VOLUME 22 - NUMBER 1 MARCH 2003

The New Library Scene

LIBRARY BINDING INSTITUTE

# PERFECT BINDING GOOD ENOUGH FOR LIBRARY USE?

*by Werner Rebsamen*

*Professor Emeritus, Rochester Institute of Technology*

*Technical Consultant, Library Binding Institute*

One of the most popular binding styles used in the graphic arts industry is "perfect" binding. It is quick and relatively inexpensive. Depending on the equipment, this method is used in on-demand desktop printing offices, at medium and high speed commercial printing and binding facilities. Some paperback bindings are perfect bound in a two-up mode at 32,000+ books an hour. Magazines and catalogs are bound at speeds of up to 20,000 copies per hour. As a librarian, you now start to question what exactly "perfect" binding is. Many just know it as a "glued" binding. You are not alone. Many printers/binders are not sure what exactly a "perfect" binding is either.

## PERFECT BINDING PATENT

In a 1988 graduate research project conducted under my direction at the RIT/LBI book testing facilities, Dr. Richard Adams found the phrase "prefect" binding first used in a patent issued on May 11, 1887, to Horace L. Arnold of Brooklyn, NY. The patent refers to "a method by which several leaves compromising a book or pamphlet are secured to each other preparatory to receiving its cover." Dr. Adams, who earned a Ph.D. studying plant fibers (lignin), was the ideal candidate to research the importance of spine preparation and how it is the optimum linkage between paper fibers and the adhesive. His completed thesis earned him kudos from industry experts. Today, with the changes in the contemporary manufacturing of paper, including recycling and coating processes, the critical spine preparation is now more important than ever.

## THE HISTORY OF PERFECT BINDING

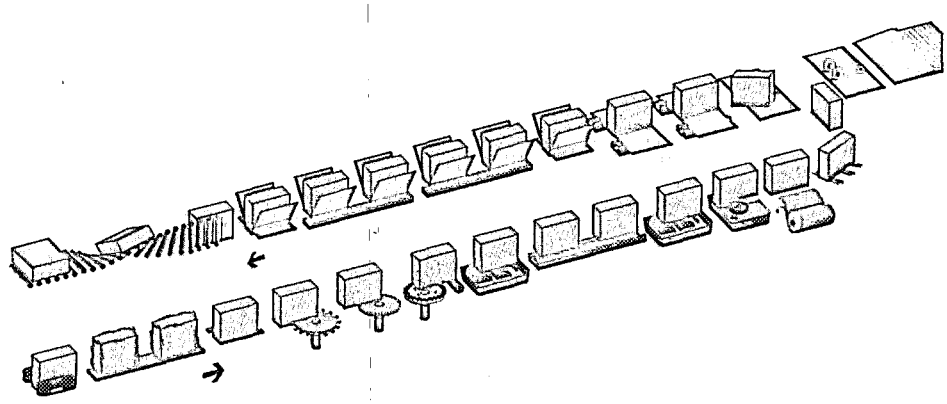
The earlier attempts to "perfect" bind books were very questionable. Until the late 1960s, perfect binding was anything but perfect. The problems were the availability of appropriate adhesives. In the 1880s, bookbinders only had animal glues and pastes to work with. Animal glues, or "Mr. Ed's" formula as my students used to refer to it, are generally brittle. Flexing a spine and using such a glue were not an ideal combination for "perfect" bindings. Earlier covering binding machines just applied glue onto the book blocks. There was no spine preparation. The large printed sheets were folded by machines. Prior to the last fold, a thin thread was pierced approximately four inches apart through the sheets at the bind fold. The ends tangled freely from each folded signature or section. The task of the covering machine was first to receive the gathered book block and orient the loose ends in the right direction by means of a rotating brush. Thereafter, the clamped book block received a heavy coat of glue on the spine. The machine aligned and merged the book block with a cover, pressed it onto a book block and forwarded it into a delivery device. These bindings, showing a thread in the center of a folded signature, left an impression of a sewn book block.

The first perfect binding machines, where the spines were milled off, started to appear in 1895. In 1908, such a binding machine used by the U.S. Government printing office and at other book manufacturing sites started the perfect binding revolution. Although glue was still a problem, millions of catalogs were bound using animal glue or India Rubber and in some cases, vegetable glues like the expensive, German-made Arabol. Glycerine was added to make the animal glue more flexible. The "perfume" shed by such glue kettles was of course another chapter! Luckily for libraries, that "cut-off spine" perfect binding method was not used on books. Although there were earlier attempts, the

first successful paperback bindings did not appear until the mid-1930s and thereafter became popular in the 1950s, after the development of the hotmelt adhesive.

