INNOVATIVE PROJECT AND SOLUTIONS TO REDUCE THE WEIGHT OF PET CONTAINERS AND BOOST THE DIFFUSION OF THE GREEN PURCHASE

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The focus of LIGHT PET project, as you can guess from the name, is PET as plastic material. The acronym P.E.T. stands for “polyethylene terephthalate”. PET is a thermoplastic material of the polyester family that in the amorphous state is transparent and which is particularly suitable for contact with food. These two important physico-chemical features mean that this material is mainly used for the production of containers for the beverages packaging and foods.

Having clarified this, one senses immediately that LIGHT PET is to mean a “lighter” PET, where lightness in this case must be understood as a lightening of the environmental impact of the material. At this first immediate intuition, it must be added that the project is aimed specifically on reducing the environmental impact of PET for packaging of beverages.

To give an idea of the scale of the problem on which the project LIGHT PET intends to intervene, is enough to recall what reported about the use of PET by the beverage and food industry: approximately 40% of the beverage which in 2010 were bottled in the world have been packed in PET containers; in the same year, in Europe, the beverage industry has consumed 2.4 million tons of virgin PET, i.e., PET manufactured from raw materials (not recycled), and the rate of increase of these figures is equal to 2% per annum.

To better understand the environmental impact related to this consumption, we must consider that to produce 1 kg of virgin PET, it takes about 1 kg of oil, 8.5 liters of water and 23 kWh of energy. Keeping as a reference the year 2010, it can be assumed that the use of PET containers for the beverage industry, during the same year, has led to the reduction of natural resources to 2.401 billion tons of oil, 20.4 billion of liters of water and 55 GWh of energy.
TARGET 1. Reduce the environmental impact. The project aims to develop and disseminate a new production process, based on a technology called “injection-compression” which has not yet been ever applied to this field of plastic materials, which will allow, in the first place, to reduce the amount of plastic material necessary for the production of a container, where a “container” in this context can be understood as both the bottle (which is the finished product) and the preform, the semi-finished product from which, by heating and blowing inside a mold, you get the bottle. The technology involved in the reduction of plastic material resides in the production process of the preform and not in that of the blowing of the bottle, which remains unchanged with respect to the existing machines. The technical problem, however, consists in being able to produce a lighter preform which in the subsequent blowing step enables to get a bottle with the same performance of the original one. In other words, it must reduce the thickness of the preform, but it must be only where this does not bring performance decrease on the bottle. If the new container process production will reduce the amount of PET in a certain percentage, then it could be said that the spread of this process on a large scale may lead to a reduction of overall consumption of virgin PET.

TARGET 2. Reduction of PET consumption. The LIGHT PET project aims to reduce the consumption of virgin PET even in another way: by allowing the use of a higher amount of recycled PET compared to that allowed by existing perform/bottle production process. This will be possible because the new technology, allowing for smaller temperature variations between perform and bottle production and lower pressure enables to make the overall process less burdensome from the physical-chemical point of view allowing the use of a lower grade PET or a PET mixture richer in recycled PET and less in virgin PET. The project will also bring other environmental benefits, such as the reduction of energy consumption, the elimination of the consumption of hydraulic oil and the elimination of the consumption of water and chemicals used in the actual process for the sterilization.

TARGET 3. Dissemination of results. The LIGHT PET project will disseminate the results to be obtained at all possible levels, starting from packaging industry, going to public authorities and reaching the consumers, in order to spread the importance of green purchasing.
The result of the LIGHT PET project takes the name of XTREME SINCRO. The system incorporates the three phases of the production of PET bottles: the production of preforms by injection-compression, preform conditioning and stretch-blow molding of containers at high speed.

1. Injection-compression preform production
2. Preform conditioning
3. Container production by stretch-blowmolding
The LIGHT PET project can be considered a technological breakthrough in the bottle production technology, being the first worldwide application of injection-compression technology in this field. Although the benefits that the project aimed to reach have been achieved already on the prototype developed (less consumption of PET, increased use of rPET, lower energy consumption, elimination of the hydraulic oil, etc.) it is clear that this technology will be the subject of subsequent enhancements.

