

Making a Case for Digital Hardcover Binding

A White Paper

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Abstract

Digital book printing has almost exclusively produced perfect-bound paperback books, but new markets are opening up for high-value, hardcover digital books, books that function as gifts, keepsakes, and mementos. Case binding has often been thought to be out of reach of most digital book printers, but today's digital case binding systems can bring high-quality and high-value print books in-house, without breaking the bank or your staff.

Introduction: Judging a Book By Its Cover

You're picking out a gift for the book-lover in your life. You're browsing in your favorite bookstore, and you've narrowed your choice down to one of two titles: a lavish, beautifully printed and bound hardcover book, and a standard, perfect-bound paperback. Which says "gift" more than the other? Even if the content were exactly the same—think of a deluxe hardcover edition of Charles Dickens' *David Copperfield* vs. the corresponding Penguin Classics mass-market paperback—which would be the more highly valued edition?

Hardcover books have always been seen as more "deluxe" than paperbacks, and it's not merely because they cost more. A hardcover has always imparted a greater quality to a title, and there is a reason why the phrase "direct-to-paperback" or "paperback original" has always (correctly or not) been used to describe a title of lesser or less literary quality than a hardback. An analogy is in the movie industry; a movie that has had a major theatrical release is deemed of greater quality than a so-called "direct-to-video" title (again, correctly or not!). A hardcover book obviously costs more to produce, thus has a larger production budget, and implies to the prospective book buyer or reader that the producer or publisher of the book feels strongly enough about the title to warrant a lavish binding.



As digital book production has evolved over the past several decades, the quality of the printing has improved, but publishers and producers of digital books have tended to neglect the binding. In fact, many aren't even aware that digital books *can* be case bound—or, if they can, that it's a prohibitively expensive or a highly complex process. Neither of these things is necessarily true; digital books can and often are case-bound, and it's easy and affordable to do so. Sure, there are best practices and techniques, but there are best practices and techniques for every other aspect of printing, too. Case-bound digital books are high-value print products, and even if they cost a bit more to produce, they can also command a higher selling price. More and more markets—and more and more opportunities are opening up—for digital hardcovers.

In a Bind: How Hardcover Books Are Made

Let's take a step back and look at the case-binding process.

As we all know, there are several choices when it comes to binding books and other types of publications. There is *saddle-stitching*, *comb* or *wire binding*, *perfect binding*, and of course *case binding*, or hardcover binding.

¹ After all, *Plan 9 From Outer Space* was given a theatrical release.

The earliest books in Western civilization were in the form of scrolls, and the first “cut-sheet” or *paginated* bound books started to appear around the turn of the first century.² Starting in the fifth century, books were traditionally bound between two hard covers. The interior pages—later called the *book block* or *text block*—were made of parchment, folded and sewn onto cords or ligaments, attached to wooden boards, and covered with leather. Following the advent of printing, bookbinding remained predominantly hardcover, and paperback books didn’t appear until the 19th century.

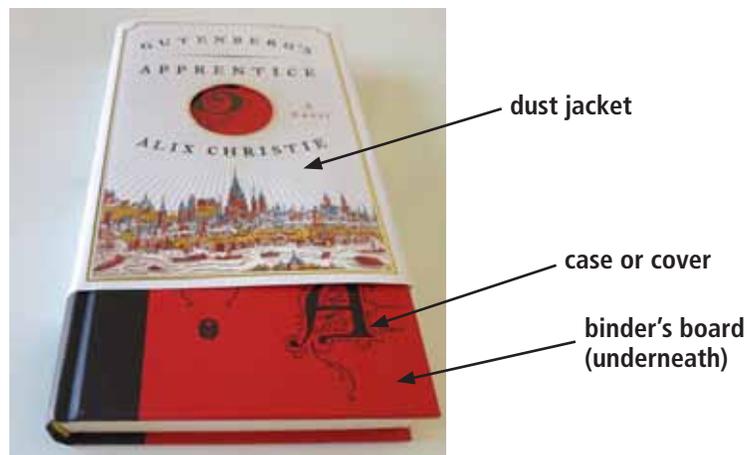
The modern process of hardcover bookbinding goes roughly like this:

