Design guidance recommendations for non-food contact grade HDPE bottles

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INDIA PLASTICS PACT

List of abbreviations

AlOx	aluminum oxide
BoPP	biaxially oriented polypropylene
EVA	ethylene vinyl acetate
EVOH	ethylene vinyl alcohol
FMCG	fast-moving consumer goods
HDPE	high density polyethylene
IPP	India Plastics Pact
LDPE	low density polyethylene
LLDPE	linear low density polyethylene
MDPE	medium density polyethylene
MRF	material recovery facility
MXD6	nylon made from m-xylene diamine (MXDA) + adipic acid
PE	polyethylene
PET	polyethylene terephthalate
PET-G	PET, glycol-modified
PP	polypropylene
PVC	polyvinyl chloride
rHDPE	recycled HDPE
SiOx	silicon oxide

Objective of the design guidance

High-density polyethylene (HDPE) is commonly used for packaging applications because of its chemical resistance, toughness and excellent barrier properties (UV, moisture, etc.).

In India, the packaging sector accounted for 75% of total demand for HDPE resin: 65% for rigid packaging and the remaining for flexible packaging. It is the most commonly used resin for rigid packaging after PET.[1]

HDPE is versatile and customizable which makes it attractive for fast-moving consumer goods (FMCG) applications. In India, HDPE bottles are most often used for non-food contact applications such as shampoo, conditioner, fabric care liquids, floor cleaners and disinfectants. In many developed countries it is extensively used to package milk; in India, however, only niche, value-added dairy products such as flavoured milk and yogurt are packaged in HDPE rigid containers.

In a circular economy for packaging, retaining the highest value of materials is a priority. The recent amendments to India's Plastic Waste Management Rules (specifically, via the EPR Guidelines in 2022[2]) have provided a clear policy direction to businesses for a circular plastics economy. The Guidelines set out targets for inclusion of recycled content in packaging ranging from 30% to 60% for rigid packaging.

To achieve these targets, packaging needs to be designed to maximize the ease of collection and recycling.

The objective of this document is to provide an overview of technical and design-related aspects, which, if put into practice, will ensure that HDPE bottles intended for non-food contact applications do not hinder the recycling process, recycler's yield, productivity and quality of the final product.

This guidance can be used by packaging designers, packaging manufacturers, bottlers, bottle, cap and label manufacturers, and fast-moving consumer goods companies.

[1] CII analysis based on PlastIndia 2019 data.

[2] Ministry of Environment, Forest and Climate Change, Government of India (2022). Guidelines on Extended Producer Responsibility for Plastic Packaging. G.S.R. 133(E). https://egazette.nic.in/WriteReadData/2022/233568.pdf

HDPE recycling in the Indian context

As per the Ellen McArthur Foundation's New Plastics Economy Global Commitment[3], a packaging or packaging component is recyclable if its successful post-consumer collection, sorting, and recycling is proven to work in practice[4] and at scale.[5]

After use, HDPE containers are widely collected via formal and informal channels and sold to aggregators, traders, material recovery facilities (MRFs) and recyclers. Waste collectors collect mixed plastic wastes from households, streets or commercial establishments and sell to aggregators and traders, where the mixed wastes are manually sorted into categories, based on resin-type and format, and labels are manually removed (depending on agreements and value realization with recyclers).

HDPE bottles are further sorted by colour, then segregated and baled at MRFs. Baled HDPE bottles are transported to recycling plants, where another round of manual or automatic sorting (depending on size of recycling unit) takes place, after which they are shredded, cleaned/washed, dried and sold to manufacturers of low-value furniture, agricultural pipes and water tanks.

Only a few formal recyclers in India have invested in closed-loop recycling even though most HDPE containers are made of a single resin and are readily recyclable.

