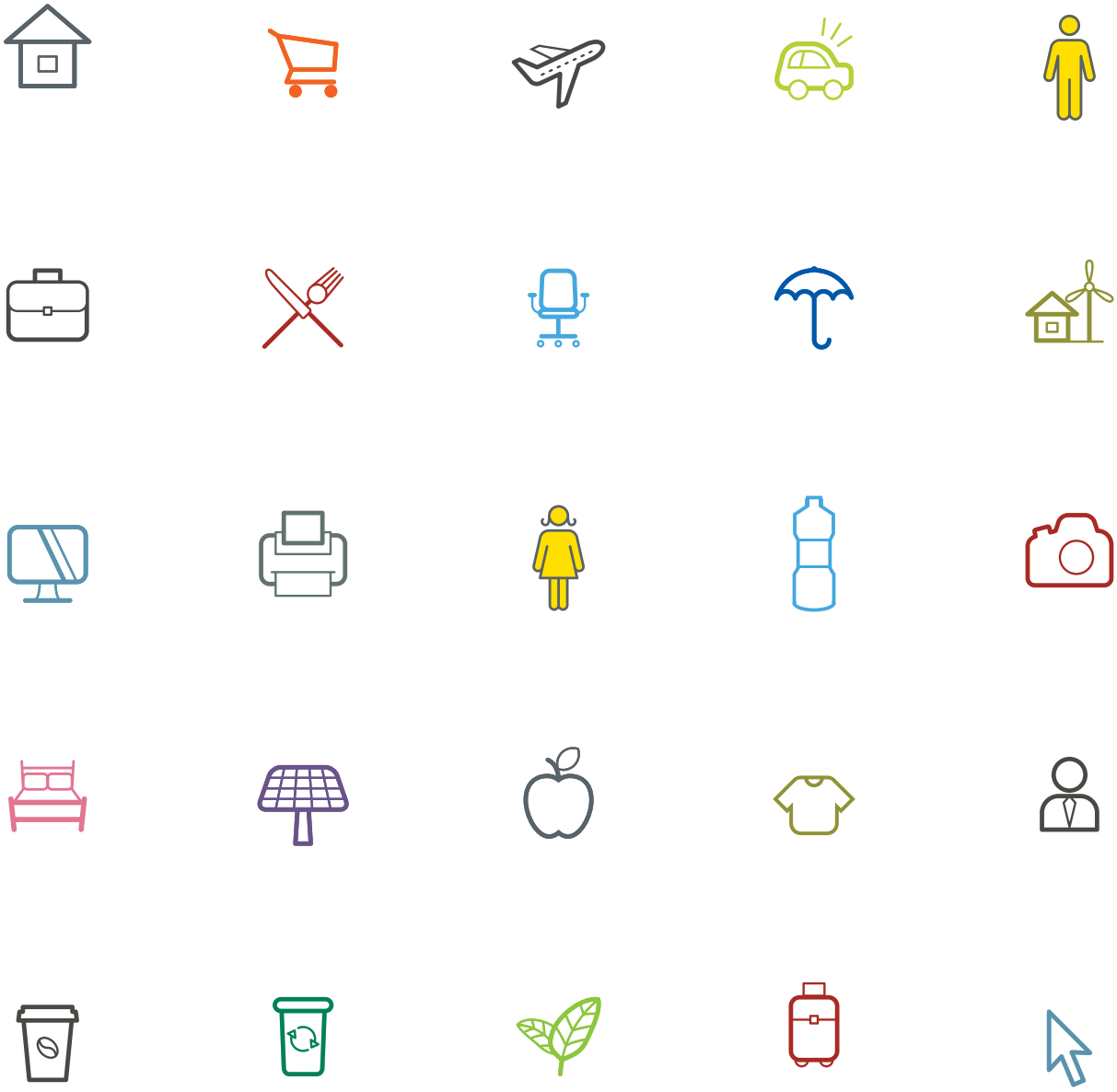
ALL ABOUT PLASTICS



PlasticsISA

www.youtube.com/Plasticsrfantastic

PlasticsISA

Plastics|SA

www.plasticsinfo.co.za

Polymer code

International polymer identification code used on products to identify plastics and ensure effective plastic recycling.

Recycling logo

The recycling logo indicates that the product is recyclable.

Plastic is versatile, durable and recyclable. It can be reused without any risk to your health or the environment.

Who are we?

Plastics and the environment

Where do plastics come from?