The book or text block consists of printed signatures of anywhere from four to 16 pages printed on a single large sheet. The most common format is *octavo*, book pages printed eight-up (that’s eight pages on each side of the sheet for 16 pages total). The large sheet is then folded so that the pages appear in order (orienting the pages in the proper order on the sheet is called *imposition*, which is performed during prepress). All the book’s signatures are gathered together in the proper order³ and are slit or trimmed to remove the folds on all but the binding edge so the pages can be turned. The pages are then sewn together, glue is applied to the book block, and the hardcover “case” is attached. The case consists of cardboard covered with paper, or, in the case of fancier books, cloth, vinyl, leather, or even some kind of specialty material.⁴ The case can be die-stamped with author, title, publisher, and other information, and most trade hardcovers protect the cases with a dust jacket, printed separately, and folded around the hardcover case. The dust jacket contains the fancily designed book cover—by which you should not judge the book, but people often do—as well as promotional text (flap and back copy), author photo, and other material used to help sell the book, or at least tell readers what it is about.

Anatomy of a Book Cover

Let’s take a quick look at all the pieces of a case-bound book. If you grab a hardcover from your bookshelf, you’ll find many, if not most or all, of these same elements, depending on the budget for the book’s production. For these examples, we will use an apt title: the 2014 novel *Gutenberg’s Apprentice* by Alix Christie.⁵

Figure 1. Anatomy of a Case-Bound Book—Dust Jacket and Case or Cover



²The English word *book* comes from Old English *boc* which in turn derives from the from Proto-Germanic *bokiz* or “beech,” referring to the type of wood on which early books were written. The word *page* comes from the Latin *pagina*, “to fasten.” In this sense, the word paginated refers to sheets bound or fastened together.

³A complete set of the book’s pages at this stage, before binding, is sometimes referred to as “F&Gs,” or “folded-and-gathereds.”

⁴Many years ago, when I worked for St. Martin’s Press, one of our books was called *The Social History of the American Alligator*. Published in 1991, a limited edition of it was bound in imitation alligator skin.

⁵The novel is a beautifully evocative fictionalized life of Peter Schoeffer, who went to work for Gutenberg at the dawn of printing. The book chronicles their adventures in printing what became known as the “Gutenberg Bible,” set against the backdrop of Medieval Germany, the Plague, and political and religious dissension.

In Figure 1 above, I had slid the dust jacket up a tad to reveal the hard case beneath. The basis of every case-bound book is a thick board called *binder's board*. Once made of wood, most binder's board these days is made from old paper fibers and are a kind of cardboard or paperboard. The board is covered with a cover material. In most trade hardcovers, the case binding is covered with a dust jacket.

The cover material can be stamped with a die. In the case of most trade hardcovers, this stamping is limited to the author and title stamped on the spine or backbone. The back of the book also contains a groove which forms a hinge, which allows the book to open and close. A well-bound book creates a hinge that doesn't place any strain on the book itself when the cover is opened and closed.

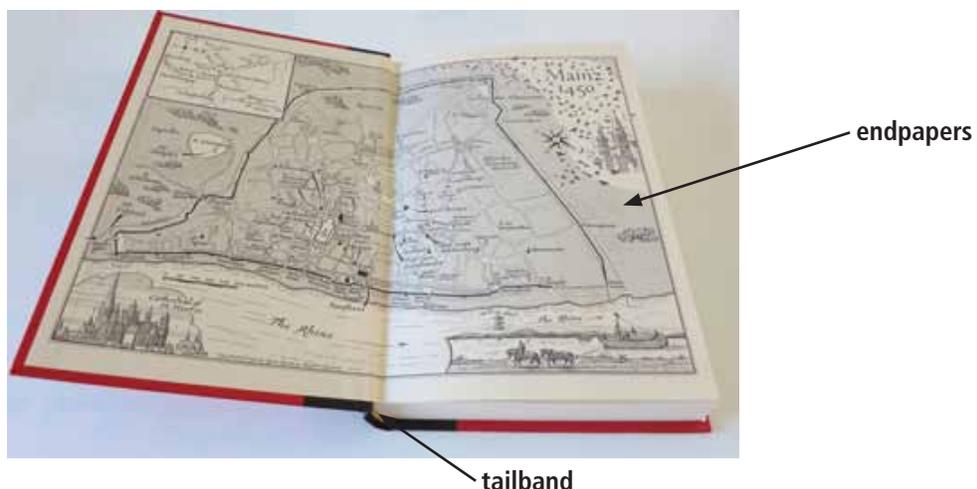
Figure 2. Anatomy of a Case-Bound Book—Spine View



Inside the book are the *endpapers* that hold the book in the case. There is one endpaper at the front of the book and one at the back. They are usually made from thicker or stronger paper than the rest of the book block, as it is their duty to hold the pages in the case. Endpapers can be left blank or be printed, and can be a convenient place to put maps or other illustrations that serve as a reference to the book's content. They can also be strictly decorative. Printed endpapers can convey a more deluxe edition of a book than one with blank endpapers.