## HOTMELT ADHESIVE DEVELOPMENT

The book manufacturing industry continued to have problems, especially in regard to perfect bindings and adhesives used. The white PVA adhesives which surfaced just before World War II first showed great promise as this adhesive seemed to "bite" into the paper fibers long after a binding was completed. This new synthetic glue had one disadvantage. It had a slow tack. It would not hold the cover in place and therefore was not suitable for high speed production of magazines, catalogs and paperback bindings. About 1949, duPont developed the very first hotmelt adhesives. These hotmelt adhesives allowed new, unheard of production speeds of up to 200 books a minute! The bound books could be trimmed in-line. There was no need to let them dry overnight. As with most new synthetic products, those earlier formulas had their faults and shortcomings. One of my colleagues, Dr. Julius Silver, a chemist on the RIT printing faculty, told us of his earlier experiences when he worked at Union Carbide. They could sell their new plastic garbage cans only in the South. Yet they still had troubles. When a cold spell hit the South, all the garbage cans disintegrated due to cold crack! Similar things happened to paperback bindings bound with hotmelt adhesives. One of my late friends, a pioneer in perfect binding, Mr. James Averill informed me of a big disaster as late as 1959 when the Sheridan company reported 300,000 books, ready to be shipped, were found falling apart upon exposure to cold weather. Nevertheless, by the mid 1950s, it was estimated that publishers annually sold over 250 million paperback bindings. That was the time when I just started a career as a bookbinder. I shall never forget a trade meeting in my home town of Zurich, Switzerland, where we discussed the American paperback revolution. We were all afraid that we had chosen a profession that had no future!



*Schematic of a perfect binding line showing infeed, spine preparation, application of hotmelt, capping (hardcover books) and cover mounting.*
*Courtesy of Kolbus America*

There were other problems with earlier formulation of those hotmelt adhesives. They had poor aging characteristics. Although they successfully bound most paper stocks, they crystallized in just a few years. In other words, that honey color glue disintegrated and the binding came apart. Those bindings must have played havoc on libraries! New EVA (Ethylene Vinyl Acetate) formulas were developed in the 1960s and solved these problems.

## THE CHEMICAL MAKE-UP OF HOTMELTS

These days the majority of all books are bound with hotmelt adhesives. These new generations of hotmelt now seem to have fairly good aging characteristics. Best of all, they allow for high speed production in bookbinding, packaging, etc.

Hotmelts are adhesives based on a chemical system consisting primarily of resin, film former, plasticizer, and filler. They contain no dispersing agents or solvents and are solid, similar to a candle at normal temperature. Under the influence of heat, the intermolecular forces are weakened. In other words, thermal energy increases the mobility of the molecules, producing the viscosity required for the gluing process. Cooling lowers the mobility of the molecules and results in rapid setting. These settings can be formulated between two and 25 seconds. There are approximately 1,000 different formulas of hotmelt adhesives. Their approximate ratios are listed in Figure 1.

The "normal" color of a hotmelt adhesive is like honey, a light brown. But do not get fooled. Industry also is using a pigmented white hotmelt to complement the paper. Flexibility still remains a major problem. Just look at an average paperback binding or refer to an earlier TNLS article on "Mouse Trapping."

The Library Binding Institute (LBI), publisher of *The Library Scene* and *The New Library Scene*, reserves the right to refuse copy which is not in accordance with LBI's established policies. Specifically: LBI endorses no machinery, equipment, material or supply or supplier thereof; other than the American National Standard *Z39.78-2000 Library Binding*, LBI endorses no method of binding.
 Subscriptions to *The New Library Scene* (formerly *The Library Scene*) are available through most subscription agencies or you may write directly to 70 E. Lake St., #300, Chicago, IL 60601. *The New Library Scene* is published quarterly in March, June, September, and December. Subscription rates are $24.00 annually. Canadian subscriptions, add $2.00 per year for postage; for foreign subscriptions, $3.00 per year. Subscribers must submit a missing issue claim within 90 days from each specific issue's date of publication. If these terms are not adhered to, the publisher will be unable to fill the request. All manuscripts are welcomed for publication review. *The New Library Scene* is indexed in "Library Literature and Information Science Abstracts." ISSN 0735-8571.
POSTMASTER: Send address change to *The New Library Scene*, 70 E. Lake St., #300, Chicago, IL 60601.

