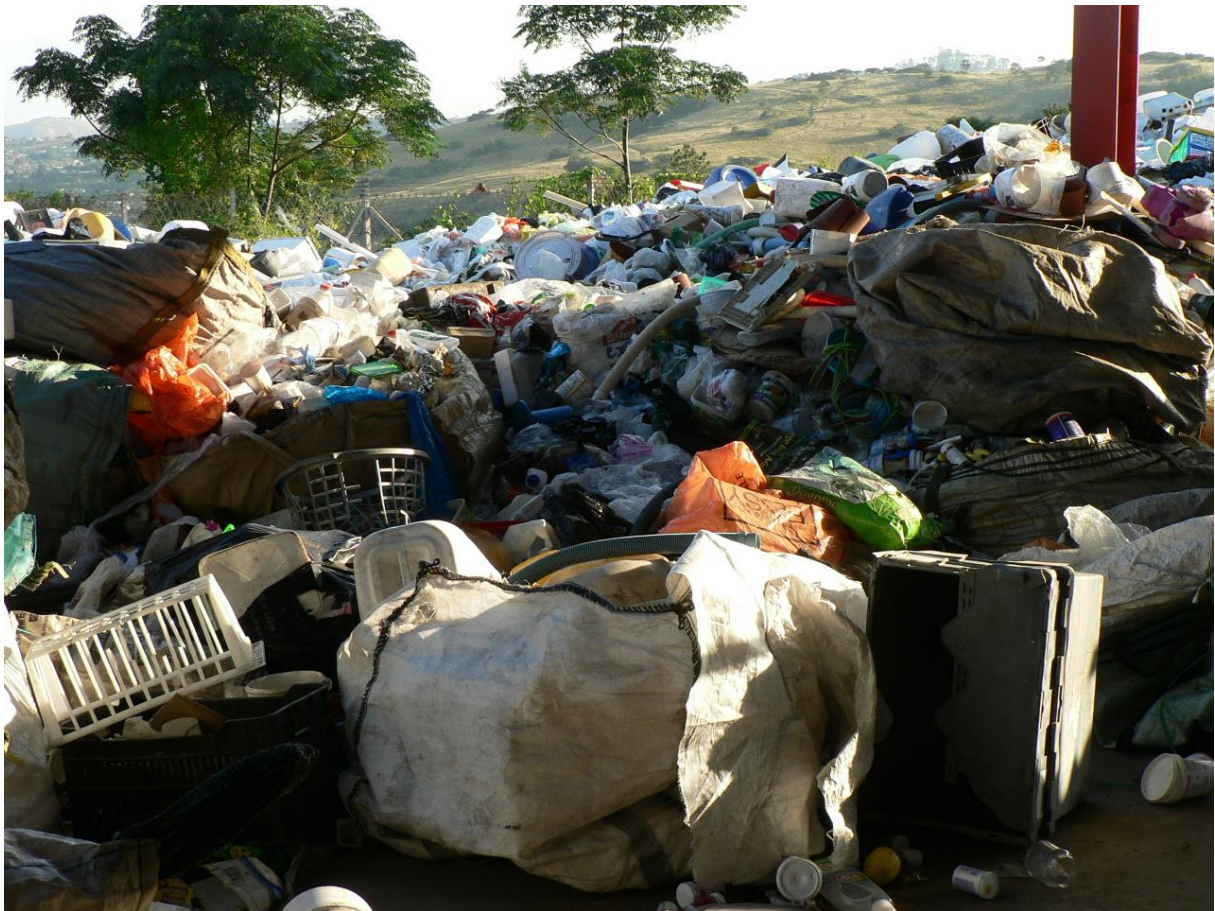


HOW TO START A RECYCLING BUSINESS?



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2 INTRODUCTION

Legislation puts more emphasis on waste avoidance, minimisation, reuse and recycling. Government published various reports on the waste economy and the value of waste. It is often said that “waste is money”. As a result, many see an opportunity in collecting waste for recycling.

What are these opportunities and what should be done to establish a successful recycling business?



3 RECYCLING

The recycling process consists of a number of steps. They are:

- (i) Collection,
- (ii) Sorting,
- (iii) Compression, and
- (iv) Transport to a waste beneficiation company or recycler.

From this point onwards, it all depends on what material it is and who the waste beneficiation company is.