Plastics go back 150 years

All plastic food packaging is 100% BPA Free

Plastics recycling

1 PET

2 PE-HD

3 PVC

4 PE-LD

5 PP

6 PS

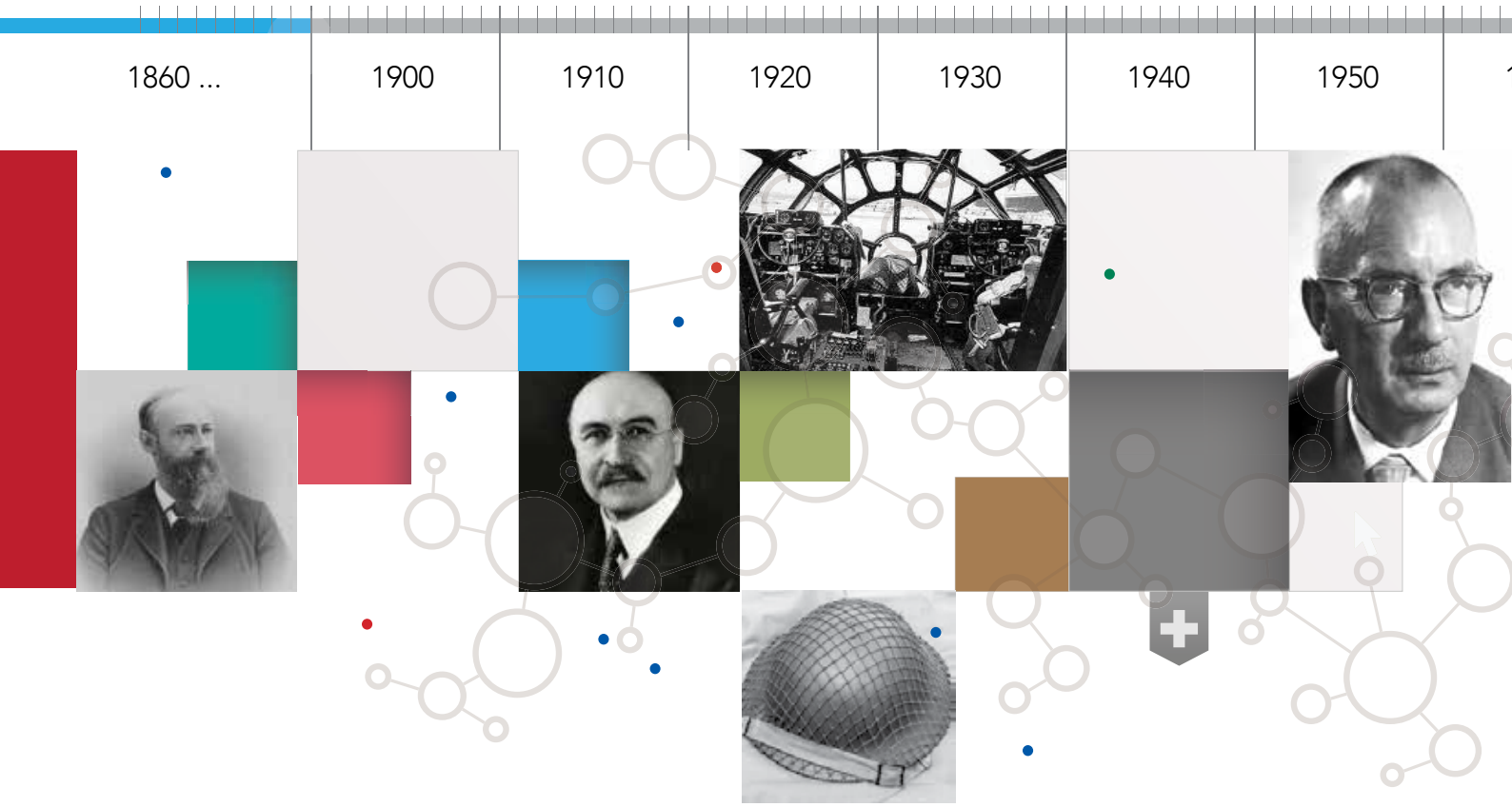
7 OTHER

The 20th century was filled with numerous inventions that greatly influenced the world; we sent humans to the moon, invented computers and discovered nuclear power.

The invention that made the most dramatic impact of all, was plastics.

PLASTICS

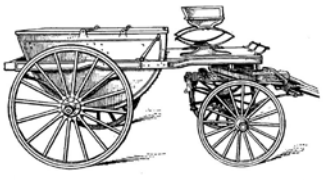
Let's **explore!**



PLASTICS go back 150 years ...

1860

The development of plastics is believed to have started around 1860, when a US pool and billiard board company offered a prize of $10 000 to the person who could design the best substitute for natural ivory.
One of the entrants, although not the winner, John Wesley Hyatt, developed a derivative for the contest. His product was quite successful commercially, being used in the manufacturing of products ranging from dental plates to men's collars.



Covered tip-cart for catch-basin refuse.

Over the next few decades, more and more plastics were introduced. Shortly after the turn of the century, Leo Hendrik Baekeland, a Belgian American chemist, found that when he combined formaldehyde and phenol, he produced a material that bound all types of powders together. He called this material Bakelite - after himself - and it was the first thermosetting plastic in the world. This material, once it set hard, would not soften under heat. It had so many uses and so many potential uses, that it was called the **material of a thousand uses**.

World War II

Plastics as a whole became very important in World War II. Plane cockpits were made of Perspex, polythene was used to insulate radar cables and plastic was used to make synthetic rubber for tyres. Germany was cut off quite early on from sources of natural latex and turned to the plastics industry for a replacement.
A practical synthetic rubber was developed as a suitable substitute. With Japan's entry into the war, the United States was no longer able to import natural rubber, silk and many metals from most Far Eastern countries. Instead, the Americans relied on the plastics industry.
Nylon was used in many fabrics and polyesters were used in the manufacturing of armour.
Advances in the plastics industry continued after the end of the war.

1960 1970 1980 1990 2000 2010 ...

Plastic Shell Equips Phone For Two-Way Listening

Two persons can share the same telephone with a device patented by Roger Heap of Lyme, Conn. Simple in design, it consists of a T-shape plastic shell which cups over the receiving end of the phone. The hollow arms transmit the message to listeners at both sides. Heap fashioned the device so that he and Mrs. Heap could join in three-way conversations with their son in Detroit.

154 POPULAR MECHANICS

1953 advert for Saran Wrap

1939 | 1953

Low density polyethylene was developed in 1939 by ICI in England. Plastics were being used instead of metal in machinery and safety helmets and even in certain high-temperature devices. Karl Ziegler, a German chemist, developed high density polyethylene in 1953 and the following year Giulio Natta, an Italian chemist, developed polypropylene (PP). These are two of today's most commonly used plastics.

1963

During the next decade, two scientists received the 1963 Nobel Prize in Chemistry for their research of polymers. More modern plastics include Teflon (used in non-stick pans), lycra (used initially in sportswear) and Dacron (crease and rot-resistant material used in sailing and tents). All of these have a background in the work done by Baekeland and his Bakelite.

... today

Today the search for new plastics continues. New and exciting plastics are constantly being developed, replacing other materials such as wood and glass.

We have now entered the age of polymers and plastics.

Source: http://dwb4.unl.edu/Chem/CHEM869E/CHEM869ELinks/qlink.queensu.ca/~6jrt/chem210/Page2.html

Plastics|SA

WHO ARE WE?

Plastics|SA is the umbrella organisation for the plastics industry in South Africa and plays an active role in the growth and development of the South African plastics industry.

Together with our associations we strive to address plastics related issues, influence role players and make plastics the material of choice. **Plastics|SA** represents all sectors of the South African Plastics Industry including polymer producers and importers, converters, machine suppliers and recyclers.

Our Focus Areas

Advocacy: accessing and influencing key decision-makers, policies and strategies that affect our industry.

Communication: relevant industry issues are shared with industry role players, the media and the general public.

Research: acquiring and compiling industry statistics, as well as research of strategic interest to the industry.

Training: developing career paths to meet the needs of the plastics industry, as reflected in the development strategy. Courses are accredited and NQF aligned.

Sustainability: in conjunction with the polymer groups providing strategic leadership to the plastics industry on environmental issues.

Member Services: are provided to companies who belong to their respective industry associations and pay the membership fees.

Address plastics related issues

Influence role players

Make plastics the material of choice

MEMBERS

Polymer Producers and Importers
Converters
Machine Suppliers
Recyclers

SUSTAINABILITY COUNCIL

1 PET 2 PE-HD 3 PVC 4 PE-LD 5 PP 6 PS 7 OTHER

Environmental Initiatives
Recycling

The plastics chain in South Africa employs over **60 000** (2013) people and is defined as a priority sector by Government.

The **combined turnover** of the industry is some **R50 billion** per annum and consumption is approximately **1,370 million tons** (2013) per annum.

Plastics|SA provides industry training and drives the plastics industry Environmental initiatives.

Plastics|SA operates from **three centres**: Midrand, Gauteng (Head Office) and the two regional centres located in Pinetown KZN and in Maitland, Cape Town.

For more information: **www.plasticsinfo.co.za**

All PLASTICS Food Packaging manufactured in South Africa is **100% BPA Free**

The use of Bisphenol A (BPA) in food containers and specifically baby bottles continues to give rise to many chemical scare stories, urban myths and internet-spread rumours regarding avoiding products that contain BPA.

What is BPA?

Bisphenol A (BPA) is a chemical building block used to manufacture polycarbonate (PC) and epoxy. PC positively contributes to the consumer's comfort and has become indispensable because of its impact and shatter resistance, high heat and electrical resistance and its clarity. It is safely used for safety glasses, visors and lenses, CD's and DVD's, computer housing, kitchen appliances, power tools, sports equipment (helmets and goggles) and medical devices.

What is the issue around BPA?

Some reports suggested that BPA had estrogenic effects in laboratory animals where large doses of BPA were administered. Concerns were raised about the safety of PC products, particularly baby bottles.

How safe is BPA for humans?

