

The plastics recycling industry and biodegradable films

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The controversies and uncertainties around the effect of biodegradable films on recycling have urged the Recyclers to ask for immediate action.

The South African Plastics Recycling Organisation (SAPRO), on behalf of its members, insists that the usage of biodegradable additives in plastic films be stopped immediately.

Introduction

The plastics recycling collection industry is well established in South Africa; from pre-consumer industrial and commercial scrap right through to post-consumer domestic packaging materials. The *Plastics Recycling Survey* undertaken by Buyisa-e-Bag in 2006 showed a total of 172 000 tonnes of plastics recycled in 2005, including 28% of all PE-LD films produced locally.

The plastics recycling industry is concerned about the negative impact of biodegradable plastics on the current mechanical recycling industry. This concern was once again triggered by the introduction of biodegradable bread bags by Tiger Brands in South Africa.

Polyethylene recyclate is commonly used in extended lifetime applications such as builder's film, nursery bags, irrigation pipes, and the like.

One of the challenges faced by the plastics recycling sector over the past decade has been to build user confidence in the technical integrity of the recycled material and to demonstrate its ability to perform as a viable alternative to virgin polymer plastics. A concern is the increasing presence of biodegradable materials in the waste stream as this *will* attack the integrity of the recycled materials and products made thereof. A minor increase in failures would be significant in applications such as irrigation pipes or builders films. The growing confidence in recycled plastics will be eroded if this technical integrity is compromised.

There are many different biodegradable additives which are clearly defined in the Australian study done by *Nolan-ITU* and *ExcelPlas* published in October 2002¹. The additives currently in use in South Africa and of particular concern to SAPRO are also known as prodegradant concentrates, and are generally based on catalytic transition metal compounds such as cobalt-, iron- or manganese stearates. These metal remains could lead to other environmental concerns in the long run.

The prodegradant catalysts are so effective at sensitising polyolefins towards oxidative degradation that even low levels of such cross-contamination have the potential to destabilise large volumes of polyethylene recyclate. Even very low volumes of biodegradable films mixed into the recycling waste stream will contaminate the material. On microscopic level, pockets of degradable content undermine the integrity of the end product.

The delayed action of the biodegradable additives will prevent recycling companies to detect the onset of the degradation process of the additive during manufacturing. Failures of recycled products (like irrigation piping and damp proofing) will be detected during application of the product where the consequential damage will be the highest.

¹ <http://www.environment.gov.au/settlements/publications/waste/degradables/biodegradable/pubs/biodegradable.pdf>

International concerns

Internationally, the plastics recycling industry is expressing its concern with regards to biodegradable polymers in the waste stream. Mark Burstoll, the chairman of the British Plastics Federation Recycling Council warned in October 2007 that *the presence of biodegradable packaging in the recycling stream represents "a short route to disaster"*. Film streams are another concern, he pointed out, since much of the recyclate from this sector is used in damp proof applications. "Film is much more difficult to sort with potentially disastrous consequences for quality and reliability," he told². The Australian study mentioned earlier clearly echoes these concerns expressed by the BPF recycling council. John M. Amos of the University of Missouri in the USA stated³ "it is not known what really takes place in degradation and if there are any harmful consequences. Unfortunately, degradable plastics cannot be recycled back into the raw material stream."

Even the suppliers of the prodegradant additives⁴ are stating, "Ensuring that the output material is not degradable is a little more complex. Oxo-biodegradable plastics when first manufactured contain an appropriate amount of process aids to make the products suitable for purpose. Some, if not all, of these process aids are consumed in the course either of the initial extrusion or subsequent heating during recycling."

In other words, for the Recycler to ensure that his material or products made from this material will not degrade during its application, more processing stabilisers need to be added to the regrind. However, the subsequent level of added protection will depend on the degree of degradation that already took place at the time of recycling. There is not yet adequate scientific proof that degradation can actually be stopped once triggered.

Incoming waste streams

Tiger Brands have been quoted saying "Recycling such flimsy film is not viable from a collection aspect and so converting to biodegradable packaging is the optimal answer". Clearly, Tiger Brands was miss-informed with regards to the recyclability of bread bags and the extent to which it is recycled. These bread bags are not flimsy – they are around 20 microns thick compared to plastic carrier bags of some 24 microns minimum. It is a great pity that they not contact SAPRO or any of its members or the Plastics Federation to verify their beliefs.

