

Expanding horizons

It seems that while the paint was still drying on the first batch of Cincinnati-Milacron's RHB-V machines back in 1977, the seed for machines capable of blowing larger bottles than the mainstay 64oz Pepsi-Cola bottles was already germinating. What followed were the RHB-9 and the RHB W capable of blowing 30-litre carbonated soft drink (CSD) bottles.

It is doubtful that anybody at that time was imagining blowing 120-litre PET drums, a potential which has been made a reality by Cypet Technologies of Nicosia, Cyprus, and most recently demonstrated at K 2019.

Even though PET material has improved over the intervening period, with a larger window for processability, expanded PET melt processing and blow moulding process knowledge, and the capabilities of PET are now better understood, it remains a challenge to produce such large containers.

Cypet faced the challenge using the one-stage process, developing a 'unique' machine where the same movement of the platen opens both the injection and the blow cavities. This made it possible to adopt a commercial injection moulding unit utilising the clamp and the injection sections as the foundation of the machine. Whereas the injection mould opens horizontally, preforms – their main axis being horizontal – must be rotated to an upright orientation via a robotic device mounted above the clamp section.

The robot removes the preforms from the injection cavities to be deposited into the blow moulds and at the same time removes blown containers out of the blow moulds to the downstream outfeed.

Several challenges had to be overcome. For a start, there is a rather high-weight preform, with a wall thickness in the order of 9mm. The preform must be cooled from the melt temperature to the blowing temperature range, keeping crystallisation in check. This is followed by the high stretch ratios for the container, making the preform design critical in achieving a uniform wall thickness and optimal material distribution and utilisation.

The large preform/container opening and the large cross section of the drum raise clamping requirements to the point that a 530-tonne clamp unit is used, as well as a large force to maintain the position of the blow nozzle.

The development of a large clamp machine was initially driven by the desire to increase

Testimony to the tremendous progress PET has made in the packaging industry, a machine making 120-litre drums has been garnering significant attention. **Dan Weissmann** finds out more



The preform design for this 60-litre stackable crate is a shallow 'tray'

the blowing capacity of 20-litre bottles to 4 cavities, whereas commercial machines at the time were only capable of a 2-cavity configuration. This essentially doubles the production rate. Once the machine design and build had been completed it was realised that the same machine could blow a much larger single-cavity container, hence the birth of the 120-litre bottle.

A standard 0.84 intrinsic viscosity (IV) resin PET grade similar to the ones used for carbonated soft drink (CSD) bottles is being used in the production of coloured drums. The higher IV provides a wider process window

before significant crystallisation sets in. Even if it does occur, it is less noticeable in a coloured wall. Where clear PET is desired, a slow-crystallising resin grade must be used to prevent any crystallisation haze from forming.

Raw material savings when PET is used rather than HDPE is in the range of 25 to 30 per cent. By comparison, a 120-litre PET drum weighs in at 3.5kg, while a similar drum made of HDPE weighs 4.5-5kg. Resin price differences make the total material cost saving in the order of 30-40 per cent. The ability to reduce material use also addresses sustainability initiatives. Additional optimisation can be reached by sizing

the containers to maximise pallet and shipping-container loading.

The 120-litre PET drums meet all performance criteria for packaging dry goods. At present, impact strength falls short when filled with a liquid.

Cypet Technologies is a spinoff of M. Sideris & Sons, a family business supplying machinery and materials for plastics and packaging manufacturers. Cypet was established in 2005 and spent the next nine years developing its machine line, which currently includes ten models. In total 22 machines have been placed to date at customers in 15 different countries and on all five continents.

Several firsts have been claimed by the Cypet machines: the capability to blow PET containers larger than 30-litre; lowest energy consumption; the ability to handle neck openings larger than 180mm (the 120-litre drum neck opening is 400mm); a four-cavity configuration for 20-litre containers; and an all-electric format.

Demand for machinery led to the opening of a second assembly plant in India. The Cyprus location, in addition to assembling machines, provides product development, mould design and manufacturing, as well as product and process capabilities.



Big and bold: 50-litre milk bottles (left) and 120-litre HDPE & PET drums

The large-format range of the Cypet machine also led to the development of a 60-litre stackable, rectangular crate with a 570 x 370mm neck opening. The design of the pre-form for this product is a shallow 'tray', which necessitated the development of a unique stretching capability.

Another area that the company specialises in is integral-handle bottles, including bottle design and machinery. Having one material forming both the handle and the rest of the bottle makes it much more recycle-friendly.

A 220-litre drum is the next step. The design of a 1,000-tonne machine is already complete and this is being readied for commercial installation.

The development and commercialisation of such large PET containers is testimony to the continuous progress of this versatile polymer since its launch into the packaging world more than 40 years ago.

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