For metals, paper and glass, the sorted, compacted waste is procured by the raw material producer who uses it as an alternative incoming material. For plastics, the recycler is not the raw material supplier and a different value chain is followed.

The first four steps are the same for any material, being it glass, paper or metal.

3.1 WHAT IS WASTE?

According to the Waste Act¹, “waste” means:

any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, by the holder of the substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3 to this Act.

The Minister may also define products not included in Schedule 3 as waste.

Waste ceases to be a waste one it has been re-used, recycled or recovered.

¹ https://www.environment.gov.za/sites/default/files/legislations/nema_amendment_act59.pdf

Waste (rejected, unwanted, abandoned, discarded) materials can be selected from any of the links in the product life cycle. Products collected earlier in the cycle are of high demand as it is normally cleaner and in a better state. The bulk of the material, however, only becomes available as waste at the end of its useful period, when it is discarded.

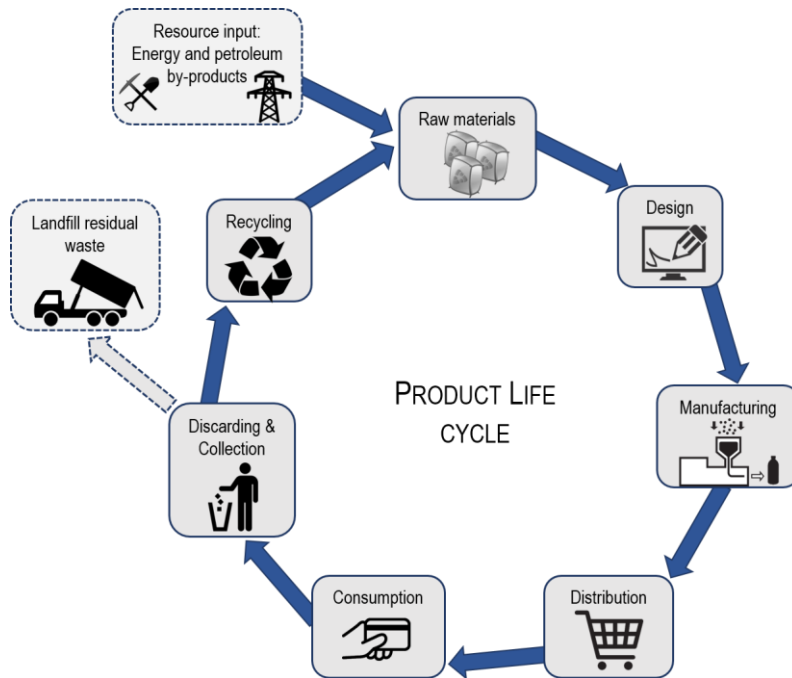


Figure 1: Product Life Cycle - schematic

4 MUNICIPAL SOLID WASTE

Domestic waste or municipal solid waste is made up of a number of different materials. The actual make-up is determined by the income level of the household, the area where the waste is discarded, e.g. urban, rural or deep-rural. Waste originated from domestic use is different to waste coming from shopping centers or a commercial district. All waste, however, consists of:

- Food waste
- Plastics
- Glass
- Cans
- Paper and Cardboard
- Garden waste
- Builder's rubble
- General waste

The various concentrations vary from bin to bin.

To establish a successful recycling centre, the more of these components that can be catered for, the better. Each of these materials have market forces influencing their economic cycles and when the one product is in a low/no demand cycle, some of the others will be more economical.

It is essential that the centre is equipped to deal with the chosen materials and that skills and knowledge exist for the particular streams.

5 SOURCING OF RECYCLABLES

How would recyclables be sourced? This will depend to a large extent if the recycling centre has its own transport or not. The various options are:

5.1 WASTE PICKERS

A common sight in South Africa is the presence of waste pickers on the streets. These guys would select recyclables from waste bins to be resold for personal income. Transport happens to be whatever the individual could access. In only a handful of instances, trolleys or bins were made available by industry. Improvised trolleys and shopping trolleys are most often used and modified.



Figure 2: Waste pickers source their materials from bins on the curbside, shopping centres and landfill

Waste pickers can bring the collected recyclable to the recycling centre or the contractor can collect from designated collection spots.