Much research has been done to identify any possible effects from BPA on the human body, leading to an impressive amount of evidence that supports the safety of BPA for use in its current applications.

Past and present studies confirm that BPA is rapidly absorbed, detoxified and eliminated from the body. The metabolic rate is approximately 4 hours, which means that BPA is essentially all eliminated from the body within the day of exposure and does not accumulate in the body.

Banning of BPA Products

Various governments around the globe have banned PC baby bottles to respond to consumer concerns.

In South Africa, The Minister of Health has banned the manufacturing, importation, exportation and sale of Polycarbonate (PC) infant feeding bottles containing Bisphenol A, as published in the Government Gazette on 21 October 2012 with immediate effect. **Plastics**|SA supports the government's decision.

Plastics|SA **is proud to announce that all plastics food packaging - including baby bottles and other beverage bottles manufactured in South Africa - are 100 % BPA free and pose no threat to your health or the environment.**

For more information on BPA: **www.plasticsinfo.co.za**

Did you know?

One would have to drink at least 120 litres of water from PC water bottles every day during one's life to reach the TDI.

By eating only 0,15kg of carrots, the amount of phytoestrogens that a **60 kg person** is exposed to, is **equivalent to 600 kg of food stored in a PC container.**

Potential human exposure to **BPA** is at least 400 -1000 times **lower** than the accepted **safe daily limit** of 0,05 mg/kg body weight/day established.

Where do PLASTICS come from?

From raw material to finished product

Most plastics are derived from petrochemical feedstock, which in turn originates from oil, natural gas or coal. In South Africa the gas comes from coal.

1

Coal

Sasol makes ethylene and propylene gas from the refining of coal at the factory in Sasolburg.

Coal

2

Polyethylene and Polypropylene

Sasol Polymers and Safripol polymerise the ethylene and propylene into polymers called Polyethylene and Polypropylene (PP). These polymers are now in a powder form. Hosaf polymerise PET from imported chemicals.

Typical Polymer Plant

3

Polymer [raw material]

In the granulation plant additives and fillers could be added to the powder and the compound is then granulated and bagged – ready to be sold to converters, who in turn manufacture products for the packaging, building, agricultural, mining, automotive sectors, etc. This is known as virgin material.

Polymer

4

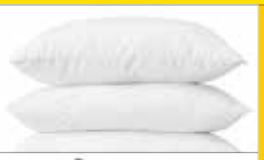
Plastics to finished product

The most common processes used in the plastics industry require specialised equipment which melt, compress and cool the plastic granules during the forming process. Some of the processing techniques are:

- blow moulding
- extrusion
- injection moulding
- rotational moulding and
- thermoforming

Film blowing

Know your PLASTICS

Polymer code	Product	Description	Recycled into
1 PET		Bottles and jars for cooldrink, detergent, juice, mineral water and food	
2 PE-HD		Bottles for milk, juice and shampoo, shopping bags, household containers and crates and closures	
3 PVC		Clear jars and bottles for toiletries, food, medication and cling film	
4 PE-LD		Bags for frozen vegetables, bread, garbage and toilet paper, milk sachets and shrink- and stretch wrap	
5 PP		Yogurt and margarine tubs, icecream containers, bottle tops and closures and clear- and metallised films for confectionery and sweets	
6 PS		Yoghurt cups, clamshells, food trays for meat, fruit and vegetables, vending cups	
7 OTHER		In packaging it could be multi-layer materials for long-life products like cheese, processed meats and sauces	

Polymer code

Despite the popular misconception, the identification code does NOT indicate the safety of the products – it is an international code used to identify the various plastics for effective recycling.

Recycling logo

The recycling logo indicates that the product is recyclable.

Plastics are versatile, durable and recyclable.

They can be reused without any risk to your health or the environment.

petco PET plastic recycling south africa

POLYCO

SAVA

Polystyrene PACKAGING COUNCIL

WASTE MANAGEMENT

1

PLASTICS EDUCATION AND AWARENESS

2

Sustainability

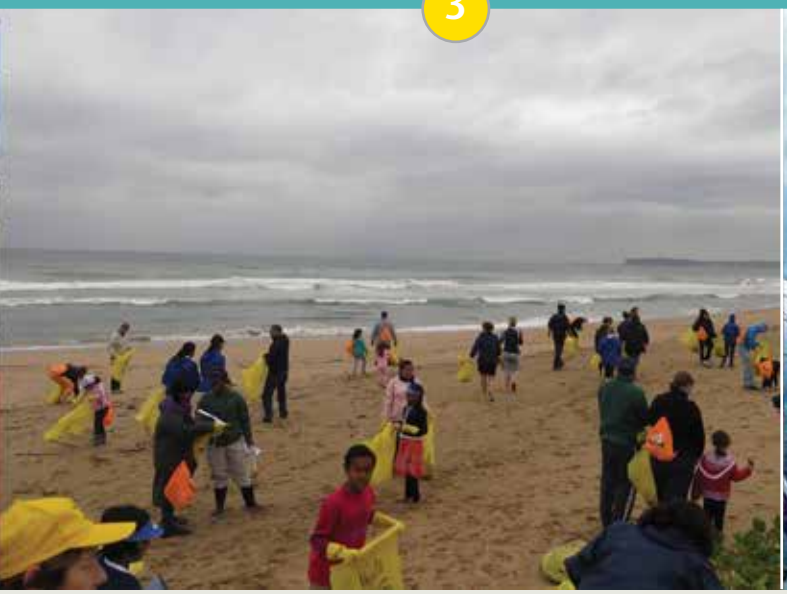
is one of six core functions of **Plastics**|SA, providing strategic leadership to the industry on sustainability issues. It is guided by stakeholders working together under the banner of the 'Sustainability Council', which is comprised of the polymer group organisations, a recycling organisation and retailers.

POLYMER GROUP ORGANISATIONS							RECYCLING	RETAIL
1 PET	2 PE-HD	3 PVC	4 PE-LD	5 PP	6 PS	7 OTHER		
petco	POLYCO	SAVA	POLYCO	POLYCO	Polystyrene PACKAGING COUNCIL	POLYCO	South African Plastics Recycling Organisation	

PLASTICS and the Environment

CLEAN-UP EVENTS AND SUPPORT

3



RESOURCE EFFICIENCY

4

The Sustainability Council's key focus areas are:

1 **Waste Management**

To promote plastics recovery and recycling - Zero Plastics to Landfill.

3 **Clean-up Events and Support**

To support and manage Clean-up SA Campaign.

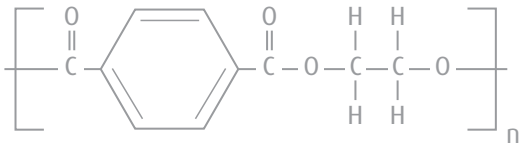
2 **Plastics Education and Awareness**

The Sustainability Council provides resources to increase awareness of the use of plastics and plastics recycling.

4 **Resource Efficiency**

Training programmes, workshops and written case studies to support energy efficiency in the plastics industry.

