TATA STEEL

TATA

System change for efficiency in 2-piece D&I food cans

Protact® laminated steel - a safe and sustainable material solution

Background

Canmakers, to compete, must comply with stringent legislation for materials in contact with food. Bisphenol A (BPA) is an organic synthetic compound used to make certain plastics and epoxy resins such as lacquers traditionally used to coat food cans. BPA in lacquers has come under intense scrutiny. Lacquers remain susceptible to possible future food safety issues. In addition, environmental legislation has led to strict allowances for volatile organic compound (VOC) emissions associated with the use of lacquers on metal packaging. Growing demands for sustainability mean many canmakers are seeking to limit the use of raw materials and energy in their processes. Brand owners and retailers are also seeking fully recyclable products.

Against this legislative and regulatory background, canmakers are under pressure to become increasingly more efficient and innovative in the highly competitive food packaging market.

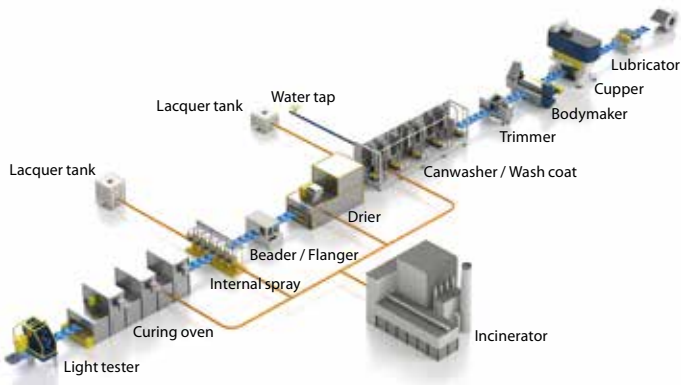

Figure 1: Conventional canmaking.

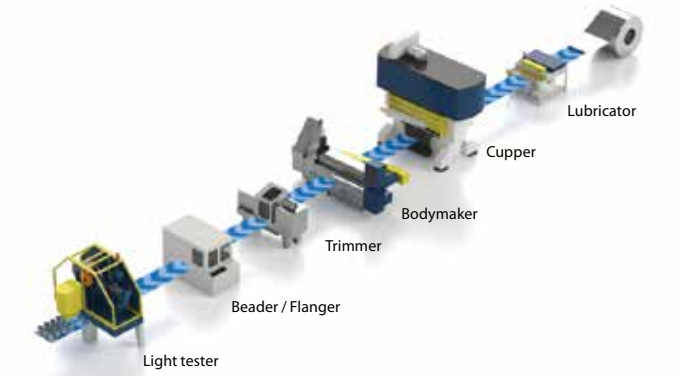

Figure 2: Canmaking with laminated steel.

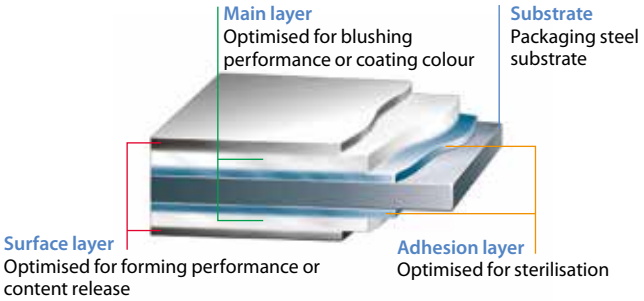

Figure 3: Food-safe and fully recyclable, Protact offers significant benefits for 2-piece D&I food can production. The three layer polymer coating system on each side of the substrate has been optimised specifically for the production of food-safe cans.

Efficiency to meet market needs

Tata Steel developed Protact laminated steel for two reasons. First, it meets market needs for more sustainable, reliable and safe packaging material. Second, it offers canmakers an opportunity to increase yield and be more competitive by removing cost-intensive unit operations in both greenfield and brownfield canmaking. Already technically proven in beer and beverage packaging and used commercially for various food applications such as deep drawn cans, Protact is a fully approved and controlled food-safe product. It is BPA-free and comprises a steel substrate and a coating of thin layers of Polyethylene Terephthalate (PET) or Polypropylene (PP) to meet a variety of performance requirements (see figure 3).

Using Protact for 2-piece D&I canmaking eliminates the need for operations related to lacquering (see figures 1 and 2). This enables a reduction in associated manning and maintenance. It also eliminates emission of VOCs in the canmaking process and significantly reduces energy consumption. Use of Protact can also reduce water consumption. To deliver further gains, Tata Steel has developed Protact laminated steel to full D&I width for optimised can line output.