5.2 LANDFILL PICKERS

Pickers living on or near municipal landfills select specific materials from the landfill which is then sold for personal income. Communities on landfill are typically organised in different classes and the more senior pickers have access to more profitable waste streams. Contractors will collect at the landfill from the pickers, weigh the recyclables and remunerate on the spot.

5.3 BUYBACK CENTRE

Different names exist for these centres. In the case of a buyback centre, consumers, public, waste pickers, or anyone can bring recyclables to the centre and gets remunerated accordingly.

5.4 DROP-OFF CENTRE

Some municipalities have provided land for drop-off centres where the public can drop-off recyclables, garden refuse and anything that cannot, or should not, go into the formal domestic waste system. Contractors can then service these centres to access the recyclables. Often, contractors would provide some man-power at the drop-off centre to assist the public to off-load and to ensure that the material is placed in the correct bins.



Figure 3: Example of a municipal drop-off site

5.5 DOMESTIC SERVICE

Where there is no municipal waste collection service, the recycling centre can opt to provide such a service with special incentives for the public to separate its recyclables from the non-recyclable waste.

Some waste facility then needs to be available for general waste, such as a skip or container that can be managed responsibly.

6 LAY-OUT OF CENTRE

Any recycling centre must have some basic requirements. These would vary from centre to centre and would be determined by the size of the operation, its location and the basic services available.

6.1 LAND

A basic requirement would be access to land. It can be private property or a lease from the local council. Ensure paper work is in place to who owns the land, when the contract expire and who is responsible for what. The land should be fenced in with a locked gate.

Storm water trenches or ditches should be in place to ensure that storm water from the surrounding areas are not directed through the site.

The property must be accessible from the road to facilitate collection of compacted materials by truck. Once well established, these trucks can be as big as an interlink.

6.2 FACILITIES

A scale is essential to weigh the incoming materials. To keep the scale safe and protected, it needs to be stored somewhere. A container that can be locked up at night or a basic building structure with a roof and a door can also suffice. The container can also house a small office space, table and chair, for the administration tasks like phoning for prices, collection or any other administrative function.

The staff needs some form of ablution facilities. It can be a regularly serviced portable toilet. Water to wash their hands and for drinking can be provided by a tank.

6.3 MOVING LOADS AROUND

Delivered recyclables can be moved by hand but once there is sufficient volumes, some mechanical means would make it easier and more effective. This can be a trolley-jack or any other mechanised trolley system.

Trolley jacks function better on a smooth surface and a concrete floor would then be advisable.

If the tonnages justify the additional expense, a fork lift can be hired for the heavier loads.



Figure 4: A2 Recycling in Krugersdorp using a trolley jack

6.4 STORAGE

Separate storage facilities need to be established for different materials and grades. These could be wire cages, large bins or any other designated space for each of the sorted material grades. Plastics are sensitive to sunlight and should be kept under a roof or cover. Paper and board needs to stay dry to maintain its value. Glass and cans can be stored in the open.

7 TRANSPORT

A small vehicle with a cage is also ideal for loads that need to be collected from the landfill, drop-off sites or shopping centres. Make sure large volumes can be accommodated, rather than heavy loads.

If you transport your own materials to, or from, the recycling centre, you need to be registered as a **waste transporter** with the Department of Environmental Affairs (DEA) or the South African Waste Information System (SAWIS). Loads must be secured that no loose pieces can fall off or be blown off.

Trailers can be manufactured according to specific requirements by most engineering workshops in South Africa.



Figure 5: Waste transporter

8 COMPACTOR

Once volumes are of such nature that space is problematic, a compactor is required to bale the waste in compressed units. There are horizontal balers, vertical balers and even hand balers. The different materials that need to be baled and the distance from the market will influence the choice of baler. PET bottles, cans and card board need stronger balers. Recycling centres far away from the markets will require harder/heavier bales to optimise on transport. Most balers work with 3-phase electricity and a power connection would therefore be required.

8.1.1 BALING MACHINE MANUFACTURERS IN SOUTH AFRICA

Baling machines are widely available. The recycling centre needs to make sure what size baler would be suitable for its specific requirements. Some suppliers are listed below:

- www.akura.co.za
- www.bulkmatechct.co.za
- www.humemachinery.co.za
- www.recyquip.co.za
- www.rubydust.webs.com

9 WHAT CAN BE RECYCLED

9.1 PAPER & BOARD

Various grades of paper can be recycled. More information can be obtained from the Paper Recycling Association of South Africa (PRASA) on their website www.recyclepaper.co.za.