Let's support our
National Environmental Days



recyclable | kind to the environment | safe | versatile

[Poly(ethylene terephthalate)]

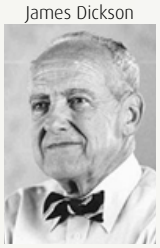
Applications for **PET**

Bottles for cool drinks, mineral water and energy drinks, detergents, vinegar and cooking oils | **Jars** for food, toys, haberdashery, etc. | **Blisters** for toys, IT accessories and batteries | **Trays** and punnets for fruit and vegetables

Wallace Carothers

James Dickson

John Rex Winfield



Nataniel Wyeth

The History of PET - Poly(ethylene terephthalate)

1929 – 1931	The synthesis of polyesters was first explored intensively by Wallace Carothers whilst working at DuPont.
1941	Polyester was first developed by British chemists, John Rex Winfield and James Dickson, in the laboratory of a small English company.
1950's	Polyester came into use as a fibre for cloths and textiles through developments by DuPont and ICI.
1960 – 1970	Polyesters were first used in film wrapping, sheeting, coating and bottle applications.
1973	The first PET bottle was patented by Nataniel Wyeth
1977	The first PET bottle was recycled!

What is **PET**?

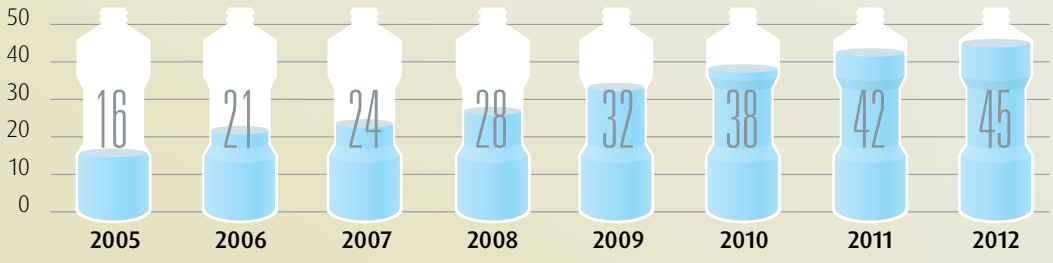
PET stands for poly(ethylene terephthalate), a plastic material and a form of polyester. Polyethylene terephthalate is a polymer that is formed by combining two monomers called modified ethylene glycol and purified terephthalic acid.* PET is the plastic labelled with the #1 code on or near the bottom of bottles and containers and is commonly used to package soft drinks, water, juice, peanut butter, salad dressings and oil, cosmetics and household cleaners.

* In SA, Hosaf makes PET from imported chemicals

PET - advantages and environmental benefits

- Lightweight
- Transparent
- High gloss
- Strong and impact-resistant
- Excellent barrier material (gas and moisture)
- 100% Recyclable
- Certain types of PET can withstand both freezing and oven baking temperatures. Only PET which is not common in SA.
- Excellent thermal insulation in fibre format for fleece jackets
- Can be manufactured into a thin barrier film for use in flexible food packaging like teabag packaging.

PET bottles recycled %



PET is the 1 Plastic

PET is recycled into ...

Fibre for polyester carpeting, duvets and pillows | fabric for T-shirts, long underwear, athletic shoes, sweaters | fabric for luggage and upholstery | strapping | sheeting for sandwich blisters, chocolate trays | bottles for detergents and even food applications

Photos courtesy of PETCO

PET applications

Packaging	Non-packaging
1 PET	> PET <

Packaging

- Carbonated drinks
- Mineral water
- Cooking oil
- Household detergent
- Blisterpacks
- Wide neck jars for peanut butter
- Vending cups
- Trays and punnets
- Ovenable trays for take-away food
- Specialised packaging eg. tea

Packaging films

- Stretch film for pallet wrap
- Shrink films for collation, e.g. 6-packs
- Heavy duty sacks
- Compost- and fertiliser bags
- Frozen vegetables
- Fresh produce
- Milk sachets
- Bread bags

Fibres

- Clothing and other textile applications
- Shoe stitching and tyre belting
- Artificial hair extensions
- Tennis ball felt

Films

- Specialised packaging e.g. tea outer packs
- Sachet liners for aggressive chemicals used in beauty care
- Ovenable cooking bags

Industrial and other

- Magnetic tapes on smart cards
- X-ray films
- Geo-textiles for soil retention
- Housing for floor cleaning equipment
- Audio/Video tapes
- Cigarette filters
- Automotive products
- Automotive oils

... more products

ceiling insulation and geyser blankets | automotive carpets | luggage racks, fuse boxes, door panels, headliners | fibrefill - sleeping bags, duvets and pillows | geotextiles - road stabilisation |new PET containers - both food and non-food products (bottle2bottle) packaging

... the recycling process

1 washing and sorting | 2 PET flakes
3 melting flakes into extruded strips
4 Pellets | 5 Fibre made from recycled PET |
6 Filling for cushions and duvets

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petco
PET plastic recycling south africa
www.petco.co.za

Plastics Industry Enviromark

[High Density Polyethylene]

Applications for **PE-HD**

PE-HD

crates and boxes | bottles for milk, food products, detergents, cosmetics | food storage containers | carrier bags | drums for food, chemicals and pesticides

The History of PE-HD - High Density Polyethylene

Hans Von Pechmann

Karl Ziegler

1898 PE-HD was discovered by Hans Von Pechmann, when accidentally heating diazomethane.

1900 In 1900 this compound was identified by the German chemists Eugen Bamberger and Friedrich Tschimer as polymethylene ($[CH2]_n m$), a polymer that is virtually identical to polyethylene.

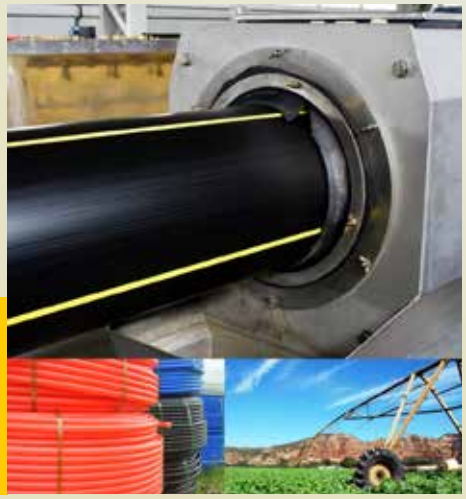
1933 The first industrially practical polyethylene synthesis was discovered (again by accident) in 1933 by Eric Fawcett and Reginald Gibson at the ICI works in Northwich, England.

1953 PE-HD was first developed by Professor Ziegler in Germany, and by researchers at Philips Petroleum Company and Standard Oil (Indiana) in the USA.

PE-HD is widely used in everyday life

To make Polyethylene, high-purity ethylene is required. In South-Africa this gas is produced by Sasol as a by-product of the coal to petrol process. In South-Africa, PE-HD raw material is produced by Safripol using a process called low pressure polymerisation. In low pressure polymerisation – developed in 1953 by Ziegler and others – special catalysts are used to manufacture polymers at about atmospheric pressure. PE-HD has a higher density and stronger tensile strength than PE-LD.