[3] Ellen MacArthur Foundation. (2020). New Plastics Economy Global Commitment: Commitments, Vision and Definitions. https://emf.thirdlight.com/link/pq2algvgnv1n-uitck8/@/preview/1?o

[4] 'In practice' means that within each of these regions, the recycling system (end-to-end system from consumer to recycled material) effectively recycles a significant share of all packaging of that type put on the market. In other words, in that area a significant recycling rate is achieved for that type of packaging

[5] 'At scale' means that the proof needs to be more than a lab test, a pilot, or a single small region. It means that recycling of a certain packaging type needs to be proven to work in practice in multiple regions, collectively representing a significant geographical area in terms of population size, ideally across different country and city archetypes. This to indicate that the recycling in practice is replicable, and that the design of the packaging is not the barrier to realise recycling in practice in other countries.

HDPE bottle design for recyclability

Components of an HDPE bottle

The following aspects of an HDPE bottle and its components have implications on the ease of recycling and should be addressed when bottles are being designed:

Body

a. Resin/material
b. Colour
c. Barrier/coatings
d. Additives
e. Size

Closures

a. Caps
b. Liners
c. Seals

Decoration

a. Direct printing
b. Labels
c. Sleeves
d. Adhesives
e. Inks

Other components such as spray dispensers and pumps

Design aspects that will facilitate the production of high-quality non-food contact grade rHDPE are described in this section, with recommendations relevant to the Indian context.

All recommendations are divided into three categories shown in the table below.

Recycling- friendly	Conditional	Problematic for recycling
These have minimal or no negative effect on the productivity of recycling operation or final product quality. Packaging with these features is likely to pass through the collection process into the most appropriate material stream with maximum potential of producing high quality recyclate.	These present known technical challenges to the material recovery facilities (MRFs) and recyclers' yield, productivity or final product quality but are tolerated by most MRFs and recyclers.	These pose significant adverse technical impact on the MRFs and recyclers' yield, productivity or final product quality. The majority of MRFs and recyclers cannot remove these features to the degree required to get a quality end product.

Body

Resin/material

Mono-material HDPE structures are usually preferred for recycling. In India, multi-layer HDPE bottles are widely used. For such bottles, it is preferrable to have multi-layers of HDPE or multilayers of different material types of PE (such as LDPE, LLDPE and MDPE).

Polypropylene is a common contaminant during HDPE recycling; both resins have similar densities which makes separation in a sink-float tank difficult. When HDPE is contaminated with polypropylene beyond a certain level, the quality of rHDPE declines (PP has a higher melting point than HDPE). Overall, PP contamination should lie between 0% and 5% for a high-quality recyclate to be produced. End applications with lower specifications can be produced with rHDPE recyclate containing 5% to 10% PP contamination.

Design guidance for resin

Recycling-friendly	Conditional	Problematic for recycling
• Mono-material structures, multilayer structures of different types of PE (LDPE, MDPE, HDPE) • PP contamination up to 5%	PP contamination of 5% to 10%	• Multilayer composite structures with resins other than different types of PE (LDPE, MDPE, HDPE) • PP contamination >10%