Paper can be recycled many times but the fibres must not be damaged – keep paper dry.

9.1.1 DIFFERENT PAPER GRADES

Different recycled paper can be used for different applications and the recycling centre will obtain a better price if the material is properly sorted. The most popular grades are listed below:



K4 – Cardboard boxes



HL1 – White office paper



HL2 – Coloured paper



CMW – Common Mixed Waste



Flat news – Newspapers



IMW – Industrial Mixed Waste



Liquid cartons

9.1.2 MARKETS

PRASA would be able to put you in contact with the nearest recycled paper buyer. Recycled paper is used by the raw material producers to make new paper. It saves them the cost of growing, harvesting and preparing wood-pulp from specially planted forests.

9.2 GLASS

All container glass can be recycled. More information can be obtained from “The Glass Recycling Company” website www.theglassrecyclingcompany.co.za.



Figure 6: Recyclable container glass

No flat glass, automotive glass, fibre glass or lights and lenses cannot be recycled – only glass bottles and jars. Domestic glasses, tumblers and crockery like cups and saucers, or TV screens, are not recyclable either.

Broken container glass – to save space – can be placed in a container to contain the glass fragments. The Glass Recycling Company can in some cases assist with glass containers for recycling. These containers need special vehicles to uplift and transport them to the markets.



Figure 7: Special glass recycling banks

9.2.1 DIFFERENT GLASS GRADES

Although all container glass can be recycled together, better prices can be obtained if the clear bottles are separated from the green-, blue- and brown bottles.

9.2.2 MARKETS

The Glass Recycling Company would be able to put you in contact with the best markets for your glass containers. Recycled glass is used by the glass manufacturers in stead of processed sand. The recycling of glass uses less water, energy and raw materials than the original raw materials.

9.3 CANS AND TINS

All metal packaging can be recycled. Recycling centres compete with scrap metal dealers when it comes to metal recycling. More information can be obtained from Metpac or their website www.metpacsa.org.za. Metal packaging, made from aluminium or steel, is used throughout the retail, wholesale, commercial and industrial sectors. It comes in many shapes and sizes and can package virtually any product.

Metal cans can be emptied and flattened to save space. If no baler is available, the flattened cans can be stored in bulk bags.

9.3.1 DIFFERENT GRADES

There are only two grades of metal packaging, steel and aluminium. The use of a magnet will assist the sorter to differentiate between steel (magnetic) and aluminium(non-magnetic). Aluminium packaging will obtain much higher prices and it is economically more viable to separate steel and aluminium. The latter is also very valuable and should be kept secure in a container that can be locked.



Figure 8: Recyclable metal packaging

9.3.2 METAL PACKAGING MARKETS

Metpac-SA would be able to put you in contact with the various buyers. The raw material producers buy recycled metal packaging to use instead of ore as it saves a lot of energy to use recycled material. Metals are natural elements that maintain their physical properties forever. Once metal enters the material-to-material loop, in which it is recycled again and again, it will always be available for future generations.





9.4 PLASTICS







Plastics are part of our everyday lives. They keep our food safe and hygienically packaged. They are inexpensive to produce, easy to recycle and light to transport. There are many different types of plastics. To make it easy for us to identify the various types of plastics, an international *material identification code* has been established for all plastics packaging. The number in the triangle indicates what type of plastic was used to manufacture the product. Most plastic packaging can be recycled.




If **non-packaging** plastics products are marked, they should be marked at some place on the surface with the appropriate acronym set between > and < marks.

9.4.1 DIFFERENT TYPES OF PLASTICS

Table 1: Various polymers, their material identification codes and some product applications