**APPROXIMATE RATIOS OF HOTMELT ADHESIVE**

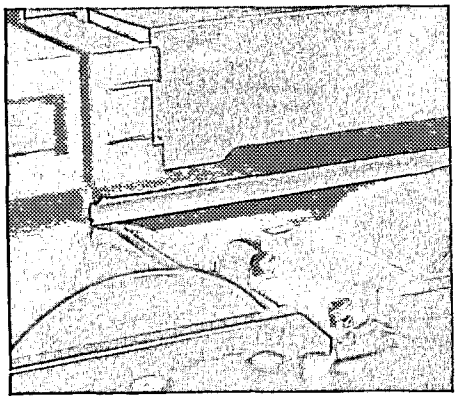
| | | |
|---|---|---|
| **Resin** | approximately | 30% = adhesion (how good it will adhere to material) |
| **Film Formers** | approximately | 35% = cohesion (internal strength of adhesive) |
| **Plasticizer** | approximately | 25% = flexibility |
| **Filler** | approximately | 10% |
| **Solid Content** | approximately | 100% |

*Figure 1*

Most hotmelt formulas and the subsequent waste do not allow those papers to be recycled.

## THE "PERFECT" BINDING PROCESS

There are many different ways to adhesive bind books. The technical term of "perfect" binding should only be used if the spines are milled-off, consist of single sheets and are bound with a hotmelt adhesive. Machinery manufacturers have developed all kinds of perfect binding equipment from small desktop models to high-speed, multimillion dollar binding lines. On desktop models, the individual sheets are jogged and placed in a clamp. Depending on the machine used, some only apply a coat of hotmelt to the spine. The cover is glued on in the same process. Some of the better processes include milling which exposes paper fibers to be imbedded into the hotmelt. Commercial, medium and high speed equipment, use all kinds of spine preparation tools to achieve an optimum linkage between the exposed fibers and the hotmelt adhesive. Just imagine the power tools required to process 200 thick phone books a minute! The spine must be milled to expose all individual sheets inside a folded signature. The milled spine is then forwarded to a roughing station where as many paper fibers as possible are exposed. Depending on the type of paper bound, notches are cut into the prepared spine as well. This is a difficult process especially on coated paper stocks, which these days have a high percentage of filler materials. Paper fibers are easily bound, but a porcelain clay coating on papers presents a difficult task. The prepared spine is then vacumed because all dust must be removed. The clamped book blocks are then moved over a gluing station which applies approximately a 20 millimeter coating of hotmelt glue. If it is less, the binding may come apart, if it is too much, the binding will be extremely stiff and will not open. Covers are applied in the same process. Some covers are scored four ways. The glued spines receive a small strip of hotmelt on each side. The covers are then carefully aligned and are thereafter transferred to a pressing station. After some cooling on a conveyer, the bound books are then forwarded to a three-knife trimmer where the folds are trimmed open. The result is a finished, bound, soft cover book in less than a minute at speeds of up to 200 books a minute!

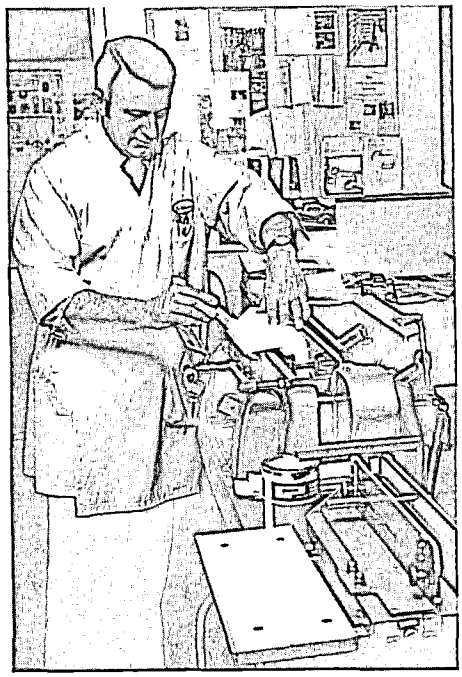


*Hotmelt application (360 degrees hot) is done onto the prepared spine only. The adhesive must flow into the grooves or notches, set in a few seconds.*
*Compliments of Muller Martini*

Perfect binding hardcover books is unfortunately popular as well. Endpapers are tipped to the front and back and off-set from the spine. This is needed to retain the endpaper fold. The book blocks are then perfect bound and capped with a small piece of lining paper over the spine. After trimming, they are forwarded to a conventional hardcover binding line. There are other techniques, like a combined endpaper where the endpapers are connected to each other with the lining paper off-line. These endpaper constructions are then fed into the binder like a soft cover and are wrapped around the book block.