A portion of the cover extends beyond the book block—these bits of overhang are called *squares*. Finally, many hardcover books also have a small decorative bit of material (usually some kind of colored cloth) attached to the top and bottom of the spine. These are called *headbands*; or the one at the top of the spine is called a *headband* while the one at the bottom is called a *tailband*.

Figure 3. Anatomy of a Case-Bound Book—Open View



Hardcover books can also have other effects, such as top-staining or top-edge gilding (colored dye or gold leaf/gilt, respectively, is applied to the top edge of the book block) or deckle edges (only the top and bottom of the book block are trimmed; the unbound right edge features untrimmed pages). Some books have a ribbon bound into the spine which serves as a bookmark, and there are other effects that turn up from time to time.

Sew What?

When printed pages come off press, before the case is added, they first must be sewn together. Historically, there have been two types of sewing techniques used in bookbinding.

Side sewing—Also called *oversewing* or *Singer* or *McCain sewing*. In this technique, small holes are punched through the left-hand edge of signatures of loose pages are then sewn together. Side sewing can be used for books up to five inches thick, which is suitable even for your average Stephen King or James Michener tome. Side sewing produces a strong binding, but the drawback is that side sewing eats into page real estate, which can lead to reduced margins or text disappearing into the bound edge if the book designer is not careful.

Smyth sewing—Also known as “sewing through the fold.” In this technique, stitches are added through the folds of folded and gathered signatures, and the signatures are then themselves stitched together. Smyth sewing can handle thicker books than side sewing, but is not an option when signatures consist of loose unfolded pages (for obvious reasons), which is how many digital book printing systems deliver pages. Smyth sewing also requires a greater degree of make-ready and is not cost-effective for many types of on-demand digital books, like photo books.

Figure 4. Side Sewing with the ODM Super Sewer



Case In—and Case Closed

While the book block is being printed and sewn, the case binding is being prepped.

The first step in the case-binding manufacturing process is to ensure that the cases are produced at the right size and in the right quantity. While the book block is being printed, one advance copy—the *case size copy*—is sent to the bindery to use to spec the size of the case that will be required.

The binder’s boards are received as large sheets and the cover material is received in rolls, and they are cut to size for each book based on the dimensions of the case size copy, with 5/8-inch extensions on all four sides. The cover material is then glued to the boards. Between the two boards is the spine or backbone, and a paper liner is glued down the backbone. The excess cover material is folded under and glued to the inside of the case. This forms a finished edge. If you look at the corners of the inside front or back cover of any hardcover book in your collection, you can see how this comes out.

As we saw earlier, the cover material can be decorated in some way, and it can be done before or after the case is made, but decorating the cover before casemaking offers more flexibility in design.

After the cases are assembled, and the book blocks are printed, trimmed, and sewn, the process of *casings-in* can be performed. This is the physical attaching of the book block to the case binding and is done on a casing-in machine. The book block is held vertically, spine up. Glue is applied to the endpapers and the case is folded down onto the book block. The bound book then needs to be held in clamps and the joint or hinge formed, a process called *building-in*. The books are then held in clamps until the adhesive is dry.

Once the adhesive is dry, it’s off to add a dust jacket and other special features, and then shipped out to the customer.

Moving into the Digital Age

The process described above has been the general process for producing hardcover books for decades, if not centuries. It has been very much like a craft, often like printing itself, but over the years has required increasing levels of automation to boost productivity. Although “boutique” book printers and binders still do a lot of these things by hand, it’s impractical to make hand-tooled leather book covers for a 10-million-copy printing of a bestselling author’s latest hit. At what the publisher would have to charge, it probably wouldn’t end up being much of a bestseller.

Oddly enough, the same dynamics apply to today’s digital book printing. As we will discuss below, digital book printing has enabled shorter runs and on-demand printing, and you would think that this environment would be ideal to bring back the hands-on craft aspect of bookbinding. And yet, the reason that short-run and on-demand book printing is economical is precisely because the printing and binding operations are highly automated and highly productive and efficient.

