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Cover Story:

Trends in Flat Dieboard The Inexorable Quest for Flatness and Stability



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Trends in Flat Dieboard

The Inexorable Quest for Flatness and Stability

Mike Porter, Freeman Manufacturing & Supply Company, Cary, IL, USA



Diagram 1



Diagram 2



Diagram 3

A few things have changed since the last time the IADD asked me for an article on dieboard, so I thought it time to put pen to paper—or rather keyboard to monitor—and provide an update on flat dieboard.

In our never-ending search for the ultimate piece of plywood over the years, the flat dieboard has evolved. The beloved maple dieboard went from 100% hard maple to a mix of soft maple and other hardwood inner plies. Our father's rock maple dieboard would bend nails. But it would also bend into a canoe come winter. The current maple dieboard may not be as hard, but greater throughput on the laser and an ultra-flat, stable panel that acts less squirrely in winter are the benefits of today's softer 7-ply maple (see Diagram 1).

The favored Finland birch board was soon replaced by Russian birch for lower-cost short-run dies, stripping fixtures and blankers.

Pre-coated dieboards became more prevalent, eliminating OSHA-scary spray booths and dip tanks. Melamine laminated Finland birch and UV-coated dieboards have become very stable alternatives to uncoated dieboards (see Diagrams 2 and 3). The sleek finishes also make for an excellent bottom stripping board on a Bobst press.

Also, a new species of dieboard has emerged—with the infestation of our ash forests by an emerald green marauder, we are harvesting the trees more quickly, resulting in more ash dieboards (see Diagram 4). These boards offer shock resistance and have proven themselves a strong, re-knifable and reliable die base in both flat and rotary tooling over the last four years. Get 'em while they last as it is predicted that the white ash will be no more in approximately seven to ten years because of the emerald ash borer.



Diagram 4

And the newest and most exciting dieboards in a decade are very stable painted boards and the new high density urethane foam dieboards. More about those later...

But as much as dieboards have developed over the last couple years, the principles haven't changed. So here is a little re-cap on the ABCs of dieboard.

The ABCs of dieboard

Ask “What’s new?” Call your expert dieboard supplier and ask. Your IADD partner may just have the problem-solving dieboard for your application.

Buy from the experts. Purchase your dieboard from an IADD member dieboard supplier. This ensures you are getting the very best materials designed for our industry and not lumber yard plywood.

Cover your dieboards. Always keep your dieboards covered with a sheet of plastic (corrugated plastic works great, see Diagram 5), and away from heat sources in the winter. Keeping your dieboards covered, especially overnight and over the weekend, will greatly reduce warp and twist, saving time flipping and handling.

Don’t use dieboard fresh off the delivery truck. Especially in the winter. Order your dieboard in enough time to allow for in-plant acclimation of at least a few days before subjecting a shivering cold dieboard to a kerf-chasing ride on a hot laser.

Evaluate the practice of reknifing. In many cases, it is much less expensive to just burn a new board and install new knife. The CAD file is already saved, so the initial set up is done. By the time you scrape off the rubber and carefully extract the old knife, a new board could be laser-cut, ready to rule...and it’s safer!

Find the flat that fits your application. Russian birch offers the lowest cost for short-run throw away dies, where as a maple or ash board may be needed if you plan to re-knife. Save the expensive composites and foam/G10 dieboards for your very best, long-run tooling.

Give your dieboards a flat and level home. Store your dieboards flat and level—never on edge on the cold concrete, and not

on a wonky freight-damaged skid—and you will always have a nice, flat plywood base for your precision tooling. Some dieboard suppliers spend extra money for reinforced, perfectly flat skids. Seek them out as it is an advantage to store the dieboard flat and level, versus unsupported in the middle on two runners.

As for what’s new, here is the most recent trend in flat diemaking and how it has affected flat dieboard selection.

Current trend

There is a trend in our industry occurring now, and that trend is the more extensive use of steel counterplates. The cost of steel counterplates has dropped, and technology has enabled more and more diemakers to get in on the manufacturing of steel plates. Combine this with the demand from converters who are finding increased speeds and fewer on-press problems running steel plates, and the result is the need for a more stable dieboard.

If your die shrinks in the storage rack this winter, you can re-set your phenolic counters to match. But when matched to a steel plate, that shrinkage often results in the need for a costly new die. And because the trend is increased steel plate usage, the need for a stable diebase has become even more important.

Consider the following finding from the USDA Forest Products Laboratory. According to their *Wood Handbook: Wood as an Engineering Material*, “The average coefficient of hygroscopic expansion or contraction in length and width for plywood panels is about 0.0002” per inch (0.0051mm per 25.4mm) for each 10 percent change in equilibrium relative humidity.”



