



Composite Boards Improve Efficiency of Carton Manufacturing

Alan Johnson, Norplex-Micarta, Postville, IA, USA

Counterplates are a critical component in the carton manufacturing process. They receive the creasing die in the process of creasing paperboard. For a long time, counterplate crease patterns were made piece-by-piece by gluing plastic strips onto a metal surface. But this technique was difficult and time consuming, and the counterplates it yielded caused many problems in production.

So today, more and more manufacturers are machining creases into their counterplates. That's because machining is a faster and more precise way of creating complex crease patterns measuring less than 0.010" (.254mm) in depth.

In many cases, these crease patterns are cut into composite materials. There are a variety of composites on the market, but the best counterplate materials feature a strong fiberglass surface for increased durability and a paper core that leaves no unsightly marks when pressed against paperboard. And, because of their material properties, they reduce machining complications and speed up changeovers.

Counterplates in carton manufacturing

In carton manufacturing, the counterplate works in tandem with a metal die that presses crease patterns into paperboard sheets of various thicknesses. Later in the process, the sheets are folded along the creases to create cartons for a multitude of cartons, ranging from cereal boxes to corrugated cardboard boxes. One large carton or a number of smaller cartons can be made from a single sheet.

A paperboard web is pulled through a machine with a die on top and a counterplate on the bottom. The counterplate contains a crease pattern that matches a pattern of protrusions on the die. The die presses into the counterplate to create creases in the paperboard. The locations and dimensions of these creases must be exact in order for the paperboard to fold perfectly into cartons later in the process.

Conventional counterplates are made of steel and plastic. A thin steel layer serves as a base onto which plastic strips are placed to create crease patterns. Each plastic strip must be cut into the right shape and then glued onto the steel surface.

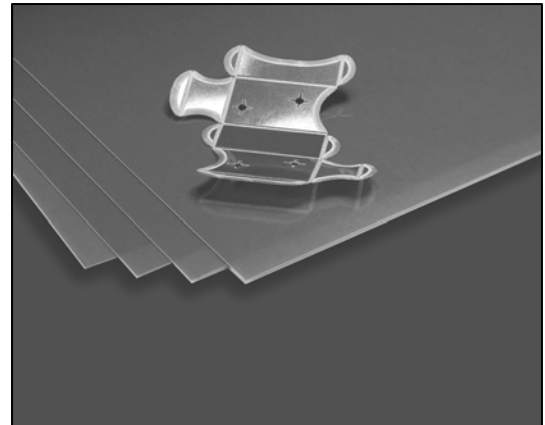
The process of cutting, positioning, and gluing plastic strips must be very precise so that creases are the right depth for optimal folding. In addition, crease patterns must match up exactly with the carton printing on paperboard sheets that can be more than 50" (1270mm) wide. Always very labor-intensive,

this process has grown ever more difficult, especially as smaller cartons are nested to maximize the yield of the web.

Once made, steel-and-plastic counterplates can cause more difficulties in the production process. Paperboard travels at high speeds through a press, introducing heat into the application and affecting the plastic strips. Fasttraveling paperboard also creates vacuum conditions that pull on the plastic strips. Sometimes, this combination of heat and vacuum causes one or more plastic corners to lift off the steel surface. This in turn can change the depth and location of creases produced when the die presses into the counterplate. In addition, lifted plastic corners can rip the paperboard web or throw it off-line as it is pulled through the press.

An attractive alternative

Tired of the problems caused by conventional counterplates, many carton manufacturers have turned to an attractive alternative: counterplates machined out of rigid thermoset composite material. The process of routing creases into composite boards requires much less labor than the old technique of cutting and gluing plastic strips onto steel plates. In addition, the new process makes it much easier to create creases with precise dimensions, as well as the complex crease patterns that are common on today's cartons.



Counterplates machined from rigid thermoset composite material maintain required thickness tolerances, ensuring a precise creasing process and improved product quality. (Photo courtesy of The Rayner Company.)

During the carton manufacturing process, the composite Counterplate will not delaminate when subjected to heat and vacuum conditions. The rigid board remains flat and dimensionally stable to keep the creasing process running smoothly for long periods of time, minimizing machine downtime.

Counterplate boards can be made of a number of different composites to optimize strength and durability. One popular option consists of a phenolic paper core with fiberglass epoxy surfaces on both sides. Strong and durable, the long-lasting fiberglass surface eliminates the need to frequently change out counterplate boards worn by the creasing process.

The phenolic paper core also plays an important role in the process. When the die presses into the counterplate, the paperboard makes contact with the core, which leaves a smooth finish on the creases in the carton material. In contrast, a fiberglass core material would leave an unsightly imprint on the paperboard creases from the weave of the fiberglass cloth.

In manufacturing machinery, composite counterplates are glued to metal plates. In many cases, removal of a counterplate is a difficult and messy process that involves scraping the board off the metal. If the board breaks or cracks, costly changeover time is increased. But some composite counterplate materials include a flexible film on the side that attaches to the metal bed. With the film layer between the metal

and composite surfaces, the counter-plate peels intact right off the machine, thereby speeding up the changeover process.

Other options

There are other material options in addition to fiberglass epoxy composites, but they all have their drawbacks. For example, crease patterns could be cut into metal sheets that serve as counterplates. But metal counterplates would be much more expensive than their composite counterparts. In addition, the process of machining metal would create burrs on the surface of the creases. These rough edges would have to be removed in some sort of secondary operation. In contrast, machining of some composite materials produces smooth surfaces that require no secondary cleanup operations.

Creases can also be cut into thermoplastic materials, but most thermoplastics lack the strength required to make good counterplates. In addition, the heat produced in carton manufacturing could soften thermoplastics, causing changes in the crease patterns. High temperature thermoplastics might provide adequate heat resistance, but these expensive materials cost far more than thermoset composites.

Counterplates can be made of composite materials with a variety of different constructions and resin formulations. But many of these materials are not well suited to meet the challenges posed by counterplate applications. For example, the high-speed motion of paperboard through a packaging machine produces heat that creates moisture on the surface of the counterplate. Phenolic resins tend to absorb moisture, so a counterplate with phenolic resin in its surface might swell slightly over time. This swelling could change the shape of the crease cuts, which would adversely affect the creasing process. A more suitable choice for the counterplate surface is epoxy resin, which provides better moisture resistance than phenolic material.

Another important consideration is the strength of composite materials. Some are simply paper phenolic laminates that do not include fiberglass surfaces. These materials do not provide the strength and durability required by counterplate applications.

Conclusion

In many carton manufacturing processes, old-style steel-and-plastic counterplates have given way to composite counterplate boards. Fiberglass-based composite counterplates are strong yet easy to machine into the most complex crease patterns. Some fiberglass composites also offer moisture resistance, smooth machined finishes, and quick changeovers to improve both cartons and the processes that make them.

Alan Johnson is the Director of Business Development at Norplex-Micarta. Alan may be contacted via telephone at 1-563-864-4275 or email at ajohnson@norplex-micarta.com. For more information on Norplex-Micarta, please visit the company's website at www.norplex-micarta.com.