The Markets for Digital Hardcover Books

The advent of digital printing in general, and digital book printing in particular, have opened up entirely new opportunities and markets for publishers, printers, and end users. While mainstream publishers are still dependent upon the traditional model of mass printing, warehousing, distribution and shipping, and returns, some have begun exploring the potential of digital printing. At the same time, it has opened up book publishing to small and even self-publishers who had been blocked from traditional publishing markets. E-commerce, meanwhile, solved one of the last remaining barriers to entry: distribution.

Not all of digital book printing necessarily requires case-binding, just as all book publishing in general doesn’t require case-binding. But just as digital printing is enabling high-volume print applications, digital case-binding can add even more value to that process.

Areas of Growth

Again, not all book genres and niches benefit from a digital approach, and certain niches are better candidates for digital printing—and digital case-binding—than others. Let’s run through a few of them.

Textbooks

Textbooks have always been economically problematic, from both the publisher’s as well as the buyer’s perspective. The cost of production, a flourishing used textbook market, and the need for regular revisions have traditionally made it necessary for publishers to charge very high prices for textbooks. This made things even more problematic for the student, and I can recall even in the mid-1980s that one could easily drop \$200 or \$300 a semester on college textbooks.⁶

Switching to digital printing won’t necessarily help with the overall economics of the textbook market; that said, though, shorter run lengths and customization approach can make them more easily and economically updated. Digital printing has helped create new types of textbooks, such as textbooks that are specific to individual classes, instructors, or even students. That is, textbooks can be customized with personalized URLs and passcodes that give each student access to his or her own course website. The digital approach also allows instructors to compile their own “anthologies” and customized content.⁷

Yearbooks

School yearbooks led themselves quite well to digital book printing, as they tend to be short run (unless you’re talking about a very large graduating class) specialty printed products. Adding a hardcover makes it even more of a keepsake.

⁶ Especially if you were a science, engineering, or math student. At least English majors could largely get by with Penguin Classic paperbacks.

⁷ Back when I was an English major at Syracuse University from 1985–1989, certain instructors would compile their own anthologies of journal articles, essays, and other materials, and have them photocopied and GBC-bound at the campus Kinko’s. They were not inexpensive, from what I recall.

Photo Books

If there has been one digital printing application that has been a runaway bestseller in the past decade, it has been digital photo books. Users upload their own photos of an event—a wedding, a birthday party, a holiday, you name it—and print limited editions as gifts for friends and family. Using case-binding rather than perfect binding only makes these books even more valuable and special.

*Children's Books*

A growing market is digital children's books—and many are even personalized. Take, for example, Put Me In the Story (<http://www.putmeinthehistory.com>), where you can create children's books and have your own children's names and other details inserted into the book.⁸

Digital Coffee Table Books

Fans of the TV series *Seinfeld* remember when Kramer published a coffee table book about coffee tables. As the term indicates, these are oversized, decorative, color gift books often designed more as decoration than reading matter. Indeed, they are left out on the coffee table with the aim of impressing guests. Not usually produced in large runs, digital is starting to catch on for these kinds of titles, especially as printing and binding equipment can increasingly support the oversize nature of these kinds of titles.

Recipe Books

Twenty years ago or so, a friend of mine's sister-in-law compiled several dozen of her grandmother's own home made recipes, had them photocopied, and spiral bound them into books that were then given as gifts to family members. It was also a way to preserve the past for posterity. (As well as some really good Italian recipes.) Today, these types of recipe books can be produced in the same way of photo books. And in this age of everyone Instagramming everything they eat, it is even easy to incorporate images for an even more high-value print application.



Digital Case-bound Bookbinding Equipment

On-demand books were one of the earliest applications for digital printing, and options for perfect-bound paperback books have been long available and affordable. Although case-bound digital books have yet to achieve the volume of paper-bound books—if they ever will, which is unlikely—there are many affordable equipment options for companies looking to expand into hardcover books.

We will run through some of the offerings that On Demand Machinery has available.

ODM Casemaking System™

If you recall our look at the case-binding process earlier in this white paper, before books can be case-bound, the cases themselves need to be created. Enter the ODM Casemaking System, which boils down the production of hardcover cases into four steps and thus four components: Spreader, Slider, Stomper, and Squeezer.