Colour

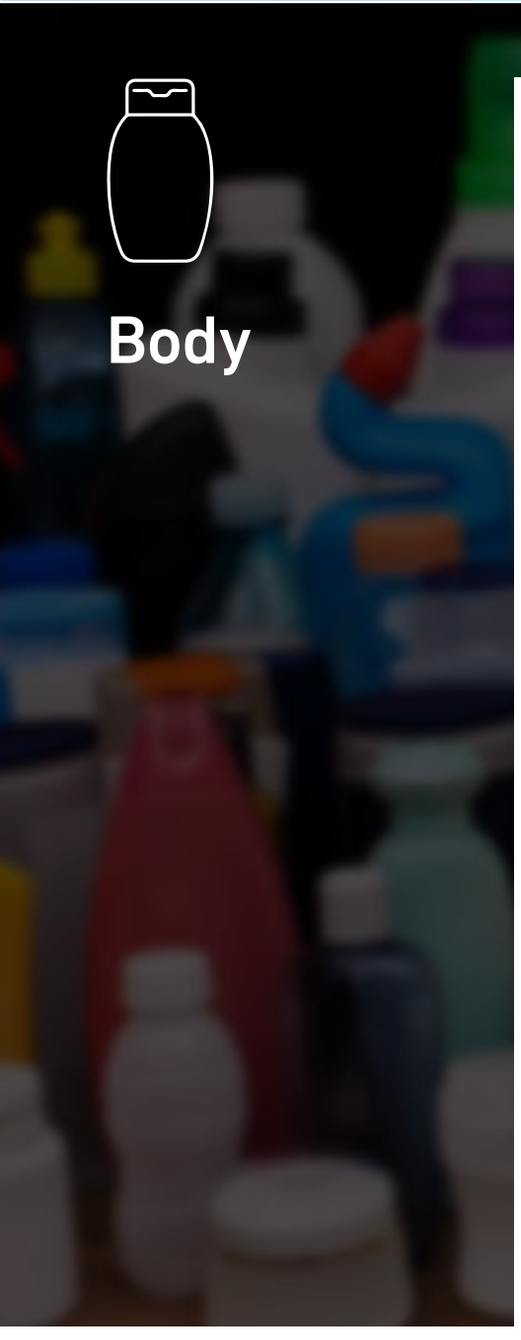
Colours are used by businesses for brand differentiation. However, in terms of post-consumer value, unpigmented/clear/natural HDPE bottles rate higher because the recyclate derived from them can be used in a wider range of applications than recyclate from coloured bottles. Therefore, wherever possible, pigments should be used in low concentrations. If multi-layer bottles are used, it is preferable to have inner and outer layers of the same colour.

The use of carbon black pigment, which causes rejection of recyclable packaging when near infrared (NIR) sorting technology is used, should be avoided. Titanium dioxide, often used to provide white colour, can also be problematic in NIR sorting as the sensors may misdirect it to the waste stream for clear plastics. Although NIR sensors are not widespread in India currently, this recommendation will help account for any possible future shifts towards NIR-based sorting systems.

Masterbatch (colourant) dosing should be limited as it affects recyclability. The use of heavy metals in masterbatch should be avoided. This can be controlled by ensuring that masterbatches meet guidelines such as the US-Toxics in Packaging Clearinghouse (TPCH) and EU-Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Design guidance for colour

Recycling-friendly	Conditional	Problematic for recycling
• Unpigmented/ clear/natural (unpigmented), with no carbon black • Inner and outer layer of multi-layer bottles of same colour • Limited dosing of masterbatch, follow EU REACH and US TPCH guidelines	• Light pigment/ light tint HDPE bottles • Different colours for different layers of multi-layered bottles	• Strong pigments • NIR non-detectable colours such as carbon black • Titanium dioxide • High dosing of masterbatch and use of hazardous or toxic chemicals in masterbatches



Body

Barrier layers and coatings

In India, for most non-food packaging HDPE applications, barrier layers and coatings are not used.

Additives and fillers

HDPE resins might contain chemical compounds or additives to improve performance and functionality of the polymer.

Additives (oxo, photo or bio) promoting degradability should be avoided. Additives/fillers such as calcium carbonate and talc in concentrations which could increase the density of HDPE to >0.995 g/cm^3 causing it to sink in the sink-float tank, should be avoided.

Optical brighteners used to increase the brightness of packaging are detrimental to the recycling process and should be avoided. These create fluorescence in rHDPE recyclate and are difficult to identify during the sorting process.