PE-HD Pipes An integrated part of the infrastructure of South Africa



The benefits of PE-HD pipes in the civil sector, chemical sector, steel industry and in gas distribution

- High impact strength, flexibility and toughness
- Excellent corrosion and abrasion resistance
- Very good chemical resistance
- Can be fusion welded ensuring absolutely breakfree joints
- Lightweight and ease of handling
- Non-toxic and safe for drinking water
- Inherent resistance to effects of ground movement
- Very low thermal conductivity

Application is found in a wide spectrum of industries

- Civil Engineering/water distribution
- Mining (Pottable water, cooling water, slurries, air)
- Irrigation
- Drainage and Plumbing
- Industrial
- Telecommunication
- Effluent
- Gas distribution

PE-HD is the 2 Plastic

PE-HD is recycled into ...

crates and bins | dustbins | flower pots | automotive mud flaps | pallets | toys | carrier bags | traffic barrier cones | pipes | refuse bags | timber plastic products | drums | worm farms | chicken nests




PE-HD applications

Packaging	Non-packaging
2 PE-HD	> PE-HD <

Bottles
- Milk
- Juice
- Motor Oil
- Household containers
  - Detergents
  - Fabric softeners
  - Bleach
  - Liquid scourers
- Cosmetics
  - Shampoo
  - Lotions

Film
- Vest-type carrier bags
- Refuse bags
- Cereal box liners

Crates
- Dairy
- Beverage
- Baking Industry
- Agricultural Industry
- Chicken Coops
- Storage Containers

Drums and Tanks
- Water
- Jerry cans
- Food (eg. fruit concentrates)
- Chemicals
  - Agriculture - insecticides, pesticides, herbicides
  - Industrial – chemicals, acids, alkalis

Pipes
- Industrial
- Mining
- Building
- Agricultural
- Tubing for electrical applications and telecommunications
- Fishing industry
- Ventilation ducting

Others
- Fibers and tapes
- Thermoformed sheets for cellphone mast trees
- Toys
- Dustbins
- Buckets
- Closures
- Housewares eg. plates, cups, containers
- Pallets
- Car fuel tanks
- Shade cloth

PE-HD Material Identification

2 PE-HD

The material identification code for high density polyethylene (PE-HD) is a '2' inside a triangle made up of three arrows.
Packaging made from PE-HD shows very good chemical resistance and is therefore used for bottles and drums for a wide range of chemicals.

This includes packaging for milk and fruit juices, personal care products like shampoo, shower soaps, domestic cleaning products, automotive care products and chemicals used in the garden, swimming pool and for crop- and animal protection. Drums from 10 litre, 25 litre, 100 litre, 220 litre to flow bins as large as 1000 litre are made from PE-HD.
PE-HD films can be identified by a crackling sound when handled and they are never clear. They are used for vest type carrier bags, inner bags for cereal and confectionary products.

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POLYCO
www.polyco.co.za
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recyclable | kind to the environment | safe | versatile

[Poly(vinyl chloride)]

Applications for **PVC**

blood transfusion sets | flooring | waterproof fabrics | bottles | clear trays | cling film | gloves | shoe soles | cable insulation | floor and wall covering | door panels | artificial leather | underbody sealants | pipes | boots | raincoats

Henri Victor Regnault

Eugen Baumann

Fritz Klatte

Waldo Semon

The History of PVC - Poly(vinyl chloride)

PVC was accidentally discovered at least twice in the 19th century.

1838 Henri Victor Regnault (French physicist and chemist)

1872 Eugen Baumann (German chemist)

These scientists observing the newly created chemical gas, vinyl chloride, also discovered that when the gas was exposed to sunlight, it underwent a chemical reaction – now recognised as polymerisation – resulting in an off-white solid material.

1913 Fritz Klatte (German inventor) took out a patent on PVC (polymerisation of vinyl chloride with sunlight).

1920 Waldo Semon (Rubber scientist) was hired by the USA company, BF Goodrich to develop a synthetic rubber to replace costly natural rubber – his experiments eventually produced poly(vinyl chloride).

PVC is considered to be the most versatile thermoplastic

PVC is a vinyl chloride polymer. During the manufacturing process, chlorine is derived from ordinary salt and is chemically combined with ethylene which is derived from oil, or coal in the case of South Africa.

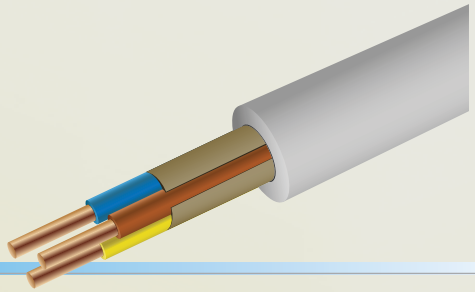
PVC is never processed into finished products in its pure form and is always compounded with additives. This allows for a wide range of PVC products that can be divided into three groups:

· Rigid PVC · Soft flexible PVC · Plastisols or liquid PVC

PVC was first used in

heels, golf balls and raincoats

1945



In 1945 PVC was used extensively in the Second World War to

insulate wiring on military ships.

PVC is the 3 Plastic

PVC is recycled into ...

shoe soles | pipes | hoses | door mats | car mats | gum boots | conduit | speed humps

PVC applications

Packaging	Non-packaging
3 PVC Poly(vinyl Chloride)	> PVC-P <
	> PVC-U <

Soft PVC (PVC-P) shower curtains | garden hoses | medical tubing | cable insulation

Rigid PVC (PVC-U) water pipes | waste- and vent pipes | conduit | guttering

Bottles
- Large bottles with handles for bubble bath
- Pharmaceuticals
- Medicines
- Hospitality industry

Film
- Cling film
- Packaging films
- Tamper evident seals

Building
- Pipes, guttering and window frames
- Cable insulation
- Flooring
- Skirting and trunking

Motor industry
- Artificial leather
- Underbody sealants
- Dashboard panel skins
- Door panel skins
- Heel mats

Medical
- Blood transfusion sets
- Waterproof fabrics
- Floor- and wall coverings

Mining industry
- Pipes
- Safety boots
- Gumboots
- Safety gloves

Other
- Protective clothing
- Shoe soles
- Credit and phone cards
- Fridge magnets
- Erasers

PVC - the 20th Century Miracle Material

- **Recycling**
  PVC is a popular material for recycling due to its ease of recycling and the demand for the recyclate
- **Energy Efficiency**
  PVC consumes minimal energy during production and can be modified to produce lightweight goods
- **Fire Retardancy**
  PVC is inherently flame-retardant – it does not readily ignite and will not continue to burn once the flame is removed: thus a safe material for building and construction
- **No Gas and Water Permeability**
  PVC continues to be used in packaging due to its good barrier properties
- **Versatility**
  PVC can be modified to produce rigid or flexible products
- **Cost Effective**
  PVC packaging is strong and lightweight and PVC products require minimal maintenance
- **Durability**
  PVC is mainly used to produce construction products which exhibit long lifespans such as pipes and window profiles

Plastics|SA
www.plasticsinfo.co.za

SAVA
Southern African Vinyls Association
www.savinyls.co.za

Plastics Industry Enviromark

recyclable | kind to the environment | safe | versatile

[Low Density Polyethylene]

Applications for **PE-LD**

PE-LD

pallet wrap | compost bags | frozen food bags | milk sachets | toys | canoes | chemical tanks | road barriers | large tanks | cosmetic tubes | irrigation pipes | water pipes | phone cables | boutique bags | pond liners

Eric Fawcett

Franklin R. Gibson

The History of PE-LD - Low Density Polyethylene

1933 In March 1933, two organic chemists, Eric Fawcett and Franklin R. Gibson, working for the Imperial Chemical Industries Laboratory (ICI) in England, carried out an experiment to react ethylene with benzaldehyde in basic equipment, using high pressured reactions. A small amount of white, waxy solid was found in the reaction vessel which Fawcett identified as a polymer of ethylene.