Material	Packaging		Non-packaging	
	Material identification code	Product examples – not all recycled in South Africa	Material identification code	Product examples – not all recycled in South Africa
PET Poly(ethylene terephthalate)		Carbonated drink bottles, mineral water bottles, clear bottles; clear trays and punnets for fresh produce and meat; clear barrier films; labels, blister packs; strapping tapes	>PET<	Carpeting, fibres for apparel and industrial applications; machined engineering components
PE-HD High density polyethylene		Milk bottles, fruit juice bottles, drums, packaging films, carrier type shopping bags, tubs, closures, cosmetic bottles, crates, pallets, bins	>PE-HD<	Irrigation pipes, shade-cloth, netting, shopping trolleys, refuse- and wheelie bins, high pressure water pipes, optical fibre trunking, cell phone tower “trees”, conveyor rollers, ventilation ducting, automotive components
PVC-P Flexible Poly(vinyl chloride)		Cling film, pouches, cap liners, soft see-through bags for toys and bedding	>PVC-P<	Cable insulation, gum boots, shoe soles, flooring, matting, medical cloth and tubing, tarpaulins, hoses, safety gloves, soft toys, rain wear
PVC-U Rigid Poly(vinyl chloride)		Clear bottles, jars, blister packaging, food packaging, inserts like chocolate trays	>PVC-U<	Water pipes, high pressure pipes, conduit, profiles, cladding, stationery foils, plumbing, skirting, cornices, trunking, cooling tower packing, window frame profiles, gutters

Material	Packaging		Non-packaging	
	Material identification code	Product examples – not all recycled in South Africa	Material identification code	Product examples – not all recycled in South Africa
PE-LD and PE-LLD Low and Linear low density polyethylene		Packaging films, domestic cling film, stretch wrap, shrink wrap, bags, shrouds, dust covers, peel-able lids, cosmetic tubes, boutique shopping bags, bubble wrap, foam sheeting	>PE-LD<	Irrigation pipes, cable insulation, agricultural films, rotational moulded products like tanks and corner protectors
PP Polypropylene		Yoghurt tubs, margarine tubs, ice cream containers, wrappers, packaging films, bottles, caps and closures, canisters, strapping tape, woven bags, crates, buckets, strapping tapes	>PP<	Coat hangers, battery cases, reels, automotive components, bumpers, furniture, bowls, carpeting, non-wovens, bristles, hair extensions, appliances like toasters and kettles, toilet seats, ropes, fishing nets, fibres for apparel and industrial applications
PS and PS-HI Polystyrene (general purpose and high impact)		Yoghurt tubs, display boxes, clear trays and punnets	>PS<	Coat hangers, take-away cutlery, take-away crockery, toys, cups, plates, audio and video cassette housings, CD covers, housings, cell phone covers, stationery items
PS-E Expanded Polystyrene		Protective packaging, take-away food containers, clamshell packaging	>PS-E<	Vending cups, insulation panels, suspended ceiling panels, seedling trays
ABS Acrylonitrile Butadiene Styrene		Tubs, portion packs for margarine and jam	>ABS<	Cones, reels, bobbins, TV and other housings, toys, automotive components, telephone casings, signage
E/VAC Ethylene(Vinyl acetate)		Cap liners	>E/VAC<	Foam insulation for exercise mats, comfort shoes, shoe soles, hand grips, cable insulation
PMMA Poly(methyl methacrylate) or acrylics			>PMMA<	Signage, light covers, lenses, number plates, reflectors, automotive components, bath tubs, shower basins, mirrors, salad bowls, kitchen utensils

Material	Packaging		Non-packaging	
	Material identification code	Product examples – not all recycled in South Africa	Material identification code	Product examples – not all recycled in South Africa
POM Polyoxymethylene or <i>acetal</i>		Aerosol container valves	>POM<	Stationery components, automotive components, curtain accessories, cigarette lighter components, washing peg springs
TPU Polyurethane			>TPU<	Footwear, hoses, mining screens, automotive components
PC Polycarbonate		Re-usable water bottles	>PC<	Lighting, lenses, automotive components, CD's, DVD's, re-usable water fountain bottles, safety glasses, sight glasses, wine- and beer tumblers
PA Polyamide or <i>nylon</i>		Barrier film in meat- and dairy packaging	>PA< >PA GF15<	Automotive components, fishing gut, cable ties, fibres for apparel, zips

Which of these materials are recycled in South Africa, i.e. as a recycling centre you would be able to find at least one recycler that will buy your sorted, compacted plastics packaging from you.

9.4.2 PET

PET bottles are widely recycled. More information can be obtained from the PET Recycling Company or from their website, www.petco.co.za

Clear beverage bottles have the highest value and should be sorted separately. Coloured bottles, specifically green and brown, are also recycled, but attract in most cases a lower price. Check with your customer what his requirements are. Some recyclers have the ability to deal with the labels, neck rings and closures and other recyclers prefer the bottles without the closures. In all cases, the bottles need to be sorted and baled. If the recycling centre does not yet have access to a baler, the loose, sorted bottles can be passed on to a collector with a baler.