Design guidance for additives and fillers

Recycling-friendly	Conditional	Problematic for recycling
	Limited amounts of additive to be used. Overall density of HDPE container should remain below 0.995 g/cm^3	• Fillers such as talc, $CaCO_3$ which increase density of HDPE container > 0.995 g/cm^3 • Degradable additives (oxo, photo or bio) • Optical brighteners

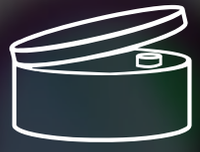
Size

HDPE bottles are produced in different dimensions, sizes, and, filling capacities, ranging from as low as 50 ml up to 50 L. The volume of shampoo bottles can vary from 100 ml to 5 litres. Industrial chemicals are usually supplied in containers of volumes >20 litres. The size and shape of HDPE bottles determines the ease and likelihood of collection, sorting, and segregation.

In the Indian context, containers of volumes up to 5 litres can pass through the recycling processes without affecting equipment, especially shredders.

Design guidance for size

Recycling-friendly	Conditional	Problematic for recycling
HDPE containers <5 litre in volume	HDPE containers >5 litre and <7.5 litre in volume	HDPE containers >7.5 litres in volume



Closures

Caps

Caps and closures made of PE which are compatible with the recycling system are preferred. If closures are made of materials other than PE or PP, their density should be >1 g/cm3 to allow easy separation during the washing process and prevent contamination.

The most commonly used resin for closures is PP. The weight of PP caps and closures should not exceed 5% of the bottle's weight.

Closures made of PVC, nylon, silicone, PS, EPS, steel or aluminium should be avoided as they contaminate the recycling stream.

Even though the density of PVC is higher than that of HDPE, and PVC sinks in the sink-float tank, it has a lower melting point than HDPE and will cause a degradation in the quality of recycled HDPE even at low contamination levels.

Closures made of same colour as the bottle, or unpigmented closures are preferred, dark coloured caps and closures should be avoided. Closures should be designed to allow for products to be emptied easily from the bottles.

Liners

Liner-less closures are preferred, but if liners are necessary, they should be made of HDPE, LDPE, PE + EVA, or PP.

Liners made of PET or aluminium should be designed for easy removal without leaving any residue on the packaging.

Liners made of PS, PVC, EVA with aluminium should be avoided.

Seals

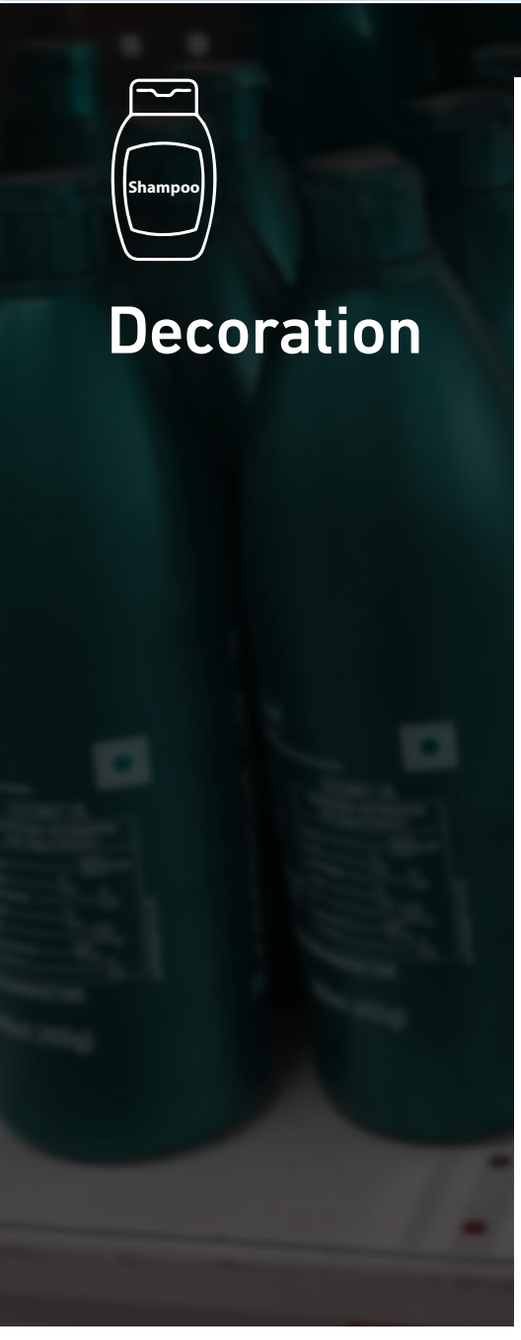
Foil safety seals which leave remnants of adhesives or foil on the bottle should be avoided. Metal parts or metal foils should be avoided as they damage the equipment in the material recovery facilities (MRFs), and in cases where the recycling facility has metal detectors, even a small quantity of metals will direct the bottle towards the waste stream resulting in yield loss. Hot seal liners should be avoided as they are not easily removable and leave adhesive residue on the surface.