1936 This low density polyethylene product was found to have interesting moulding and electrical properties and was patented in 1936 by ICI. Polyethylene played a key role in World War II – first as an underwater cable coating and then as a critical insulating material for such vital military applications as radar cable insulation.

PE-LD is widely used in everyday life

In South Africa Low Density Polyethylene (PE-LD) and Linear Low Density Polyethylene (PE-LLD) raw material is produced by Sasol Polymers using high purity ethylene gas from Sasol.

Life-cycle of a **PE-LD/LLD** bag to pipe

1. PE-LD raw material, in the form of white pellets, is sold to a film convertor.
2. The material is melted in a film extruder. The melt is forced through a circular die to obtain a thin tube. Air is used to inflate the tube whilst being pulled and stretched by rollers. The bubble is flattened into a tube that can be printed cut and sealed into a bag.
3. At the end of its useful life as a bag, it is discarded in the [solid waste stream] refuse bin?
4. Waste plastic bags and film is sourced by collectors from households, shops, factories and landfill. The film is sorted by type and colour, then compressed and baled and sold to a recycler.
5. The recycler opens the bales, granulates the film and washes the flakes to remove labels, residual content and dust and grime. The clean flakes are dried and fed into a pelletising extruder. The melt is forced through multiple holes in the ide. The strands are cut into short pellets and cooled in water. Air is then used to dry the cold pellets. Bags of recycled PE-LD pellets are then sold as raw material to a pipe convertor.
6. The material is melted in a pipe extruder. The melt is forced through a circular die to obtain a hollow tube. Air is used to push the soft melt against the calibrator to cool the pipe into specific dimensions. The pipe is water cooled, marked for identification and cut into length.
7. The pipe is used to irrigate our farms or to transport our water.
8. Waste plastic pipes are sourced by collectors from farms, etc.

PE-LD is the 4 Plastic

PE-LD recycled into ...

bags | dust bins | containers | bin liners | refuse bags | construction film | water pipes | irrigation pipes | furniture covers | blast barricades





PE-LD applications

Packaging	Non-packaging
4 PE-LD	> PE-LD <

Packaging
- Stretch film
  - Pallet wrap
- Shrink film
  - Collation
  - Pallet wrap
- Heavy duty sacks
  - Compost bags
- Food packaging
  - Frozen foods
  - Fresh produce
  - Meats and cheese
  - Milk sachets
  - Bags
- Consumer bags
  - Boutique bags

Roto-moulding
- Large tanks
- Toys and playground equipment
- Canoes and kayaks
- Chemical tanks
- Road barriers

Pipes
- Water pipes
- Irrigation pipes

Wire and cable
- Communication cables

Agriculture
- Silage Wrap
- Greenhouses
- Tunnels
- Mulch Film

Health and Hygiene
- Medical garments
- Medical blankets

Other
- Pond liners
- Monofilaments - car wash
- Cosmetic tubes
- Squeeze bottles
- Peel-off lids
- Wine stoppers
- Stretch labels

Bag to Bag recycling - often 100%

Crate and bin recycling

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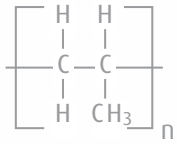

recyclable | kind to the environment | safe | versatile

[Polypropylene]

Applications for **PP**

dairy tubs for margarine yogurt, cottage cheese | woven bags for grain, dog food, etc | stain resistant carpets | chocolate wrappers | sweet wrappers |crisps packets | outdoor furniture, stadium seating | swimming pool cleaners | buckets for atchar, paint, nappies | baby nappies, etc.

Giulio Natta

Paul Hogan and Robert Banks

The History of PP - Polypropylene

1950 Polypropylene was discovered in the early 1950s by Giulio Natta. Having being separately invented about nine times during that time, it was a patent attorney's dream scenario and litigation wasn't resolved until 1989. Polypropylene managed to survive this legal process and two American chemists working for Phillips Petroleum of the Netherlands, Paul Hogan and Robert L. Banks, are now generally credited as the "official" inventors of the material.

Polypropylene serves as a plastic, as well as a fibre

Polypropylene is a member of a group of plastics known as polyolefins. Structurally, it is similar to polyethylene, the difference being that every other carbon in the backbone chain has a methyl group attached to it. The position of the methyl group on the polymer chain can be regulated during polymerisation to form products with different properties. In SA Sasol Polymers and Safripol are the producers of Polypropylene.

Polypropylene at your service

This hardy, versatile polymer is easy to mould or extrude and also has the right balance of toughness and flexibility to make hinged products. It holds colour well, doesn't absorb water and is ideal for such robust applications as moulded car bumpers, luggage and storage boxes, fibres, woven bags and carpet backings, houseware and tools. The hollow nature of the fibre gives it excellent water (and sweat) absorption properties in clothing and other fabrics.

Recycling of **PP** waste from Industrial and Post Consumer sources

From waste PP to twine

1 Collected waste PP is reduced in size with a granulator. | 2 The granulated material is fed into a recycling extruder where it is melted and pelletised. | 3 The pellets are extruded into PP film. The film is then slit into narrow tapes and stretched in an oven. | 4 The stretched PP tapes are wound onto bobbins and taken to the twisting section. | 5 At the twisting section the tapes are twisted and wound into twine.

PP is the 5 Plastic

PP recycled into ...

buckets and bowls | refuse bins | shopping baskets | coathangers | outdoor furniture | paint tray | flower pots | storage containers | toys

PP applications

Automotive
- Dashboards
- Knobs
- Bumpers
- Handles
- Exterior trim
- Battery cases

Health and Medical
- Syringes
- Labware
- Medical trays
- Specimen bottles
- Pharmaceutical tablet containers
- Baby nappies
- Sanitary napkins

Rigid Packaging
- Bottle tops and closures
- Yoghurt cups
- Margarine tubs
- Ice-cream containers
- Buckets
- Bowls
- Paint containers

Other
- Housewares
- Corrugated board
- Tool cases
- Garden tools
- Shopping trolleys and baskets
- Cooler boxes & storage containers
- Briefcases and luggage

Packaging | Non-packaging

5 PP

- Vacuum cleaners
- Kettles

Flexible Packaging
- Food and confectionery eg. Biscuit packaging
- Clothing protection
- Sweet wrappers
- Stationery tape
- Bottle labels
- Flower sleeves
- Chocolate wrap

Fibre
- Tape and strappings
- Staple fibres
- Woven sacks and bags
- Ropes, twine and yarn

> PP <

- Woven fabrics
- Landfill liners
- Carpets and upholstery
- Carpet backing
- Bristles

Other Consumer Products
- Outdoor furniture
- Toys
- Coat hangers
- Decorative ribbon
- Chair shells
- Hair extensions
- Disposable diaper liners

Polypropylene is one of the most widely used plastics in everyday life.

