales increase percentages, they may find themselves the proud producers of the first platinum-selling CD-R project.

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