Diagram 5

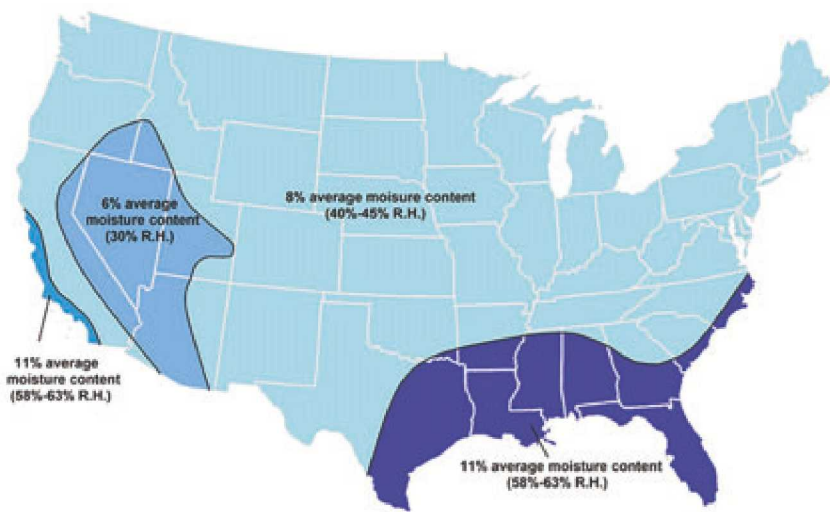


Diagram 6

Granted, the plywood panels tested for this handbook were probably construction grade, made from white pine or Douglas fir. But the coefficient is instructive, and useful as a rough guide for dieboard shrink. And as

anyone using steel plates can tell you, dieboards shrink. Using the coefficient of 0.0002" per inch (0.0051mm per 25.4mm) shrink for each 10% drop in humidity, we can expect a die made in summer at 70% relative humidity (RH) and then stored until winter at 30% RH to shrink. Or, for a die made in the southeast US (see Diagram 6, a RH map used for plywood flooring) with an average RH of 60%, and then shipped to Nevada with an average RH of 30%, to also shrink.

So for example, a 47" (1193.8mm) Bobst 162 large format die may shrink roughly 47" x 0.0002", or 0.009" (0.2286mm) per every 10% drop in RH. A 40% drop in RH from summer to winter means the cutting die is now four times 0.009" smaller over the 47" span. It has shrunk out of spec by 0.036" to 0.040" (0.9 to 1.02mm) and no longer matches its steel plate.

To mitigate this shrink, the need has arisen for even more stable dieboards. Here

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ADVERTISING CONTENT REMOVED

» DIEBOARD

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Diagram 7



Diagram 8

are the best and brightest dieboards that remain more stable when matched with steel counterplates, from lowest cost to highest cost, based on the length of run.

UV-coated dieboard

An excellent choice for dies matched with steel counters that are typically shorter run. The UV-coating provides a moisture barrier, mitigating the moisture exchange and helping to keep the die matched to the steel plate. Insist that your coated maple, ash or birch boards are aged and acclimated prior to coating, rather than coated at the factory. Coating immediately after pressing may trap the inherent moisture in the glue-line, which may cause excessive shrink later on. UV-coated boards are also available in 5/16" (7.94mm)

coated one side only for those customers using a router.

Painted birch dieboard

There are a couple new boards on the market that are coated with a very thick layer (or layers) of coatings that further mitigate moisture (see Diagram 7). These coatings help reduce the inevitable shrinking that has plagued us. These boards are a little more expensive, but make up for it in stability. Painted dieboards are completely sealed to lock in the moisture that shrinks a plywood panel as it escapes. Some are powder-coated while some are roll-coated and infrared heat-cured, with edges coated as well.

Lightweight HDU foam/G10 dieboard

The lightest and most stable dieboard to date is a sandwich board made from high density urethane (HDU) foam core with G10 glass epoxy faces. An ultralight, ultrastable foamcore is sandwiched between two layers of fiberglass/epoxy high pressure laminate G10. This new sandwich construction offers the industry a completely stable platform for

the first time. There is no veneer or cellulose of any kind that could shrink this tooling out of spec with its matching steel counterplate. Somewhat cumbersome to build, they are definitely worth the extra effort, resulting in a lightweight, safer and completely stable cutting die.

Solid composite and composite/veneer hybrids

I am always careful not to mention brand names of dieboards so as to remain objective, but in all fairness, Paul Hettinga's Rayform still dominates as the go-to choice for a solid composite diebase (see Diagram 8). It has some drawbacks—heavy weight being the main complaint—but is still a viable option for heated platen thermal dies. Contact your IADD member dieboard supplier to see what new, lighter-weight composite hybrids are also now available.

Hopefully one of these new dieboards will help you on your quest for stability with steel plates.

I'd like to wrap it up with a recommendation for a new favorite book, *Extreme Ownership* by Jocko Willink and Leif Babin. Willink and Babin are Navy SEAL leaders who demonstrate how the lessons learned in combat are relevant and extremely helpful in business and life. Happy reading—or if you're on the road a lot like me, happy listening to the audio book. 📖

Mike Porter entered the steel rule die industry in 1992 at Triangle Dies, progressing from Plant Superintendent to Plant Manager to General Manager. Mike also worked for The Rayner Company as Director of Marketing and Product Development, served as President of Piette Dieboards and President and co-owner of PSC Global Dieboards. In 2015, PSC Global was acquired by Freeman Manufacturing & Supply Company. Mike is currently Business Development Manager for Freeman Manufacturing & Supply Company, headquartered in Avon, OH, USA. For more information on any of these dieboards, please contact Mike at 1-847-287-8587, by email at mporter@freemansupply.com or visit www.FreemanDieSupply.com.

Freeman Manufacturing & Supply Company has served the aerospace, automotive, foundry, prototyping and pattern making industries for over 100 years. With 14 locations in North America, Freeman is the largest materials supplier to anyone making parts, patterns, tools or molds. Since entering the die supply industry in 2015, Freeman has worked hard to become a one-stop shop for all die supply needs.

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