

Secrets of cartoning – Solving common problems

By John R Henry

Cartons are the key to sales for many products. They are what the customer sees on the store shelf. A good looking carton, properly formed with no scuffing or tearing, can be the key to moving your merchandise.

Good cartoning starts with the converter (supplier) cartons must be properly cut, scored, folded and glued. Cheaper cartons may make the purchasing department look good but they can be a nightmare on the packaging line. Nightmares on the packaging line mean low efficiencies that will far outweigh any savings on purchases. Just 2 percentage points of inefficiency means 1 week of lost production. On a line running 250 cartons per minute, that can mean more than 6 million annual lost sales.

Cartons must meet specification. Variability is the enemy of efficiency. Cartons that meet specifications but vary within the specifications can cause problems. Make sure you keep the specifications as tight as possible.

Glue has to stick. That's the whole point of glue and sounds pretty obvious. Most non-tucking cartoners use hotmelt glue which is supplied in pellet form, melted and sprayed onto the carton. There are several hundred different types of hotmelt glue used in packaging and each is formulated for specific properties. There is no "one size fits all" glue. Using the right glue for the application is a must.

Applying the glue is critical too. Too hot and it will not adhere quickly enough. Too cold and it will not adhere at all. In either case, the carton flap will not be sealed. Ideally, the unsealed flap will be detected on the line and can be resolved. Sometimes it will seal weakly, looking good on the line and opening in the store, frightening customers into buying Brand X instead of your product. The two cartons were found in the supermarket.



The carton on the right has an additional issue with the chrome coated major flap. Glue likes a rough surface to cling to. The chrome coating may not allow the glue to adhere properly even if everything else is right. Glue areas must always be unvarnished for best adhesion.

After glue application and closing, the flaps must be held closed, “compressed” for a short length of time to assure good contact on both flaps. Some intermittent motion cartoners use a reciprocating mechanism. Many cartoners use a pair of side belts to compress both ends of the carton.

Once you get the cartons in-plant, make sure they are stored properly. Cartons are paper and hygroscopic, meaning they will absorb or release moisture depending on ambient humidity. In a heated warehouse, in wintertime, humidity may be close to zero and cartons will dry out. In the summer, in the same warehouse, humidity may be in the 60-80% range in some parts of the country. Stiffness of dry and moist cartons will vary and can cause issues on the machine. Consistent warehouse conditions can help avoid these variations.

Carton forming at the converter is another area to look at. Two issues are forming and gluing.

The converter, after scoring and die cutting, folds and glues the carton into a tube. This glue joint, called the “manufacturer’s joint” must be perfectly square. If it is not, when the carton is opened in the cartoner, it can cause jams.

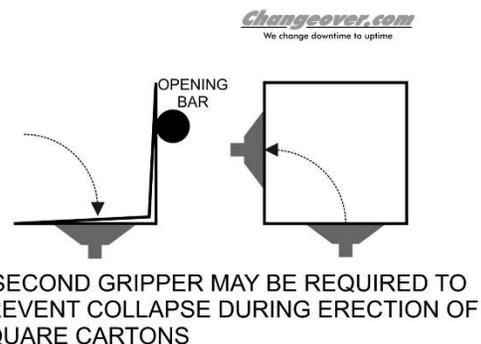
Another issue with the manufacturer’s joint is excess glue.



This picture shows a corrugated case but the glue problem is similar. Excess glue from the manufacturer’s joint has glued the knocked down case shut. This may prevent it from opening properly and causing a jam. Stronger opening grippers may rip it open but at the cost internal damage.

Many cartons are rectangular. These, especially if they run at relatively low speeds <100cpm or so, can be picked and opened with suction cups on a single face.

Square cartons can be more problematic. Square cartons have scorelines directly opposite if each other. This makes them more prone to opening into an “L” and jamming. When square cartons are to be run an articulated dripper, with or without additional grippers are often required for positive opening.