PE and PP seals are preferred, but seals made of silicone and PVC should be avoided.

Closures

Design guidance for closures, liners and safety seals

	Recycling-friendly	Conditional	Problematic for recycling
Caps and closures	• Closures made of PE/PP • If non-PE/PP material used for closures, then density >1 g/cm^3 • PP caps and closures to be <5% of total weight of bottle • Closures made of same colour as bottle, or unpigmented	Dark coloured caps and closures	PVC, nylon, silicone, PS, EPS, steel, aluminium closures
Liners and safety seals	• Liner-less closures • If liners are necessary, they should be made of HDPE, LDPE, PE + EVA, PP • PE and PP seals	Liners made of PET or aluminium should be designed for easy removal	• Liners made of PS, PVC, EVA with aluminium • Foils, safety seals which leave remnants of adhesives or foils, metal parts or metal foils, PVC seals • Hot seal liners



Decoration

Direct printing

Direct printing on the bottles should be avoided unless it is minimal print for production or expiry dates.

Inks used on labels and for direct printing should not contain heavy metals. Laser printing can be used for date stamp or date stamps can also be engraved onto the bottles, removing the requirement for inks altogether.

Use of light coloured, non-gassing inks that are temperature- resistant up to 240°C, is preferred to minimize the loss of value of recycled HDPE.

Avoid using metallic or mineral inks.

Labels and sleeves

Labels should cover as little space on the bottle as possible: they should ideally cover under 40% of the bottle surface. Larger labels prevent the bottle from being detected by NIR sensors and may misdirect the bottle towards rejects. NIR sensors are not widespread in India currently, this recommendation will help account for any possible future shifts towards NIR-based sorting systems. Labels should also use the smallest possible quantity of adhesives that do not leave any residue on the bottle. If labels/sleeves of material other than polyethylene or polypropylene are used, they should be designed for easy removal by the end-user, without leaving any residual material on the bottle.

PE (MDPE, LDPE, LLDPE, HDPE) in-mould labels, self-adhesive PE labels, sleeves and wraparound or collar labels made of HDPE are acceptable.

PP or BoPP labels are also compatible with HDPE recycling streams.

PE/PP labels should be of the same colour as that of bottle; dark-coloured labels should be avoided. The overall weight of PP or BoPP components should be less than 5% of container weight.

Sleeves on HDPE bottles should be only made of HDPE to prevent sorting to another material stream.

Paper labels should be avoided because they form pulp when wetted which remains suspended and overloads water treatment systems. Paper labels that remain sticking to HDPE flakes can carbonize later in the recycling process and discolour the recyclate.

Metallized films should be also avoided because metal detectors are able to pick up even thin labels and may direct the bottle to a non-recycling stream.

Labels that are compatible with the recycling stream, such as PE and PP can have a thin layer of vacuum deposited metal without hampering recycling.

PS, PLA, PET and PET-G labels should only be used if they can be separated easily from the bottles, either by consumers, or during washing.

PVC labels should not be used even with adhesives which will release the material during the wash process, as even a small quantity of PVC not separated in the sink-float tank will degrade the quality of rHDPE.