One of these could be the achievement of an higher percentage of recycled PET than that which has been verified on the prototype machine and, on this specific aspect, the results obtained by PET LIGHT exceeded expectations (50%, already exceeds the 30% targeted value of the project). To date, the engineers do not exclude that even the ambitious goal of 100% recycled PET can be achieved. In this regard SIPA is already searching for prestigious collaborations in the treatment of recycled PET.

Another development, which could be carried out when the machine will enter the commercial phase, could be the design and production of a bottle with special geometry and functional features that can get the most in terms of resistance and therefore minimize the material used, reducing the thickness at key points (neck and back). In this way the “real” limit of the new technology can be tested.
Concerning the conditioning phase (IRCA rotational oven) there may be new developments, given that the testing has revealed that the oven prototype is slightly oversized for use. This occurred because the technology was completely innovative and the engineers were cautious in the design phase to not risk failure. The know-how acquired by IRCA through the LIGHT PET project would put the company in a position to improve that component, while in the medium term, the company could also develop its own technology for the key components of the oven or ceramic rings.

The system, which already incorporates the advantages of the two phases of integrated production of preforms and bottles, can easily be connected to a third element of the bottling line, the filler, creating a single block for containers production and filling which is very compact and more hygienic. In this way, in fact, the bottles do not need to be rinsed before filling phase with relative saving of water and chemical agents.

Finally, as regards the promotion of green products, the project partners will try to make sure that in the future a bottle produced with technology XTREME acquire certification MEPA regarding green purchasing of public administration. Since this certification relates to sold food and beverage, on this opportunity will have a dominant role the beverage manufacturer, but the partners are confident of being able to reach this goal.
LIGHT PET PROJECT
PARTNERS

For more than 25 years SIPA has specialized in various technologies for production (as well as filling and packing) of PET containers, from the preform to the final product. Its extensive product range includes equipment for production of preforms as well as single-stage injection-stretch-blow molding systems and stretch blow molding equipments (both rotary and linear), filling monoblocs, process equipments and the full range of robotized and palletizing solutions. SIPA is also a moldmaker for blow and preform injection system and it also has an important bottle design and engineering operation at the service of its customers. Headquartered in Italy, the company can rely on 18 sales branches, four manufacturing facilities (two sites in Italy, China and Romania) and 30 service centers for fast access to service, parts, and expert engineering support.

IRCA -Zoppas Industries Heating Elements Technologies boast an experience of over 40 years in design and production of heating elements and systems, even completed with thermal controls for domestic and industrial applications. Thanks to its business units' high specialization in the different application areas from major to small domestic appliances and from comfort conditioning to the industrial market, IRCA has solid competence and steady innovation in developing tubular heaters, cartridges and band heaters, etched foil, thick film, heating cables, stitched wire heating elements, finned aluminium heaters, functional assemblies, and electronic controls.

PROPLAST Consortium for the promotion of the plastic culture was created in 1997 with the aim to promote the plastic culture in Italy. Originally created by Bayer, Basell, Guala and Mossi & Ghisolfi Group. PROPLAST is a R&D body focused on applied research and pilot-scale demonstration activities in the field of polymer processing. It is composed of an industrial consortium which includes 210 enterprises and the major Italian plastic industrial associations.
The LIFE program is the EU’s funding instrument for the environment. The general objective of LIFE is to contribute to the implementation, updating and development of EU environmental policy and legislation by co-financing pilot or demonstration projects with European added value. LIFE began in 1992 and to date there have been four complete phases of the program (LIFE I: 1992-1995, LIFE II: 1996-1999 e LIFE III: 2000-2006, LIFE+ 2007-2013). During this period, LIFE has co-financed some 3104 projects across the EU, contributing approximately 2.2 billion to the protection of the environment.