Step 1: The Spreader is the unit that applies adhesive to the cover material for affixing to the boards. Consisting of a top-side gluer equipped with an 18-inch glue roller, cold adhesive is placed in a glue reservoir, and the amount of adhesive that is ultimately applied to the cover material can be easily adjusted using a scraper blade.

⁸ This is not a new concept; in the late 1970s, there was a shopping mall kiosk that did something similar; parents gave the kiosk vendor their child's name, pet's name, and parent's name, variable information that was inserted into a prewritten story. The text was then output using an impact printer on preprinted color pages and hardbound with a die-cut cover that let you see the title which featured the child's name. This was all before true digital printing and the term "variable data printing" had yet to be coined.

Figure 5: The ODM Casemaking System



Step 2: Once adhesive is applied to the cover material, the Slider aligns the hardcover boards in position. The Slider’s arms open as wide as four inches, and the unit also comes with an adjustable side guide and arm spacer kit for different joint gaps.

Step 3: Once the boards are aligned on the cover material, the Stomper—an air-operated turning-in machine—folds and wraps the excess cover material on all four sides of the cover. The Stomper is available in both 30- and 36-inch widths, and larger units can be custom manufactured. The Stomper will support a wide range of cover materials, from leather to library buckram.

Step 4: Finally, the finished case goes through the Squeezer, a rotary press that ensures that the cover material is securely applied to the boards. The Squeezer rotary press can accept materials up to 18 inches wide and any length. The squeezer rollers are also adjustable for both pressure and gap opening.

Super Sewer™: In-Line Sewing Machine with Back Tack Technology™



Once the cases are ready, the book block needs to be sewn in preparation for casing-in. This can be accomplished using the ODM Super Sewer™, an automatic in-line sewing machine. Suitable for on-demand photo books, yearbooks, journals, children’s books, and textbooks, it will support book blocks up to one-half-inch thick. The Super Sewer™ features Back Tack Technology™ which, in a nutshell, means that the sewing machine does a reverse back stitch on the head and foot of the book block which ensures a very strong side sew which won’t easily come apart like standard side-sewn books can. The Super Sewer™ can stitch up to 10 books a minute or 600 books an hour. Supported book sizes range from a minimum 3 x 5 inches up to 11 x 14 inches.

Sticker™ and Smasher™

Once the cases are made and the book blocks are sewn, the next step is casing-in, which is performed on the Sticker™. Casing-in is a four-step process: The sewn book block is placed on a “wing,” the operator hits a foot switch and the wing drops below the glue rollers; the rollers apply glue to the endpapers; and the hardcover is placed in position.



The Smasher™ is a building-in machine. The cased-in books are taken from the Sticker™ and placed in the Smasher™. The operator locates the joint area, and then activates the hydraulic system that clamps the book with 20,000 pounds of pressure. Heated joint irons help form the joint by melting the adhesive in the joint area. The Smasher™ has an adjustable dwell timer that controls how long the book remains under pressure.



Entry-Level Options: Casemaking XXL, Sticker™ XXL, and Smasher™ XXL

Consisting of the same four components as the Casemaking System detailed above—Spreader, Slider, Stomper, and Squeezer—“Next Generation” Casemaking XXL System™ supports hard book covers as small as “wallet size” (4 x 4 inches) up to oversize tabloid size (22.75 x 46.75 inches). The Casemaking XXL also works with complementary casing-in and building-in units the Sticker™ and Smasher™ XXL Series.



Workflow and Automation: Super Sticker™ with Transfer Station and Super Smasher™



For users who have high-volume case-binding requirements, On Demand Machinery offers a variety of automated solutions. The Super Sticker™ is an automated casing-in machine that can produce 400 to 600 books per hour, and the Super Smasher™ is an automatic feed building-in machine that can produce up to 18 books a minute, or more than 1000 books an hour. The Super Sticker and Super Smasher are linked with the Transfer Station. Cased-in books come off the Super Sticker™ conveyor belt and the Transfer Station automatically feeds them into the Super Smasher™ for building-in.

Book-Trac™ Barcoding Technology

Matching the book cover to the right book block has been a perennial challenge in bookbinding, but the Book-Trac™ barcoding technology developed by On Demand Machinery in conjunction with Productive Solutions (Data Integrity Control Systems) matches book blocks with covers. Barcodes are printed on the covers, and on the spines of the book blocks. The Super Sticker reads the barcodes, and if they match, the job proceeds. If they do not, the job is halted.