Decoration

Adhesives

Adhesives that are water soluble between 60°C and 80°C, and hot-melt alkali-soluble adhesives are easy to remove during the recycling process. Adhesives that are dispersible under caustic wash conditions at pH >12 and <40°C are ideal, and pressure sensitive label adhesives that are dispersible in caustic wash conditions pH ≥12 and ≥70°C, can also be used.

Non-soluble adhesives in water or alkali at 80°C, hot melt glues and large areas of glue should be avoided.

Inks

Ink should not bleed colour as this might cause discoloration of rHDPE recyclate.

Design guidance for labels, inks and adhesives

	Recycling-friendly	Conditional	Problematic for recycling
Labels	• Labels covering <40% of the surface of the bottle • PE (MDPE, LDPE, LLDPE, HDPE) in-mould labels, self-adhesive PE labels, sleeves and wraparound or collar labels made of HDPE • PE/PP labels of the same colour as that of bottle	Dark coloured caps and closures	• Labels covering >60% of the surface of the bottle • Dark-coloured labels made of paper, PET, PET-G, PS, PVC, PLA, metallized films
Inks	Non-toxic inks which do not bleed colour Light coloured inks		Metallic, mineral, toxic inks
Direct printing	Engraving, laser printing for date stamps		
Adhesives	• Water-soluble adhesives between 60C and 80C • Hot-melt alkali-soluble adhesives • Adhesives that are dispersible under caustic wash conditions pH >12 and <40C	Pressure sensitive label adhesives that are dispersible in caustic wash conditions pH≥12 and ≥70°C	• Non-soluble adhesives in water or alkali at 80C • Hot melt glues, • Large areas of glue

Other attachments

HDPE containers could have additional attachments such as spray dispensers and pumps. Plastic dispensers made of PE and PP copolymers, thermoplastic elastomer (TPE), ethylene vinyl acetate (EVA), thermoplastic olefin (TPO), are preferred. All the components of the bottle (except those compatible with the recycling stream) should have a density >1 g/cm3 and sink in the sink-float tank.

The total weight of all the components made of PP, such as caps, labels, dispensers and pumps, should not make up more than 5% of the total packaging weight.

Metal contamination is undesirable in the HDPE recycling process. Even though metal sinks during the sink-float sorting process, it impacts machinery at recyclers.

Some recycling units use metal detectors which can reject HDPE bottles even if small components such as pump springs, valves or safety seals are present.

Use of other attachments which are not necessary should be discouraged as they reduce the base material yield and increase separation costs. For applications where attachments are necessary, such as neck rings on a tamper-evident closure, they should be of the same colour as bottle and designed in a way that they can be easily removed with the closure.

Attachments made of metal, glass and other non-plastic components should be discouraged.

Design guidance for spray dispensers, pumps and other attachments

Recycling-friendly	Conditional	Problematic for recycling
• PE, PP, TPE, EVA, TPO dispensers • PP attachments weighing <5% of the total weight of the bottle • All components of bottle not made of HDPE or PP should have density >1 g/cm^3 and sink in the sink-float tank	• Valves in sprays/pumps made of silicone • PP attachments weighing between 5% and 10% of the total weight of the bottle	• Metal contamination such as pump springs, valves, safety seals • Use of attachments which are not necessary • PP attachments weighing >10% of the total weight of the bottle • Attachments made of metal, glass, and other non-plastic components

Conclusions

The selection of closures, material colours, and label materials for bottles by a brand is based on a number of factors; aesthetics and consumer appeal are probably the most important of these, and tend to influence decisions in favour of highly decorative packaging. However, these decisions have a significant impact on recyclability, both in terms of line efficiency and yield.

The market potential for high-quality HDPE recycling is significant, as it is a highly recyclable material and collected efficiently in India, but how successful it is in practice depends on the decisions of packaging designers, brand owners and packaging converters.