Food safety

PET is acknowledged as one of the safest food contact materials in use. The PET coating in Protact comprises polyester types proven in PET bottles. These contain few chemical components. Purity levels and processing conditions of the chemical substances used in Protact manufacture are well-controlled. Independent screening of Protact confirms very few and less prominent substance-related 'peaks' when compared with the 'forest of peaks' in thermoset lacquer. Fewer and less prominent peaks indicate very few non-intentionally added substances, proving that Protact has excellent levels of food safety.

Protact's inert polymer coating has excellent organoleptic properties. This ensures that the original taste of packaged food is not affected by the

packaging material. The packaging material does not scalp or taint food flavour. The food safety status of Protact is rigorously controlled by the respected European independent food institute, TNO Triskelion. Protact complies fully with European Food Safety Authority and US Food and Drug Administration food safety regulations. See Tata Steel's Food safety of Protact® data sheet for additional information.

Sustainable packaging

Protact's polymer coating and steel substrate are infinitely recyclable. Steel is the most recycled packaging material in Europe – with recycling levels at 76% in 2014. The polymer coating of thin PET layers is burned off during the conversion of recycled Protact cans at around 1550°C in the steel making process. This produces thermal energy and high quality steel scrap.

Sustainable process

Protact enables improved environmental performance in the canmaking process. Removal of lacquer-related operations – washcoat, spraying and curing – reduces energy consumption and CO_2 emissions from gas-fired ovens. It also means that VOC emission is eliminated from the canmaking process, along with the need for equipment dedicated to VOC removal. In Europe, VOC emission continues to be a focus for attention in potential updates to the Best Available Techniques Reference Document (BREF). Use of Protact offers a safeguard against further tightening of VOC-related legislation and the costs that this could entail.

Using Protact, 2-piece D&I food cans can be made in a wet or dry canmaking process. In a dry process there is no requirement for an emulsion or for subsequent can washing. In addition to reducing water consumption, it enables canmakers to dispense with water treatment facilities. Tata Steel continually conducts company-wide life cycle analysis against competitor materials and can provide insights on individual request.

Adopting laminated steel for food can production

Greenfield investments can benefit immediately from the adoption of Protact laminated steel. Without washing and lacquering operations, capital investment and manning costs are significantly lower. There is no need to build and maintain technical expertise in lacquering. The simplified canmaking lines are shorter and can be built on a smaller physical footprint. With no need to store inflammable compounds, insurance costs are reduced due to a lower risk of fire or explosion.

Tata Steel's Customer Technical Service team and Research & Development experts can assist customers in converting or adapting existing canmaking lines. Lines can be readily converted for Protact by making adaptations at the cupper and bodymaker. Tata Steel has developed techniques for cupping and canmaking that are vital to successful line conversion. These techniques ensure that no polymer hairs are made in the forming process. Hair formation would result in clogging or contamination. Hair formation can be a problem with some laminated steels in 2-piece can formation. But, with Protact, Tata Steel's techniques ensure that hair-free canmaking is achieved in the final moments of the drawing process. This entails precise control of timing of the blank holder lift-off to prevent pinching of the blank edge. Dry D&I canmaking also requires modifications to the dies and punch to ensure that heat generated in the process is removed.

In the bodymaking process, small adaptations are needed to run Protact through the installation. These comprise modifications to the wall ironing process and the redraw step in the bodymaker. The changes ensure wall ironing reductions of 50 - 55% are possible, as required for food cans. Tata Steel is recognised for the support it gives customers in assisting in the design of tooling and modifications needed to move from a traditional lacquer-based process to one using Protact laminated steel.

Conclusion

Food-safe and infinitely recyclable, Protact offers significant benefits for 2-piece D&I food can production. It eliminates up to five unit operations related to lacquering – delivering safer, more sustainable canmaking operations with a reduced environmental footprint. Canmakers can save money through a reduction in manning, energy bills, insurance premiums and investment. In addition to efficiency gains, Protact offers the opportunity to maximise yield because it is available in widths up to 1220mm. Extra width allows an increase of 10 – 15% in cupper output, compared to standard 1000mm wide material.

Elimination of VOC emission – coupled with the fact that Protact is BPA-free – provides a safeguard against potential tightening of environmental and food contact regulation. Canmakers operating in VOC-capped manufacturing environments, such as California, can increase their production volumes whilst eliminating their VOC output completely.

The D&I canmaking line at Tata Steel's R&D facility is run at commercial speeds. In co-operation with customers, it offers the opportuity for development of the canmaking process for 2-piece D&I food cans using Protact laminated steel.

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