Brussels, 25th June 2012

The Technical Committee of the European PET Bottle Platform (EPBP) has evaluated the effect of ***PET grades manufactured using monomers derived from renewable resources*** on the PET recycling stream.

Several processes have been announced that allow the production of monomers that can be used to manufacture PET and "PET-like" polyesters starting from renewable resources like food and food scraps (corn, sugar cane, ...), biomasses and waste (wood chips, switchgrass, stalks, algae, compostable city waste, ...). Some of those processes have already reached or are close to reach industrial scale. The replacement of the traditional monomers with the ones derived from renewable resources can be either total or partial.

The PET grades manufactured using those monomers are sometimes identified with proprietary names, that highlight the point that the polymer is at least partially manufactured using monomers deriving from renewable resources.

The impact of those resin grades on the PET recycling stream falls into two main categories:

1. Monomers or co-monomers derived from renewable resources that have the same chemical structure and meet comparable purity criteria with the corresponding monomers originating from traditional petrochemical synthesis. Renewable resources may be used as the starting point to manufacture one or more of the standard monomers and co-monomers used for PET production, such as Terephthalic Acid (PTA), Isophthalic Acid (IPA), Ethylene Glycol (EG), Di-ethylene Glycol (DEG), Cyclohexanedimethanol (CHDM). If the monomers and co-monomers manufactured from renewable resources have the same chemical structure and meet comparable purity criteria, they are virtually indistinguishable from those derived from traditional (fossil) origin and can be differentiated only by means of very sophisticated analytical investigations. As a result, the final resin is virtually indistinguishable from the corresponding standard PET grade made from monomers derived from fossil (i.e. non renewable) sources. The resin properties and performance, including its recyclability, are not affected by the use of raw materials of different origin. Renewable resource polymers are no different from PET; they are fully recyclable and will result in the same rPET quality as a conventional PET grade. The differences between a PET grades partially or totally derived from renewable resources and standard PET grades are not in the polymer or in its building blocks, but in the choice of the starting raw materials and in the upstream processes and the chemical synthesis of the monomers and co-monomers. Once the polymer building blocks have been synthesized with a purity level suitable for use in an industrial PET production plant, which requires raw materials of very high quality for the PET polycondensation reaction to proceed, they are virtually identical and there are no significant differences between the outcome of the two manufacturing routes. A typical example is the production of PET using ethylene glycol (EG) made from ethanol, which in turn derives from biomass fermentation processes. If

a PET grade that has been made using EG originating from biomass fermentation processes is compared to the corresponding PET grade which has been manufactured using standard EG of petrochemical origin, no difference in the polymer properties and performance is found. This is a consequence of the fact that both monomers have the same chemical structure and in order to be suitable for PET synthesis, the EG must meet strict purity criteria. The difference between the two is in the production process of the EG. Once the EG is made, the PET production process and the related chemistry are the same.

2. Monomers or co-monomers derived from renewable resources that have a different chemical structure than monomers already used in PET production. If the monomers manufactured from renewable resources have a different chemical structure than those commonly used for PET production, the result is a polyester resin with a composition that is different from that of PET. This situation has more to do with the total or partial replacement of one or more monomers or co-monomers than with the origin or the process used for the manufacture of the replacement monomers themselves. In other words, the way the new monomers or co-monomers are manufactured, whether from renewable or fossil resources, is secondary to the fact that they are structurally different than monomers routinely used for PET production and th difference leads to a polyester resin that has a different chemical structure and can have different properties. As a consequence, the final resin may perform in a different way than a standard PET grade. These differences may also extend to its recyclability. Due to the wide number of chemical compounds that can be potentially used as a replacement of the monomers used for PET production, it is not possible to generalize conclusions. Each replacement monomer or co-monomer needs to be investigated and the recyclability of the resulting PET variant must be assessed on a case-by-case basis, following the same criteria that are used for the evaluation of the recyclability a new PET grade, modified with the addition of a new co-monomer or the total or partial replacement of an existing monomer or co-monomer with a different one. A typical example of this is the use of Furandicarboxylic Acid (FDCA) as a partial or total replacement of PTA or IPA. Due to the fact that FDCA has a different chemical structure, the resulting polyester has a different composition than a standard PET grade made from PTA or IPA. This is regardless of the fact that FDCA is manufactured from renewable or fossil resources.