There are limited buyers of non-beverage PET bottles used for chemicals, domestic cleaning agents and food products. Currently, there is no market for edible oil bottles.

PET punnets, trays and lids are not recycled. PET strapping tape and thick sheeting used in skylights and roofing are not recycled, either. All bottles marked with a one in the three chasing arrows are recycled.

9.4.2.1 RECYCLED PET MARKETS

Recycled PET beverage bottles are recycled back into bottles and packaging sheeting used for thermoformed tubs and trays. PET bottles are also recycled into fibres for apparel and domestic use as well as for industrial applications in geotextiles, tyre manufacturing and automotive carpeting.

9.4.3 HIGH DENSITY POLYETHYLENE (PE-HD)

High density polyethylene consists of various grades. Each of these grades need to be kept separately as they would be recycled into separate products. More information can be obtained from Polyco or their website, www.polyco.co.za. However, identify some customers for the recyclable PE-HD and communicate directly with them with regards the format, quantities and specifications for the recyclable materials.

PE-HD is very popular as a recyclable incoming material stream and it would be worthwhile to do good preparation before rushing into collecting, sorting and compacting it.

9.4.3.1 PE-HD BOTTLES

Milk bottles, domestic cleaning agents and personal care bottles are popular for recycling. If space allows, keep food contact bottles separate from chemical bottles. There is also some demand for white bottles. For these you need to remove the labels, neck rings and closures.

DIY silicone cartridges are also PE-HD but is not recyclable. Ensure that there are no cartridges amongst the bottles. The residual silicon is not recycling-friendly.

9.4.3.2 PE-HD DRUMS

Although drums (anything bigger than 5 litre) are made from a similar grade than bottles, it is recycled in a separate stream due to the chemical nature of the residual contents. Drum grade is in high demand but not for human contact applications.

9.4.3.3 PE-HD CRATES

All crates belong to someone, normally the brand name on the crate. Crates can only be recycled if approved of by the brand owner. In areas far removed from the main stream traffic, it is advisable not to recycle crates. For non-branded crates, recycling centres need have a *Second hands Goods Permit* which can be obtained from the local police department. SAPPORO has some *Operating Procedures for the Recycling of Crates* on their website, www.plasticrecyclingSA.co.za. It involves the keeping of a log for the buying and selling of crate materials.

9.4.3.4 PE-HD PIPES

With the installation of optical fibre cables, many trunking off-cuts are becoming available for recycling. It is important to ensure that no lining materials are collected with the PE-HD pipes.

9.4.3.5 PE-HD CAPS AND CLOSURES

Caps and closures are made from a number of materials. Most beverage bottles have PE-HD caps and closures. They are slightly shorter and harder than the PP closures and very seldom have a gasket on the inside. Caps and closures can be recycled with crate material but should be kept separate in a bulk bag for the recycler.



Bottles



Drums



Crates



Pipes



Caps and Closures



Film and Bags

9.4.3.6 PE-HD FILM AND BAGS

Vest type shopping bags are made from PE-HD and for a couple of years have not been recyclable due to high levels of additives that render the recyclate useless. Since the beginning of 2018, brand owners and retailers have undertook to reduce the additive levels. Very few recyclers have started again to recycle PE-HD film grade. Some would buy it with their *mix and coloured PE-LD* film materials.

9.4.4 POLY(VINYL CHLORIDE) – PVC

PVC comes in two distinct classes, flexible PVC which is soft and rubbery and rigid PVC which is hard and rigid.

More information can be obtained from the South African Vinyls Association or their website, www.savinyls.co.za.

Very little PVC packaging gets recycled as there are not so much packaging in the waste stream. The biggest challenge with the recycling of non-packaging PVC is the various recipes that have been used to make the PVC. Some years ago heavy-metals have been phased out. Ducting and pipes coming into the waste stream now could be as old as 30 to 40 years and still contain heavy metals. The collector at the recycling centre would find it very difficult to identify the actual ingredients. Therefore, keep the products in as big as possible pieces.

9.4.4.1 RIGID INJECTION GRADE

Pipe fittings, plumbing fittings and some industrial taps can all be recycled together.