These stakeholders must consider the impact of components such as labels, inks and closures on the recyclability of packaging. The use of mutually compatible components will help maximize HDPE recycling value and efficiency.

Design for recyclability has not been a high priority for brands in the past; however, using this guidance packaging designers and marketing personnel can work together to help avoid the use of materials or combinations of materials that might create problems in collecting, sorting or recycling HDPE bottles.

Decisions made at design level by brands will facilitate change over the entire country because more HDPE containers will enter the highly recyclable category. The quantity and quality of rHDPE available for reuse back into bottles will increase, and the amount of recyclable material being downcycled because of impurities or dark colours, for example, will decrease.

Not least, the Guidelines will also help brands and packaging manufacturers achieve their EPR targets and allow good practices to percolate down via supply chains.

Supported by research, capacity-building, dissemination and incentives to set up infrastructure for high-quality recycling, the Extended Producer Responsibility Guidelines which came into effect in July 2022, can drive up quantities of HDPE resin recycled in a closed loop.

Summary of guidance

Components		Recycling-friendly Materials and aspects that are known to be acceptable in HDPE recycling and can be used.	Conditional Materials and aspects that might pose a low risk of interfering with HDPE recycling and should be avoided when possible.	Problematic for recycling Materials and aspects that pose a high risk of interfering with HDPE recycling and should not be used
Body	Resin / material	• Mono-material structures, multilayer structures of different types of PE (LDPE, MDPE, HDPE) • PP contamination up to 5%	PP contamination of 5% to 10%	• Multilayer composite structures with resins other than different types of PE • PP contamination >10%
	Colour	• Unpigmented/clear/natural (unpigmented), with no carbon black • Inner and outer layer of multi-layer bottles of same colour • Limited dosing of masterbatch, follow EU REACH and US TPCH guidelines	• Light pigment/light tint HDPE bottles • Different colours for different layers of multi-layered bottles	• Strong pigments • NIR non-detectable colours such as carbon black • Titanium dioxide • High dosing of masterbatch and use of hazardous or toxic chemicals in masterbatches
	Additives and fillers		Limited amount of additive if overall density of HDPE container remains <0.995 g/cm$_3$	• Fillers such as Talc, CaCO3 which increase density of HDPE container > 0.995 g/cm3 • Degradable additives (oxo, photo or bio) Optical brighteners
	Size	HDPE containers <5 litre in volume	HDPE containers >5 litre and <7.5 litre in volume	HDPE containers >7.5 litres in volume
Closures	Caps	• Closures made of PE/PP • If non-PE/PP material used for closures, then density >1 g/cm^3 • PP caps and closures to be <5% of total weight of bottle • Closures made of same colour as bottle, or unpigmented	Dark coloured caps and closures	PVC, nylon, silicone, PS, EPS, steel, aluminium closures
	Liners and seals	• Liner-less closures • If liners are necessary, they should be made of HDPE, LDPE, PE + EVA, PP • PE and PP seals	Liners made of PET or aluminium should be designed for easy removal	• Liners made of PS, PVC, EVA with aluminium • Foils, safety seals which leave remnants of adhesives or foils, metal parts or metal foils, PVC seals • Hot seal liners