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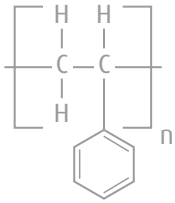

recyclable | kind to the environment | safe | versatile

[Polystyrene]

Applications for **PS**

PS

yogurt tubs | vending cups | salad containers | egg trays | meat trays | hamburger clam shells | fish boxes | seedling trays | cooler boxes | pens | cutlery

Hermann Staudinger

The History of PS - Polystyrene

Styrene monomer was first mentioned in 1830 by the French chemist Bonastre who had distilled the liquid from Storax - a liquid obtained from an American tropical tree. In 1839, a German apothecary called Eduard Simon ascribed the name Styrol to this liquid. Simon left this liquid to stand for several months and he found that a jelly-like material formed. It took another German, organic chemist, Hermann Staudinger, to realise that Simon's discovery comprised of long chains of styrene molecules and in fact was a plastic polymer.

Polystyrene came onto the market in 1930 and is derived from petroleum and natural gas byproducts. We do not make PS in South Africa.

Crystal and High Impact Polystyrene

Packaging	Non-packaging
PS / HIPS	> PS < > HIPS <

Crystal Polystyrene: (transparent)

Food Packaging: Yogurt tubs, vending cups, salad containers, egg trays, meat trays, hamburger clam shells, cake domes

Protective and Display Packaging: cosmetic containers, CD cases, jewellery containers, calendar stands, cassette housings and display boxes for pens, emblems and signs

Other: Shower doors, medical trays and laboratoryware, pens and rulers, retail coat hangers. Crystal PS can be foamed during extrusion to producefoamed sheet that can be formed into trays and clamshells.

High Impact Polystyrene: (opaque)

- retail coat hangers
- computer, television, radio and telephone housings
- printers and keyboards
- Refrigerator, freezer and cooler liners
- combs and razor bodies
- medical trays and laboratoryware
- trays

Expandable Polystyrene

Packaging	Non-packaging
PS-E	> PS-E <

A lightweight cellular material

The raw material for PS-E is produced in the form of small polystyrene beads containing a blowing agent (pentane) which, when exposed to steam, expand to form a lightweight "prefoam" of required density. This "prefoam" is then processed by further steam treatment until the beads fuse toghether, either in a mould to give the material a required shape and size or as large blocks for cutting into sheets and shapes. PS-E was invented in 1952 by BASF.

Applications:

Food Packaging: meat trays, fruit boxes, vending cups, fish boxes

Buildings and construction: under-floor heating systems, drainage boards, displays, prefabricated walls, decorative gables and facades, suspended ceilings.

Protective packaging: for industrial, pharmaceutical and retail use; seedling trays

Insulation: cooler boxes, cold rooms, refrigeration, fermentation tanks, vessels

PS is the 6 Plastic

PS recycled into ...

hangers | pictureframes | cornices | skirtings | construction | tutu desks | seedling trays | cutlery | rulers | toys | combs

Polystyrene – a unique combination of performance, economic and environmental benefits

Low carbon footprint, lightweight, resource and energy efficient

Desirable appearance - transparency, gloss

H E A T resistant

Enhances food hygiene

Prolongs the shelf-life of food

Is effectively and safely disposed of in landfills and improves aeration in landfills

Can be effectively recycled

... the recycling process

1 collection | 2 granulated
3 extruded into ingots | 4 Ingots - ready to be granulated and pelletised | 5 Extruded into picture frame profiles | 6 One picture frame can be made from as much as 41 recycled hamburger clamshells

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Polystyrene PACKAGING COUNCIL
www.polystyrenepackaging.co.za

EPSASA
www.epsasa.co.za

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Packaging

filter coffee packets | toothpaste tubes | Processed meats and cheese | sauces | soups | portion packs for butter and margarine





RECYCLE Multi-layer Plastics

Different plastics don't melt at the same temperature and different materials cannot be recycled together.

In general, multi-layer plastics can only be recycled into plastics timber products.

Multi-material products can only be recycled if the layers can be separated, e.g. the paper / board layer can be recovered from the Tetrapac containers.

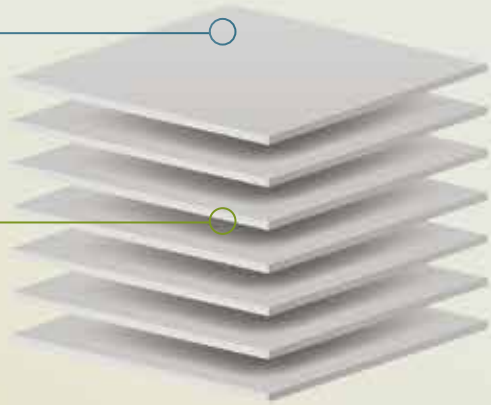
Multi-layer materials

are used where **special barrier properties are required** in order to

protect the product

AND

increase the shelf life



These properties are not obtainable with single material packaging.

Did you know?

Multi-layer materials incorporate a mix of plastics and/or paper and/or foil.

The volume of multi-layer materials constitutes <3% of the total plastics usage in South Africa.


Sachets for sauces, olives, sundried tomatoes


Juices


Bags for cat and dog food


Toothpaste, tomato paste


Processed meats


Filter coffee, tea bags


Wipes, baking powder


Biscuits, icing snow

OTHER is the 7 Plastic

Non-packaging

[Multi layer]

>ABS< Computer housings, Automotive grill | **>PA<** Edge trimmer cord, Fishing gutt | **>PMMA<** Sheeting for signage | **>PC<** Roof sheeting, Camera / cell phone housing | **>PUR<** Bakkie liners, Foamed mattresses and many more examples. There are more than 40 different plastics used in everyday life.




Packaging | Non-packaging

In packaging it is a

combination

of two or more materials.

For a milk bottle closure 7 HD + LD

A **car bumper** has ABS + PP materials mixed together to form the final product, the polymer code will look like this;

> ABS + PP <

A combination of various types of plastics

The number 7 plastics are made up of various combinations of or other types of plastics which do not fit into the categories 1-6.