The barcodes also contain the specs of the job, such as final book size, which allows same-size jobs to be grouped for maximizing efficiency.



Related Gadgets

There are a variety of other tools that are used in the case-binding process, such as the Slicer™, which is a simple, hand-operated machine designed to cut perfect corners on cover sheets prior to the casemaking process. The ODM Slicer can



handle a stack height of up to one inch. There is also the Book Jacket Jig, which facilitates wrapping a dust jacket around the hardcover; it allows the manual placement of book jackets on books. It uses a pneumatic foot controlled clamp and a laser beam to line up the jacket printing on the spine of the book.

ODM also offers a Straightener that dewarps hardcovers; a Lock Binding Gadget that clamps the book block’s spine so that extra sheets protecting the endpapers can be easily stripped off; and more.

Figure 6: ODM book jacket jig with red laser centering line



FAQs

Isn't all case-binding basically the same?

Well, is all perfect binding the same? We've all had books—hard- and softcover—that after one read started shedding pages like a long-haired cat, and other well-thumbed books that even after 20 years are still tightly bound together. Best practices for case-binding exist because you're trying to produce a book that will stay together. Especially if it is meant to be a keepsake and even handed down from generation to generation like a photo album, good binding techniques will ensure that it lasts.

Are certain substrates better for case-binding than others?

Yes. Traditional papers and substrates tend to work best and will be more compatible with the adhesives used in case-binding equipment. Coated papers can present difficulties in getting glues to adhere properly.

A more important substrate issue, perhaps, is attention to grain direction. Pages in the book block should be printed so that the grain direction is parallel to the spine. Why? As any printer intimately knows, paper readily absorbs moisture. Paper fibers in printed and bound books will inevitably pick up moisture (moisture also comes from the bookbinding adhesive), which means that the pages will expand. If the pages are bound with the grain perpendicular to the spine, this natural expansion is restricted and books will warp and become damaged. The grain direction in the binder's board should also be the same as that in the book block, so that the board and the pages expand in sync with each other.

Do adhesives matter?

Of course! Not all adhesives are the same or behave the same way or with the same effectiveness on all substrates. At the moment, polyurethane reactive (PUR) glues, introduced in the 1990s, are touted as the latest and greatest in adhesives, but they're not perfect for every application. Other types of adhesives used in bookbinding are ethylene vinyl acetate (EVA) hot-melt and polyvinyl acetate (PVA) cold-emulsion adhesives. PURs work via a chemical reaction with moisture in the substrate and as such can form a much stronger bond. However, PUR glues are more expensive and require longer curing times than other adhesives. Inadequate curing can lead to books falling apart or pages falling out after repeated use.

Can case-binding be automated?

There is no logical reason that it can't be, other than the fact that it traditionally hasn't been. Unlike perfect binding, case-binding has usually required a lot of user intervention to move book parts and pieces around the plant and physically assemble them. However, increasing demand for automated systems means that those systems are working their way to market. Automation is the next great frontier for case-binding.

Is case-binding equipment JDF-compatible?

Again, as with automation in general, there is no reason that it can't be other than that it just generally wasn't. Even all these years after JDF's supposed world domination, it still has been haphazardly implemented, especially in finishing systems. Although JDF can offer end-to-end workflow automation, simple barcoding like ODM's Book-Trac can offer most of the benefits of JDF automation, and is specific to bookbinding challenges, such as marrying the right cover with the right book block.

Where can I find answers to case-binding questions as they arise?

The trend today—not just in case-binding, and not just in finishing—is for equipment manufacturers and sellers to offer more consultative services than simply selling you something and then leaving you literally to your own devices. Experts at On Demand Machinery, for example, often find themselves doing more consultation with customers than selling, and can help choose the right case-binding system, identify casebinding best practices, and troubleshoot any problems you may have.

Conclusion

The market for digital books has been growing steadily since the advent of digital printing, although the vast majority of those books have been paperbound. But hardcover books have always been viewed by consumers as more of a “premium” item, a high-value print application that also serves as a keepsake, which is what new digital printing applications—like photo books, yearbooks, and so forth—are producing. For years, casebinding was thought to be out of reach economically and even technologically. But today’s digital casebinding systems bring high-quality bookbinding within the reach of virtually any shop, opening up new opportunities to produce those high-value print applications.



This white paper was sponsored by On Demand Machinery. For more information about ODM’s case-binding equipment, please visit www.odmachinery.com.