Cartoner changeovers can be complex with many interrelated adjustments. Lengthy changeover times, cause huge production losses. I use the 10W-40 mnemonic. Just 10

minutes of wasted downtime, including changeover, daily is the loss of 1 week of annual production. At 250cpm, that's more than 6 million lost sales.

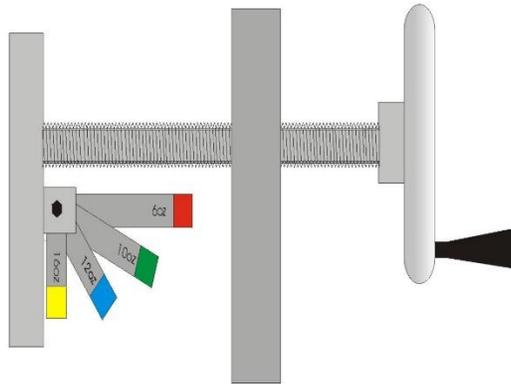
A big changeover loss with cartoners often occurs after changeover is complete. The line is restarted and it can sometimes take hours of tinkering to get the cartoner running right.

The first step in reducing changeover time is figuring out how to do it properly and documenting it. That includes how and when to make each adjustment and the proper setpoints. Documentation should include a highly detailed SOP or work instruction to be used as mainly for training and reference. A less detailed checklist needs to be prepared as well. The checklist must be used in every setup regardless of how experienced the technician is.

The setup must include quantitative means of achieving setpoints. This may include scales or digital indicators.



Color coded gauge blocks are the best since they eliminate the need to look for setpoints. Just set everything to yellow (or whatever color corresponds to the product)



No matter how good the documentation or the measurement tools, they are worthless unless they are used in every changeover by every technician, no matter how experienced. Management must build a culture of doing setups “by the book”.

Most cartoners use vacuum to pick the carton from the magazine and may use vacuum elsewhere as well. If the suckers do not grip properly when removing the carton from the magazine, they will jam. There are several common issues with vacuum and grippers:

The grippers, or suction cups are a wear part. They are not supposed to last forever though some people seem to think so. They do wear and when they do they must be replaced. They must be replaced as soon as they start to show signs of wear such as feathering along the edges or damage such as cracking.

The vacuum source must provide sufficient vacuum for the suckers to get a good grip. One issue is that if there is leakage, due to a damaged or worn sucker, loose connections or damaged hose, the vacuum source may not be able to overcome it. A larger vacuum source is one solution. Another is to use individual vacuum generators on each suction cup such as this system from PIAB.

Be sure the vacuum hose is not kinked, restricting flow. This needs to be observed in operation. In one instance the hose had been shortened by an inch or two. This was fine with the machine at rest. When the arm with the sucker extended to place the carton, it pulled the hose tight around a corner, kinking it closed. This caused the carton to fall slightly out of position just as it was placed in the pocket.

Venturi vacuum generators are frequently used. These use compressed air through a venturi nozzle to generate a vacuum. They are convenient but a bit expensive because of the high cost of compressed air. Any paper operation such as cartooning will generate paper dust. When this dust gets sucked into the venturi device, it causes

clogging in 2 areas: First in the venturi area itself, Second in the muffler on the venturi exhaust. When these clog, the venturi's performance suffers. Regular internal cleaning of the venturi, especially in dusty environments, is a must.

Erecting and closing the carton is only half the battle. Somehow the product must get inside. This can be done manually or automatically but in either case it requires attention to detail.

Product handling needs to be one of the first things discussed in a cartoning project since so much else will depend on it. The machine builder must get realistic product samples showing the way the product will come to the machine.

For example, a dry product will sometimes be duplicated by filling a bottle with water to match the weight. If the bottle is always vertical, this may work. If it gets tipped horizontal for loading, it will handle completely differently, leading to unpleasant surprises when the actual product is run.

Even temperature of the product can be a factor. If a product is packaged cold, condensation may form on the surface, causing handling problems. The key is to give the machine builder samples that truly represent the range of typical conditions rather than all "good" products.

Careful matching of the machine, carton and product--along with attention to detail in set-up and careful maintenance--will go a long way towards turning a potential nightmare into a dream.