7 Examples of plastics with the number 7 polymer code are; Polycarbonate, Nylon, Acrylic, ABS and PETG.

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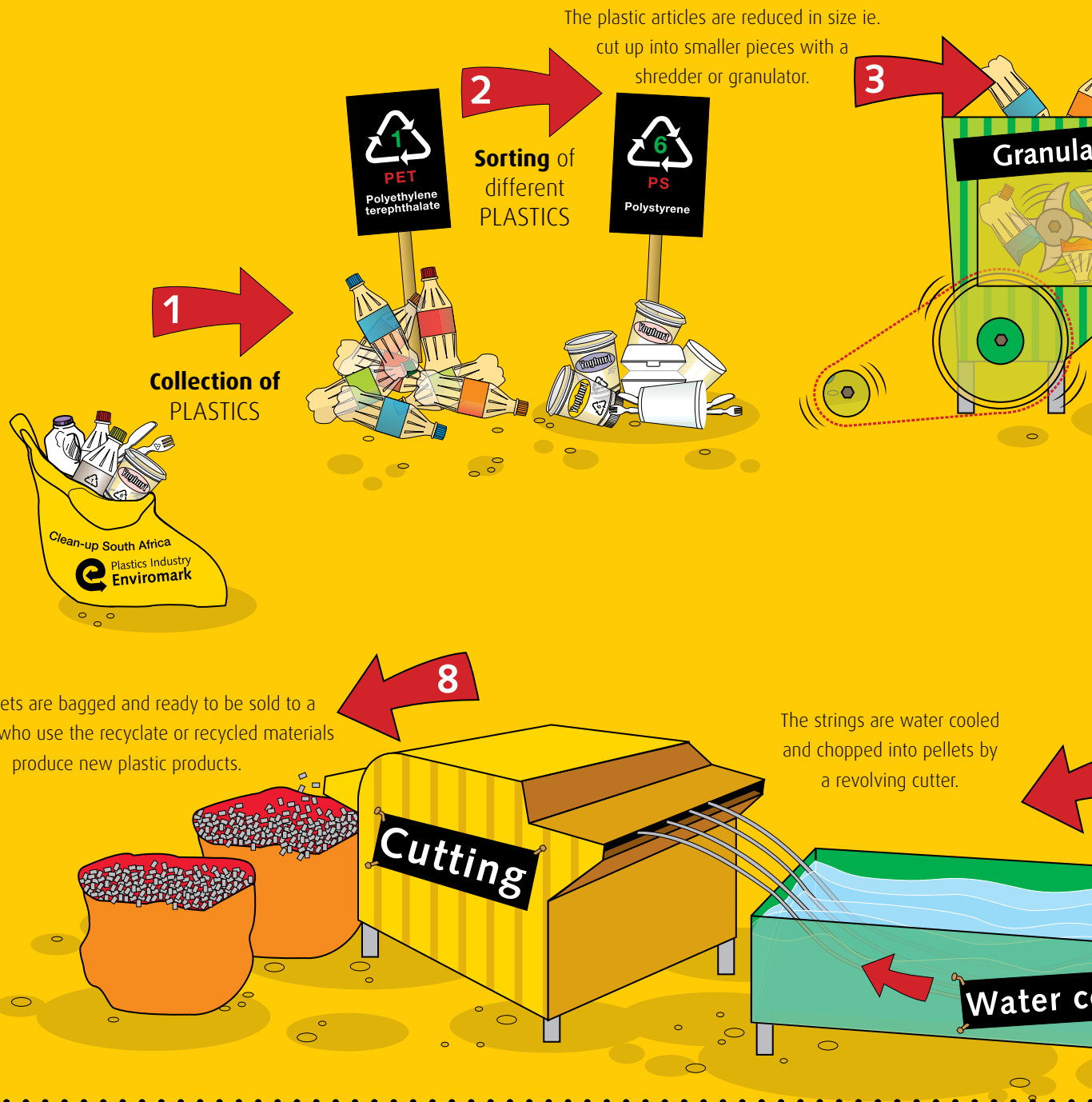
The plastics recycling sequence



Some interesting products made from **RECYCLED PLASTICS**

garbage bags · dustbins · irrigation pipes · picture frames · garden furniture · buckets · fence poles · roof tiles · fibre · flower pots · automotive parts · shoe soles · door and car mats · hoses · coat hangers · stationery · garden tools · refuse bags · sawdust bags

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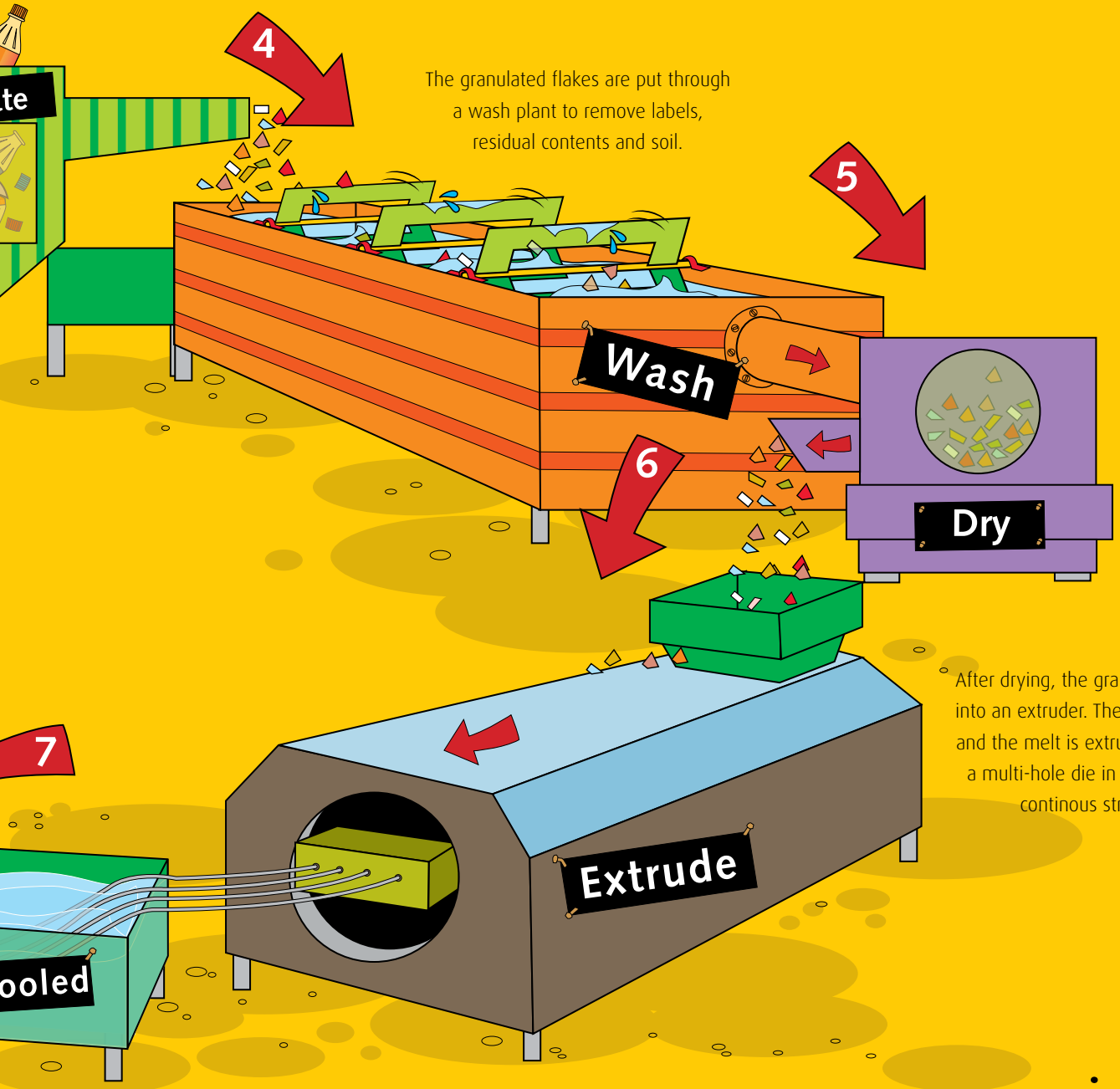
Plastics make it possible

PLASTICS recycling



The granulated flakes are put through a wash plant to remove labels, residual contents and soil.

After drying, the granules are fed into an extruder. They are melted and the melt is extruded through a multi-hole die in the form of continous strings.

roof insulation · building film · carpets · strapping tape · crates · stadium seats · pallets · paint trays · seedling trays · curtain tie-backs · cornices · skirtings · plastics timber · ride-on toys · wheelbarrows · pick handles · carrier bags · park benches

petco PET plastic recycling south africa

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