

UV-Cured Coatings

Speed Up the Beverage Can Production Process

By Steve Colville



While the beverage can is one of the many consumer items that we handle every day as part of modern life, few people give any thought as to how it is produced or its unique complexities.

The reality is that the modern “tin” can is almost exclusively made from aluminium and produced in vast quantities on high-speed lines. Recent data indicates that approximately 230 billion beverage cans are produced globally each year. That figure continues to increase rapidly with expansion in emerging markets such as Asia, the Middle East and South America.

To be produced in such massive quantities, beverage cans are highly engineered and standardized. This can be effectively illustrated with the following characteristics:

- High production speeds (2,000+ cans per minute)
- Total recyclability (95% energy savings by using recycled cans)
- Pressure vessel (required to hold up to 90 psi)
- Precision engineering (wall thickness of 70 microns—similar to writing paper)

Manufacturing

The can-making process starts with a metal coil, which is stamped into discs and drawn into shallow cups. The sides of these cups are then “wall-ironed” in successive steps to the required height. This process resulted in the term DWI (drawn-wall ironed), which is still used today by those in the industry.

The can then moves through a series of processes involving trimming, washing, coating, printing, internal coating and necking (tapering of the top) to result in the finished body.

The end is made separately and attached to the body after the can is filled with product by the filler.

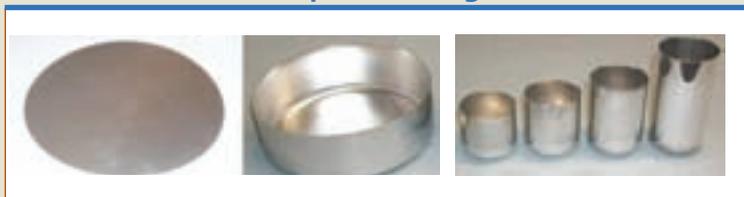
The core can-making process has remained unchanged for decades. However, recent trends include faster production speeds and lightweighting, which aims to decrease the amount of metal used in each can without sacrificing performance or quality.

Role of Coatings

Coatings provide the vital functions of protection and decoration on the bodies and ends of beverage cans. Internal coatings act as a barrier between the metal and the product, while external coatings are used in combination with decoration to create a robust, damage-resistant finish but also project a brand image to consumers and convey critical product information.

FIGURE 1

Can material at each process stage



These coatings are generally thermally cured, solvent- or water-based formulations. One exception is the Base Rim Coat (BRC), which is applied to the rim of the can's base. Its primary role is to allow aluminium cans to move easily on conveyors in the production and filling lines, but also to reduce abrasion on the base and decrease metal dust that can cause equipment failures if allowed to build up.

The rim coating contains an optical brightener that fluoresces under a black light. This is useful for the quality control checks of coverage and film thickness.

UV Curing

The original BRCs were thermally cured but the favored option now is to use UV-cured.

The advantages of UV-cured coatings are familiar:

- Smaller footprint (easy retrofit)
- No VOCs (clean)
- Energy efficiency (low running costs)
- High speed (can throughput)

Whether a retrofit to an existing line or included in a new build, the ability to use a compact UV-curing unit as opposed to a large oven is a clear advantage both in space-saving and energy efficiency terms.

Effects of Increasing Line Speeds

As previously mentioned, two recent trends in can production are

increasing production line speeds and reducing can weight. Handling large numbers of cans with thinner walls at higher speeds presents some specific challenges, namely the possibility of increased can spoilage.

The use of BRCs helps mitigate this challenge by allowing cans to move more easily through the line—avoiding jams and crushes and, in turn, reducing spoilage.

It is important to remember that a thermally cured BRC needs to pass through an oven, but as line speeds are increasing either the size of the oven or the temperature needs to increase simultaneously. Larger ovens are very expensive, and there is a temperature limit above which the tensile properties of the aluminium are affected. Alternatively, effective

solutions include a compact UV unit that can operate at high speeds or a wider conveyor with relatively low linear speed but high throughput.

Location

The preferred location for a BRC unit is close to the beginning of the production line after the washer stage. This provides a clean surface for optimum coating adhesion. (Consequently, almost all BRC retrofits are UV-cured due to space limitations.)

Depending on line configuration and line speed, the exact position may vary. Occasionally, when dealing with relatively slow lines, the BRC may be applied at the very end of the production line to ensure that the cans have the best possible quality coating for the filling line.

Application

Thermally cured BRCs can be either sprayed or roller applied. Roller application is the more common of the two because spraying runs the risk of overspray and internal contamination, which must be avoided at all costs.

The UV-cured solution is always roller coated with either a high-speed, single-file setup or a relatively low speed, but wide roller format used

FIGURE 2

Can-making process



FIGURE 3

Can rim



to maintain the high can throughput. This is often called mass rim coating. The choice depends on the curing unit's location in the line, but the vast majority utilize the mass rim option. The slower line speed of the wider conveyor allows greater control of film

weight and UV dose while reducing the chance of damage to the cans.

Summary

Using UV-cured BRCs in aluminium beverage can production has facilitated faster line speeds and lightweighting.

Both of these attributes have helped the beverage can maintain its competitive position with consumers.

A BRC is used to:

- Improve can mobility (production and filler)
- Reduce number of jams (less downtime)
- Increase abrasion resistance
- Reduce metal fines (fewer maintenance problems)

A UV BRC offers all of the above benefits plus:

- Compact unit (flexibility of location in the line)
- Simpler retrofit
- Energy savings
- Reduced VOCs
- Reduced spoilage
- Potentially 5-10% more can throughput

About Crown Holdings, Inc.

Crown Holdings, Inc., through its subsidiaries, is a leading supplier of packaging products to consumer marketing companies around the world. Its world headquarters are located in Philadelphia, Pa. For more information, visit www.crowncork.com.

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TABLE 1

Trends of lowered weights and increased speed in can-making

