

Guidance on sorting and processing of plastic bales for MRFs

Zero Waste Scotland commissioned a trial study and report into plastic bale sorting and reprocessing with collaboration from a number of plastic sorting and reprocessing facilities from within the UK. Following the results of these trials, and from discussions held with UK plastic sorters and reprocessors and those from overseas, a number of key findings have been identified in terms of how independent MRFs in Scotland and other UK nations should process and present plastic bales to sorters and reprocessors. This document presents these key 'messages', as well as providing guidance on how bales should be presented for sorting and reprocessing.

1 Background

It is important to recognise that the term 'mixed plastics' has a number of different interpretations and meanings within the waste and recycling sector. For some the term refers to mixed high density polyethylene (HDPE) and polyethylene terephthalate (PET) bottles, to others it refers to a mixed stream containing a number of different polymer types such as HDPE, PET, polypropylene (PP), polystyrene (PS) and polyvinyl chloride (PVC) and both bottles and non-bottle rigid packaging. For the purposes of this document the term mixed plastic bale refers to a bale containing only HDPE, PET and PP in the form of bottles and other non-bottle rigid packaging.

Trials were carried out using different bale types and compositions at each of the sorting and processing facilities in order to understand the quality, practical and cost implications of using each bale category. The trials were designed to gain an understanding of the practical processes that the bales go through and how plastic sorters and reprocessors operate in order to determine how MRFs can supply plastic bales which are easier and more cost effective to recycle.

The scope of the project also included discussions with plastic sorters and reprocessors from North America, Europe and the Far East to determine their requirements both in terms of composition and presentation when sourcing plastic bales from the UK and in particular Scotland.

The UK trials took place using the standard plastic processing lines available at each of the participating plastic sorting and reprocessing facilities. Each facility was supplied with baled plastic feedstock that was compliant with their processing capability. Discussions were held with members of the management team at the plastic sorting and reprocessing facilities to understand their requirements in relation to bale composition and quality in order to be able to give feedback to MRFs. The practical aspect of handling and processing the baled material was also explored in discussions with staff at each facility in order to be able to advise MRFs on the best way to present bales, for example in terms of preferred mass and tying of the bales.

An economic assessment was carried out using a generic MRF model to estimate the cost benefits that could be obtained from producing mixed polymer bales rather than separate clear PET and natural HDPE bales. The analysis shows that it is possible to achieve an increase in revenue in the region of £150,000 pa due to a greater yield of saleable 3D plastic when producing mixed bales (based on a MRF with a capacity of 25,000 tonnes per annum). This is because pots, tubs and trays can be included, and more HDPE and PET can be recovered due to two sorts being done on one material stream and the recycle loop. In turn, this reduces the residue which must be landfilled, which is primarily where the difference in revenue comes from.

2 Bale composition

UK plastic sorters and reprocessors will buy mixed plastic bales (HDPE, PET and PP bottles and non-bottle rigid packaging) if this is produced as a high quality output with minimum contamination and of a measureable quality from MRFs. The key message is for independent MRFs to maximise the yield of plastics separated by sorting on the following polymer types for both bottles and non-bottle rigid packaging:

- PET;
- HDPE; and
- PP.

Contamination should be minimised by eliminating:

- Polyvinyl chloride (PVC);
- Polystyrene (PS);
- Paper;
- Plastic film;
- Glass;
- Metal; and
- Tetrapaks.

Independent MRFs should concentrate on their key business of separating out the key material streams (paper, card, metals, glass, plastics), enabling plastic sorting and reprocessing facilities to focus on their key activity separating the mixed plastic fraction into high quality single polymer streams.

Plastic sorting and reprocessing facilities would like MRFs to treat mixed plastic bales as a commercial product and these should be positively sorted, rather than containing what is left on the belt once other material streams have been removed. MRFs should be able to produce a high quality plastic stream to commercial specification for sale to sorters and reprocessors.

Non-UK sorters and reprocessors may have different requirements. There is no single business model and some will take mixed plastics while others prefer polymer sorted bales. The requirements of each sorter and reprocessor will vary and specifications should always be discussed with the potential customer.

3 Presentation of bales

The following information provides guidance to MRFs on how best to present plastic bales to plastic sorters and reprocessors. There was general consensus amongst UK plastic sorters and reprocessors on these issues.

3.1 Bale ties

Preference was expressed for bales to be held using five or six baling wires in a single direction (see

Figure 1). Fewer than five wires means that if one should break then the material can easily spill out of the bale. A greater number of baling wires increases the time taken to cut the wires if doing so manually, or can cause blockages if using a de-baler. Using wires running both horizontally and vertically (see Figure 2) makes cutting the wires awkward and is time consuming. None of the sorters and reprocessors expressed a preference for plastic ties which can break easily upon impact with a sharp edge from another bale, causing material to spill out of the bale.

Figure 1 HDPE bale held with vertical wires only



Figure 2 Mixed plastic bale held with horizontal and vertical wires



3.2 Bale mass

It is helpful if bales are densely packed so that they take up less space during haulage and storage at the facility. The preference is for bales of around 500 kg or slightly more as they can still be handled relatively easily.

3.3 Material shape and crushing

Cylindrical objects such as bottles should be crushed flat to avoid a drop in yield which can occur in several ways. Cylindrical items can roll-back on conveyor belts which can cause blockages or lead to a loss of material as it spills off the belt during processing. It is also difficult for near infrared equipment to detect and target cylindrical bottles and useful material can be lost this way. Bottles which remain full of content cannot be ejected by near infrared detectors as they are too heavy and so will be lost as residual material.

3.4 Extent of baling

There is a preference for material that has only been baled once; this is because baling physically breaks up the bottles to some extent (for example cuts the necks off). If material is baled several times a significant number of bottles can be broken up and will be recovered as 'pots, tubs and trays' which is lower value material.

3.5 Contamination

Some contamination with dirt, liquid residues, paper, film and metal is expected but should be kept to an absolute minimum. Most facilities can handle low levels of contamination but higher levels can cause a decrease in the throughput rate as the processing lines must be stopped to clear blockages. The presence of contamination should be reflected in the price of the bales. Large items should be removed from bales to avoid damage to machinery.

3.6 Composition

Mixed plastic bales can contain a relatively higher percentage of non-useful plastics such as PVC and PS, which is difficult to process and can cause contamination to the final product. Plastic sorting and

reprocessing facilities would welcome the opportunity to buy positively sorted mixed bales containing PET, HDPE and PP with contaminants, non-target plastics and large items removed, as outlined previously.

3.7 Moisture content

Moisture content should be kept to a minimum to avoid causing blockages not only in sorting, but also after granulation as the flakes are conveyed pneumatically along the pipe work and these can become clogged-up. It is difficult for MRFs to directly control the level of liquid residues in bottles other than through educating householders at the collection stage. It is also difficult for MRFs to prevent increased moisture content due to bales being stored externally due a lack of internal storage space.

It is essential that MRFs discuss the specification of the output materials they produce with their customers to ensure they are producing material that is required. The exact requirements will vary and specifications should be agreed. Sorting and reprocessing capacity is growing in the UK, with more facilities able to handle and sort a range of polymers.



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