
Subject: KHS and the use of recycled PET

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Title

KHS promotes closed plastics loop with sustainable systems and solutions

Subtitle

Systems supplier engaged in recycled PET research since 2012

Teaser

The debate on plastic is presenting the beverage and food industries with a number of big challenges. The KHS Group is clear that the increased use of recycled PET provides a significant partial solution to this problem. The Dortmund systems supplier is thus focusing on sustainable products and services which help to close the recycling loop.

Main text

According to business magazine Forbes, around 140 PET bottles per head are circulated in Europe each year, with this figure more than twice that in the USA at 290. Despite all the criticism the plastic container is actually growing in popularity, with the number used increasing globally by around 4% per annum. Awareness of the need to recycle is also on the rise, however; according to Forbes, an estimated 57% of all used PET bottles were collected worldwide in 2019. For 2029 the magazine forecasts that this rate will increase to 68% – albeit with major differences from region to region. While 57% of all bottles could be collected in Europe, in the USA this would only amount to 30%. China, on the other hand, could become something of a model student and in ten years achieve an impressive collection rate of 82%. Collecting does not necessarily mean recycling, however: in the USA 70% of all collected plastics end up at waste disposal sites – and in Europe 30%.

Practically made for recycling: plastic

Yet plastic can be very easily recycled, especially PET. It is the only plastic that, when recycled, satisfies the legal requirements governing food grade materials. Whereas with other materials, such as polypropylene, polyethylene and polystyrene, the loss of quality which occurs on application of the usual recycling methods is irreversible, recycled PET can always be brought up to the standard of new material.

It is thus no surprise to learn that of the approximately 477,000 metric tons of PET used each year to make bottles in Germany alone, about 93% of this material is recovered and reused. Only roughly a third of this is used to make new bottles, however; the rest goes into the manufacturing of films and especially textile fibers.¹ This means that the bottle-to-bottle recycling loop is deprived of a large percentage of this raw material.

There is also the development in price to be considered: while the cost of what is known as virgin PET is based on that of crude oil and benefits from the current low market price thereof, the charge for recycled PET has continuously risen over the last three years. Companies now have to pay about 20% more for rPET than for the original material – also because the supply cannot meet the growing demand.

High standards of quality

Not only do hurdles have to be overcome at the raw materials end; some beverage producers also have reservations. They often fear that the rPET material may discolor or that the level of intrinsic viscosity² may drop. Another issue are safety standards and thus the harmlessness of the material. Time and again the question is raised as to whether multiple recycling can affect the quality. Although this has not yet been fully researched in practice, one thing is clear: as the polymer chains reform, no compromises must be made as regards the material quality as long as the additives can be completely separated off. The European PET Bottle Platform

¹ “Aufkommen und Verwertung von PET-Flaschen in Deutschland 2017” (occurrence and recycling of PET bottles in Germany), GVM or Gesellschaft für Verpackungsmarktforschung (on behalf of Forum PET).

² Intrinsic viscosity is a measure of the molecular weight of a polymer which reflects the melting point, crystallinity and tensile strength.

(EPBP) is just one of the institutions that helps to assure high standards of quality with its clear specifications and certifications. Whereas just a few years ago experimentation was rife and the beverage and food industries gained their experience with recycled PET through sheer trial and error, from a technical standpoint there is now nothing preventing the global use of high percentages of recycled PET. More and more beverage producers and brands are even opting to use bottles made of 100% recyclate. Where this is not yet the case, voluntary commitments are being publicized; Poland Spring, one of the biggest water brands in the USA, and Evian want to use recycled PET only by 2025. The other brands by Danone Waters, Pepsi and Coca-Cola plan to introduce a worldwide quota of 50% by this date. Their objective? They would like the consumer to interpret the slight graying that can occur when PET bottles are recycled several times over as a hallmark of quality for sustainable packaging.

Sound expertise: KHS specialists have been studying rPET since 2012

The KHS Group has also been examining the use of recyclate for some time now – in fact since 2012. KHS' Bottles and Shapes™ service program focuses on the practical application thereof on the stretch blow molders and indeed all of the filling and packaging lines engineered by the Dortmund systems supplier. "We run tests to qualify recycled PET so that we can tell our customers in advance which impact the material will have on the blow molder and bottle quality," says Arne Wiese, product manager for Bottles & Shapes™ at KHS Corpoplast. The aim to be able to quantify the various different qualities.