Bread bags are an integral part of the incoming waste stream for recycling and have been recycled for many years. In 2005, more than 40 recyclers were doing post-consumer recycling in South Africa, including bread bags. Bread bags are represented mainly in waste streams from the agricultural sector (specifically pig farms), shopping centres and landfills. The normal sorting and separation facilities cannot distinguish between packaging films of different suppliers, e.g. Sasko, Albany, etc. The thickness of PE-LD plastic bags is not a discerning factor in the high volumes of PE-LD films dealt with, i.e. it is being recycled. Currently, bread bags are present in most post-consumer waste streams and therefore SAPRO expects that it will have a major negative effect on existing plastic recycling operations. Increasing usage of biodegradable films is in conflict with separation at source initiatives. "Consumers are confused when it comes to separating biodegradable, compostable and recyclable plastics," according to a study by the Waste and Resource Action Programme (WRAP) in the UK⁵. The same will happen here.

² http://www.prw.com/homePBP_NADetail_UP.aspx?ID_Site=818&ID_Article=23796&mode=1&curpage=87&mode=1

³ <http://extension.missouri.edu/explore/wasteman/wm0002.htm>

⁴ <http://www.degradable.net/how/recycling.shtml>

⁵ http://www.prw.com/homePBP_NADetail_UP.aspx?ID_Site=818&ID_Article=24627&mode=1&curpage=0&keyword=4%20May%202007&x=24&y=3

Biodegradable additives

It is well documented that this specific prodegradant is very effective in degrading plastic. Research documents point out that the OIT's (measurement of the ability of a polymer to resist degradation) of biodegradable films are reduced from 185 minutes to less than 3 minutes⁶.

Symphony claims that the addition of processing stabilisers could stop the degrading effect of the prodegradant. Recycling profit margins and processes do not allow for the addition of these very expensive processing stabilisers. However, the effectiveness of these additives in stopping the degradation process has not yet been adequately established.

Market applications for recycled films

Applications are many and varied. Wherever the quality of the recyclate is such that it can be used to produce a satisfactory end product, at a lower cost than using virgin material, it will be used. Many of the recycled polymer applications are in extended life-time products like under-tile film, damp proofing, irrigation pipe, etc. Typical short to medium term applications are refuse bags, furniture covers and bags for chopped wood. It is neither practical nor viable for the recycling industry in South Africa to manufacture dedicated grades for durable and non-durable applications.

Litter and Landfills

Biodegradable plastics will not solve the litter problem as "new" plastics litter will always enter the litter stream on a daily basis. The visual impact of plastics litter will not be reduced by the introduction of biodegradable packaging. Jan Bickerstaff, a director of Incpen⁷ (The Industry Council for Packaging and the Environment) stated in 2005 that "biodegradable materials do not disappear within an acceptable time-span if littered, neither especially do they encourage individuals to be more responsible for their actions".

Studies have shown that very little bio-activity takes place in landfill sites and the complete biodegradation of polymers in landfill sites is highly unlikely. A group of anthropologists, including Bill Rathje⁸, working on landfills said "landfills are not vast composters; rather, they are vast mummifiers. There is biodegradation, but its pace is measured in centuries, not decades."

Conclusion

Plastics product design must be accompanied by a full life-cycle assessment in order to verify its impact on the environment or the recycling industry.

The plastics recycling industry has developed into a stand-alone industry and contributes significantly to environmental issues by supplying an alternative to virgin materials. They create job opportunities directly through the recycling process and indirectly through the collection industry. These are mainly unskilled labourers. The plastics recyclers have been denied the opportunity to import waste from Europe, in order to protect the local collection

⁶ <http://www.degradable.net/credentials/performance.shtml>

⁷ <http://www.incpen.org/resource/userdata/incp1/docs/Pira5July2005.pdf>

⁸ <http://query.nytimes.com/gst/fullpage.html?res=9E0CE6DA163CF936A35754C0A964958260&sec=&spon=&pagewanted=1>

industry and they now expect the same protection in the irresponsible usage of biodegradable additives.

The plastics recyclers in South Africa consider the inclusion of bio-degradable additives into products that are extensively recycled as a major threat to the industry.

“There are still a lot of unanswered questions on biodegradables in various disposal environments and more research is required to establish if biodegradable plastics can offer any long-term benefits to the environment⁹.”

Till then, mechanical recycling is a viable and sensible way of reducing the impact of waste plastics on the environment and needs to be encouraged. Decision makers such as Brand owners and specifiers must rather focus on designing packaging for recycling.

The internationally accepted and practised waste management hierarchy is: “reduce / re-use / recycle / recover / landfill” – in that order. Biodegradation prevents re-use and recycling of packaging which is just not acceptable. It flies in the face of the South African Government’s strategies to introduce waste management at a Municipal level that is based on formal recycling initiatives.

Compiled and issued by SAPRO on 14 May 2008, for further information, contact Annabé Pretorius on annabe@absamail.co.za or on 083 654 8967.

⁹ <http://www.environment.gov.au/settlements/publications/waste/degradables/biodegradable/pubs/biodegradable.pdf>