9.4.4.2 RIGID EXTRUSION GRADE

Mainly PVC pipes and ducting and trunking. Some expanded rigid PVC fascia and barge boards are also ending up in the waste stream.

Figure 9: Examples of PE-HD recyclable products

9.4.4.3 FLEXIBLE EXTRUSION GRADE – HOSES

PVC garden hoses, medical tubing (not contaminated!), irrigation tubing and small bore flexible PVC tubing are all part of the flexible extrusion grade.

9.4.4.4 CABLE GRADE

Copper is very popular for recycling and get good prices locally and internationally. Most of the cable covering on domestic- and industrial cables is flexible PVC. Waste pickers should be discouraged to burn copper cables to get hold of the copper. In open flame, PVC releases chlorine and the PVC is lost for recycling.

9.4.4.5 MEDICAL GRADE

Post-industrial medical PVC that has not yet been in contact with body fluids or blood can successfully be recycled. Adcock Ingram, together with the SA Vinyls Association, started a separation process in some of the larger hospitals to access the non-contaminated PVC tubing and drip bags. Once contaminated, it is classified as *hazardous waste* and cannot be recycled.

9.4.4.6 FOOTWEAR

Gumboots, shoe soles and many other smaller injection moulded flexible PVC components are recycled together for footwear applications.

9.4.4.7 RECYCLED PVC MARKETS

Very little PVC is only recycled to turn it back into products again. Many of the recyclers have chemists on their payroll or have access to chemists that can reformulate the material. Various ingredients are added to the recycled PVC prior to recompounding. These *regenerated* PVC grades compete with virgin grades in the market place. Rigid products like sewage pipes and plumbing pipes are often made from regenerated PVC. Very few shoe soles, locally or internationally, are made from virgin materials.

9.4.5 LOW DENSITY POLYETHYLENE – PE-LD

PE-LD is very similar to PE-LLD and for this discussion they are grouped together. It is the most widely recycled material in South Africa. PE-LD films are separated into three grades for recycling.

9.4.5.1 SMOKEY

Any unprinted and clear films can be recycled together. For better prices, remove all staples, sticky tapes and labels from the film. Clear bubble wrap is also classified as *smokey*. In KZN, these clear, unprinted film grade is split into *light Umgeni* and *dark Umgeni*.



Figure 10: Baled post-consumer PE-LD film waste

9.4.5.2 MIXED AND COLOURED

Film and bags with any amount of printing as well as coloured film are sorted together in this recyclable grade. Small quantities of PE-HD film and bag can be tolerated as well. Before refuse bags are added to the mix, check with the recyclers. Not all recyclers allow refuse bags to be part of the mix. Domestic film and bags used for general packaging of rice, apples, toilet paper, mattresses, shoes, etc. all form part of the *mixed and coloured* PE-LD grade.

9.4.5.3 PALLET WRAP OR CHAPPIES

A few recyclers can process sticky pallet wrap on its own and would then buy pallet wrap, also known as *chappies*, separately from the other film grades. Check with the recycler before starting to collect pallet wrap. If no buyer can be identified, small quantities of clean pallet wrap can be mixed in with the clear smokey grade.

9.4.5.4 NOT RECYCLABLE FILMS

Multi-layer films often contaminate the polyethylene film waste stream and immediately will reduce the potential revenue of the recyclables. Multi-layer films can be identified in that they tend to be thicker, more sturdy films and often the bags would have a flat seam. The bags are also often equipped with an inline zip. *Do not mix multi-layers with the PE-LD films!*



Figure 11: Examples of non-recyclable multi-layer packaging films

9.4.5.5 RECYCLED PE-LD MARKETS

The bulk of the recycled film would go back into packaging films for refuse bags, stronger, thicker bags for compost and braai wood or general shrouds for furniture. Builders films like damp course and under-tile films are also made from recycled PE-LD films. Irrigation piping for the agricultural industry and urban small-holding markets are made from *mixed and coloured* PE-LD films.

9.4.7 PP MARKETS

9.4.8 POLYSTYRENE – PS

9.4.8.1 EXPANDABLE PS

9.4.8.2 GENERAL PURPOSE PS

9.4.9 OTHER?

9.5 E-WASTE

9.6 ORGANIC WASTE

10 GENERAL COMMENTS

10.1 DOCUMENTS TO INCORPORATE

SAPRO membership application

Identification guide

Contacts for all recyclables