## PERFECT BINDING AND LIBRARY BINDING SPECIFICATIONS

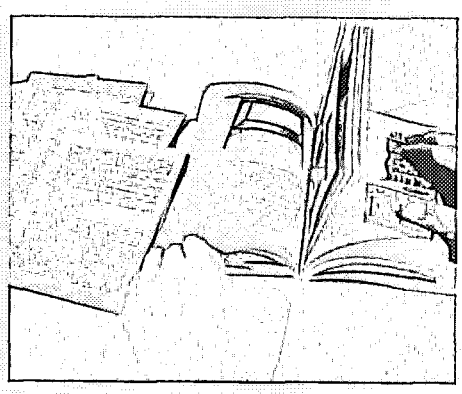
Despite all the claims made by book manufacturers and publishers "that contemporary perfect bindings are now perfect," none of the specifications allows this method of bindings or hotmelts to be used for certified library bindings. Library binding specifications were written by some of the most knowledgeable people in the field of library maintenance, preservation and library binding. Having served on such voluntary committees, I do have a first-hand knowledge why librarians never even considered perfect binding to be acceptable for library use. Generally, the hotmelts used in bookbinding are stiff. A binding which resists opening is easily cracked, especially if a



*Author demonstrating double fan adhesive binding, the only method approved for Library Binding. PVA adhesive is applied to each side of individial sheets.*

**PREFECT BINDING**

*Earlier perfect bindings were prone to fall apart. Newer perfect bindings do not open flat.*



student/reader implements an SAT (Student Abuse Test), bending the binding backwards, cover to cover for easier reading and copying. Thereafter the bound-in sheets start to come loose. Aging characteristics were also cited as a problem. Most likely, this is no longer the case for books bound in North America, but there are many other parts of the world where the adhesives used may be very questionable in this regard.

Unfortunately, there are always unscrupulous enterprising "library" binding peddlers who sell their bound products as "library bound." To achieve the lowest price, they take "perfect" bound soft cover books, and just wrap a hard cover around it. The binding is the original, bound with a hotmelt adhesive and one which no knowledgeable librarian would ever accept being circulated in a library environment.

For an acceptable library binding, certified library binders must shave off the hotmelt and use the double-fanning adhesive binding process. It is the only adhesive binding process that is acceptable for meeting the tough NISO/LBI standard for library binding. The standard specifies a special PVA adhesive which results in a strong, yet flexible binding. In an extensive testing project supported and endorsed by LBI's Technology Committee, it was found that such specified adhesives and bindings will last approximately 500 years. Now that is a perfect binding!

**Questions or comments about what you've read here?** Contact the Library Binding Institute at info@lbibinders.org or call our office at (312) 704-5020. We'd love to hear from you.

## DIVINE DEBACLE

By now everyone has heard about the RoweCom/Divine Information Services debacle. RoweCom, one of the largest subscription agencies in the United States, stopped processing orders after a serious financial failure "that some are calling the Enron of the library world."

As a quick synopsis of the events that transpired in the last several months, RoweCom collected prepayments (approximately $50 million) from subscribing customers and spent it on operating costs and debt payments instead of paying publishers.

In late December of 2002, an ad hoc group formed and was compose of representatives from affected creditors. They in turn elected a steering committee compiled of five libraries and five publishers to set up an action plan. Anyone interested in getting updates from the committee can join a Yahoo newsgroup at *groups.yahoo.com/group/rowecomecreditors/.*

Since then, RoweCom's parent company, Divine, has filed for bankruptcy and faces possible criminal charges. EBSCO Industries continues toward the acquisition of RoweCom. For more information and updates, you can reference the ebscoind.com and rowecom.co.uk websites.

# GLOSSARY ...

As part of LBI's continued educational initiative, *The New Library Scene* will be supplying terminology in an effort to clarify the intricacies of library binding. The definitions and explanations listed are pulled from this issue's feature article from Werner Rebsamen.

**Double-Fan Adhesive Binding** - A method of adhering loose leaves together at the binding edge of a text block.
The precise method used and required by the NISO/LBI Z39.78-2000 standard is as follows:
The text block is securely clamped. The binding edge is fanned first in one direction, as adhesive is applied; and then in the opposite direction, as adhesive is applied. An emulsion copolymer of internally plasticized polyvinyl acetate adhesive (PVA) is used. The flexibility and surface finish of the paper as well as the thickness and weight of the text block is taken into account when deciding whether to double-fan adhesive bind a volume. No text block more than 2 inches thick should be bound in this manner. There are more details on the penetration between the pages, the adhesive running into text and other various technical specifications that all Ceritfied Library Binders must adhere to (pardon the pun). The NISO/LBI standard can be found at www.lbibinders.org under the *Publications* page.

**Endpaper** - Also known as end sheets or end leafs. The sheets of paper (two or more) which come between the cover and the sewn sections. One sheet is pasted against the book's front cover and one against the back cover.

**Filler** - A chemical such as china clay or starch, added to paper and cloth to bulk it out. When added to paper it also makes it whiter.

**Notch/Notching** - The spines of text blocks can be notched by machine prior to double-fan adhesive binding. Notches are parallel grooves cut into the spine perpendicular to the binding edge. The depth of the grooves and the distance between them can be adjusted to suit the size and weight of the text block. Notching increases the amount of surface area on the spine that comes in contact with the adhesive and increases the strength of double-fan adhesive bindings.