In doing so, KHS must work closely with preform manufacturers. They are ultimately often the companies which subject the washed PET flakes or rPET granulate to further thermomechanical processing and prepare them for injection molding. "We're consulting with all of the major plastics processors in Europe on this topic," Wiese emphasizes. And that is not all; KHS is also liaising with various engineering companies on preform manufacture. Thanks to this close cooperation, data from the injection molding process can be used just in time to adapt the stretch blow molding

process. This makes bottle production faster and more efficient and improves the quality of the finished containers.

Adaptations needed: KHS has the right systems

“With recycle the color can vary from batch to batch, for instance,” is how Wiese outlines one of the challenges faced. “Darker material absorbs heat better. The lower heating capacity requires less energy. This makes production more efficient yet means that adaptations must be made to the blow molding program on the stretch blow molder.” It is therefore essential that the effects are quantified, he continues. Another challenge is the intrinsic viscosity. “The longer the recycle is boiled under vacuum, the longer the polymer chains become. This means that the intrinsic viscosity increases and the quality improves. However, this results in additional costs which not everyone is prepared to invest,” Wiese adds. “Here, we have to come up with ways of redistributing the material from uncritical areas – the bottle base in the case of still water – to more critical zones.” Experience shows that manufacturers of premium brands – whose containers have thicker walls – have less cause for adjustment than discounters, where all of the lightweighting options have often been exhausted. This is where recycle can reach its limits.

In this context a technology developed by KHS in cooperation with inspection technology manufacturer Agr International scores points: Unit Mold Control, a digital, automated control system which regulates the blow stations on the InnoPET Blomax individually. It helps to control material distribution more precisely, reduces variations in the wall thickness by up to 30% and lessens any fluctuations in quality during stretch blow molding. “This is especially relevant when using recycled PET,” explains Frank Haesendonckx, head of Technology at KHS Corpoplast. “Here, the quality of the material can vary, meaning that the lower the preform weight, the greater the fluctuations in material in the bottle and the more unstable it becomes.” During continuous wall thickness inspection the new system identifies any unwanted material displacement and automatically counteracts this, states Haesendonckx. “Unit Mold Control combines weight reduction with bottle stability and is thus one of

the many sustainable and effective answers KHS has to the challenges thrown up by the current packaging debate.”

According to Bottles & Shapes™ expert Arne Wiese there are no convincing arguments against the use of recycled PET in beverage bottles. The only relevant difference he sees between virgin PET and recycled material is the slightly darker color. This is a question of sorting, however – and only really visible in water bottles. With other beverages, such as the Beyond Juice bottle developed by KHS which is made entirely of recycle, the consumer would not even notice the difference once the bottle is filled. As far as the mechanics are concerned, there is nothing to stop companies converting to rPET, providing ideal conditions for the creation of a functioning circular economy.

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Beyond Juice

Every aspect of the Beyond Juice container concept from KHS has been optimized to ensure the best possible recyclability.

share PET bottles

Water bottles produced by the share brand are made of 100% recycle. Each bottle sold donates a day's supply of drinking water to people in need.

Arne Wiese

"KHS is consulting with all of the major plastics processors regarding the further thermomechanical processing of rPET," states Arne Wiese, product manager for Bottles & Shapes™ at KHS Corpoplast.

Frank Haesendonckx

"We provide many sustainable and effective answers to the challenges thrown up by the current packaging debate," explains Frank Haesendonckx, head of Technology at KHS Corpoplast.

About the KHS Group

The KHS Group is one of the leading manufacturers of filling and packaging systems for the beverage and liquid food industries. The KHS Group includes the following companies: KHS GmbH, KHS Corpoplast GmbH and numerous subsidiaries outside Germany, located in Ahmedabad (India), Sarasota and Waukesha (USA), Zinacantepec (Mexico), São Paulo (Brazil) and Suzhou (China).

KHS manufactures modern filling and packaging systems for the high-capacity range at its headquarters in Dortmund, Germany, and at its factories in Bad Kreuznach, Kleve, Worms and Hamburg, where the group's PET expertise is pooled. The KHS Group is a wholly owned subsidiary of the SDAX-listed Salzgitter AG corporation. In 2018 the KHS Group and its 5,081 employees achieved a turnover of around €1.161 billion.

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