Components		Recycling-friendly	Conditional	Problematic for recycling
Decoration	Direct printing	Engraving, laser printing for date stamps		
	Labels and sleeves	• Labels covering <40% of the surface of the bottle • PE (MDPE, LDPE, LLDPE, HDPE) in-mould labels, self-adhesive PE labels, sleeves and wraparound or collar labels made of HDPE • PE/PP labels of the same colour as that of bottle	• Labels covering >40% and <60% of the surface of the bottle • PP or BoPP labels PE or PP labels with a layer of vacuum-deposited metal	• Labels covering >60% of the surface of the bottle • Dark-coloured labels made of paper, PET, PET-G, PS, PVC, PLA, metallized films
	Adhesives	• Water-soluble adhesives between 60C and 80C • Hot-melt alkali-soluble adhesives • Adhesives that are dispersible under caustic wash conditions pH >12 and <40C	Pressure sensitive label adhesives that are dispersible in caustic wash conditions pH≥12 and ≥70°C	• Non-soluble adhesives in water or alkali at 80C • Hot melt glues, • Large areas of glue
	Inks	Non-toxic inks which do not bleed colour Light coloured inks		Metallic, mineral, toxic inks
Others	Other attachments	• PE, PP, TPE, EVA, TPO dispensers • PP attachments weighing <5% of the total weight of the bottle All components of bottle not made of HDPE or PP should have density >1 g/cm^3 and sink in the sink-float tank	• Valves in sprays/pumps made of silicone • PP attachments weighing between 5% and 10% of the total weight of the bottle	• Metal contamination such as pump springs, valves, safety seals • Use of attachments which are not necessary • PP attachments weighing >10% of the total weight of the bottle • Attachments made of metal, glass, and other non-plastic components

About the India Plastics Pact

The India Plastics Pact, launched in 2021, unites businesses, governments, NGOs and citizens to create a circular plastics economy in India. It was developed by Confederation of Indian Industry (CII) and WWF India. The CII-ITC Centre of Excellence for Sustainable Development (CESD) anchors the India Plastics Pact, within CII. The initiative is supported by WRAP, a global NGO based in the UK.

It is the first Plastics Pact in Asia. As of August 2023, there are 14 Plastics Pacts spread across the globe. 50 organizations are currently part of the India Plastics Pact. The Pact works on all plastic resins at all stages of the plastics value chain.

www.indiaplasticspact.org

About Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government, and civil society, through advisory and consultative processes. For more than 125 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. CII engages closely with Government on policy issues and interfaces with thought leaders to enhance efficiency, competitiveness and business opportunities for Industry through a wide portfolio of specialized services and strategic global linkages.

India's premier business association has around 9,000 members, from the private as well as public sectors, and an indirect membership of over 300,000 enterprises from around 286 national and regional sectoral industry bodies. With 62 offices, including 10 Centres of Excellence in India, and 8 overseas offices in Australia, Egypt, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with 350 counterpart organizations in 133 countries, CII serves as a reference point for Indian Industry and the international business community.

About WRAP

WRAP is a UK based international resources and climate action NGO working around the globe to tackle the causes of the climate crisis and give the planet a sustainable future. WRAP is working with businesses across the plastics value chain globally through the Plastics Pact network, transforming how we make, use, collect, sort, reuse and recycle plastics to create a circular economy.

WRAP set up, and manages, the UK Plastics Pact. Established in 2018, in partnership with The Ellen MacArthur Foundation, it has catalyzed 14 further Plastics Pacts to be developed including South Africa, US, Chile, Kenya and Colombia. WRAP was instrumental in establishing the India Plastics Pact with CII and WWF-India. The Plastics Pact network encompasses over 1,000 leading plastics businesses in their membership. WRAP provides operational and technical support to the India Plastics Pact and other Pacts. WRAP also runs a knowledge sharing platform between the various circular plastics initiatives internationally.

About European Union-Resource Efficiency Initiative

European Union's Resource Efficiency Initiative (EU-REI) for India is aims to support India in the implementation of the United Nations global Sustainable Consumption and Production (SCP) agenda by way of adapting international standards and best practices in business on resource efficiency and fostering the efficient and sustainable use of natural resources.

The project is working to create a dialogue on the need for resource efficient approaches in India among key government and non-governmental organisations, businesses, students, media and the general public. It will also underscore the link between recovering raw materials from different material streams and creating an enabling ecosystem for the management of secondary raw materials. Adoption of RE standards and benchmarks and business best practices on resource efficiency will remain key in this transition. The primary sectors of interest are mobility, buildings and construction, renewable energy (photovoltaics), and resource recovery from waste (e-waste and plastics and packaging).

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