भारतीय मानक **IS 16630 (Part 1) : 2024**

Indian Standard

प्लास्टिक - पोस्ट-उपभोक्ता बोतलों और पॉली के अन्य रूपों (एथिलीन टेरेफ्थेलेट) (पीईटी) से पुनर्चक्रित

भाग 1 अभिनाम प्रणाली और विशिष्टियों हेतु आधार

(पहला पुनरीक्षण)

Plastic — Recyclates from Post-Consumer Bottles and Other Forms of Poly(Ethylene Terephthalate) (PET)

Part 1 Designation System and Basis for Specifications

(First Revision)

ICS 83.080.20

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Plastics Sectional Committee, PCD 12

FOREWORD

This Indian Standard (Part 1) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

This standard was first published in 2018. In this revision, the major changes are as follows:

a) The title of the standard has been modified to accommodate the objective of the *Plastic Waste Management* (*PWM*) *Rules*, 2016 and its amendments of reducing plastic pollution; and

b) Scope of the standard has been broadened to include PET articles beyond bottles (for example, trays, sheets). However, given the various formats of the recycling process and multiplicity and variability of the life cycles undergone by the recyclates, recycled PET has the potential to contain UVCBs (chemicals of unknown, variable, complex composition). Hence, this standard continues to cover PET recyclates for non-food applications only.

This revision not only reflects the actual recycling practices, but it also brings clarity to the nomenclature used herein. For example, the 'recyclates' are differentiated from the final 'recycled products' keeping in mind the overall process as follows:

Post-consumer PET → recycler → recyclate→ converter → recycled product

NOTE — Here converters are fibre producers, moulders, etc.

This standard (Part 1) continues to provide a designation system for PET recyclates as in the original version, namely, data blocks comprising positions for indicating different attributes of the recyclates. However, in this revision the constituents of data blocks have been reorganized to make a grouping of attributes. Thus, attributes of the recyclates that reflect 'information' (the polymer, the recyclate and the process) are placed ahead of those 'measured' (properties and levels of contaminants).

In this revision, only attributes that are in the recycler's control have been given in the mandatory data blocks and other attributes (for example, the intended application of the recyclate) are given in an optional data block at the end of the designation system. This revised designation system allows codification of a variety of recyclate formation processes present in the evolving field of PET recycling.

Other part of this series is:

Part 2 Preparation of test specimens and determination of properties

In this revision, alignment between (Part 1) and (Part 2) of IS 16630 has been addressed as follows:

a) measurement of rPET content has now been clearly enunciated in Part 1. This rests on the measurement of ash content which is included in Part 2;

b) residual alkalinity which is mentioned in Part 2 but was missing in Part 1 has now been included in Part 1; and

c) methods for the measurement of optional parameters such as rheological properties, BPA, phthalates, heavy metal content, are provided for in Part 2.

During the preparation of this standard, considerable assistance has been derived from ISO 12418-1 : 2012 'Plastics — Post-consumer poly (ethylene terephthalate) (PET) bottle recyclates — Part 1: Designation system and basis for specifications.

The composition of the Committee responsible for the formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

PLASTIC — RECYCLATES FROM POST-CONSUMER BOTTLES AND OTHER FORMS OF POLY(ETHYLENE TEREPHTHALATE) (PET)

PART 1 DESIGNATION SYSTEM AND BASIS FOR SPECIFICATIONS

(First Revision)

1 SCOPE

1.1 This standard (Part 1) establishes a designation system for recyclates produced from post-consumer poly (ethylene terephthalate) (PET) bottles and other forms (such as jars, thermoformed trays/cups, etc), which may be used as the basis for specifications.

1.2 This standard is applicable to all forms of 'recyclates' (flakes, pellets and powder) generated from the mechanical recycling processes and meant for non-food applications.

1.3 This standard deals with mechanical recycling processes provided for in IS 14534, pertaining specifically to those without the intentional addition of any chemicals/comonomers/modifiers during recyclate formation.

1.4 Due to the variations in the input (post-consumer PET) and in the recycling processes, the output (recyclates) may differ in various attributes, like contamination levels, properties, etc. Based on these attributes, the recyclates need to be segregated for their effective utilization subsequently. For example, in order to identify the various recyclates according to their attributes, a designation system that is in control of the recycler is proposed in this standard.

1.5 The designation system is merely an identification of the recyclates attributes. The designation system:

a) is not meant to suggest the recyclate' s fitness for purpose;

b) is not intended to imply that materials having the same designation will give the same performance; and

c) is merely a classification system to facilitate segregation of recyclates.

1.6 This part of standard does not provide engineering data or data on processing conditions which might be required to specify a material for a particular application and/or method of processing. If such additional details are required, they shall be determined in accordance with the test methods specified in Part 2 of the standard, if applicable.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All Standards are subject to revisions, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

IS No.	*Title*
IS 14534 : 2023	Plastics — Recovery and recycling of plastics waste — Guidelines (*second revision*)
IS 7019 : 1998	Glossary of terms in plastics and flexible packaging, excluding paper (*second revision*)
IS 16630 (Part 2) : 2024	Plastics — Post-consumer poly(ethylene terephthalate) (PET) bottle recyclates: Part 2 Preparation of test specimens and determination of properties (*first* revision)

3 DESIGNATION SYSTEM

3.1 General

PET recyclates are characterized by different attributes that need to be designated in a logical and identifiable manner. For this, the following pattern is adopted:

a) Relevant attributes are codified;

b) Codes are placed in discrete positions; and

c) Positions are grouped in different data blocks.

3.1.1 The designation system comprises a default data block followed by mandatory data blocks wherein information critical to the use of recyclates in non-food application is placed. These can optionally be followed by appending additional information in a separate data block. The default data block mentions the Indian Standard number governing the recyclates. The mandatory data blocks provide information for the effective utilization of recyclates through attributes that can be 'information-based' or 'measurement-based'. Information-based attributes are placed first followed by measurement-based attributes.

3.1.2 Various attributes of the recyclates that may have pronounced impact during their subsequent utilization are included in the designation system as below.

3.1.2.1 Information-based attributes are intended application and form of recyclates. Wherever needed, alpha-numeric codes are used to convey information that differentiate various recyclate formation processes or process parameters.

3.1.2.2 Measurement-based attributes are recycled content, routine contaminants (label and other similar visible contaminants, PVC, polyolefins including adhesives), chemical properties (intrinsic viscosity (IV), moisture content, residual alkalinity) and physical properties (size, bulk density, colour). Unless stated otherwise, attributes shall be measured in accordance with IS 16630 (Part 2). Although a measurement will yield a specific value, it is placed in an appropriate band (range of values) in the designation system. The bands have alpha-numeric codes.

3.1.2.3 Any attributes of the recyclates other than those mentioned in **3.1.2.1** and **3.1.2.2**, may be recorded in the optional data block (data block 7) as agreed between the buyer and the seller.

3.1.3 The designation system comprises a default data block and other data blocks that contain codified attributes placed in discrete positions. This is explained in data block structure given on next page. The designation system for other data blocks is described in **3.2**.

3.1.4 All attributes are codified with letters or alpha-numeric codes. The system of code letters is given in Table 1. Certain attributes will have alpha-numeric codes in which the code letter assigned in Table 1 will be followed by a number to indicate the intensity of that attribute.

3.1.5 If a property value falls on or near a range limit, the manufacturer shall state which range will designate the material. If subsequent individual test values lie on, or either side of, the limit because of manufacturing tolerances, the designation is not affected.

3.1.6 Each data block has a fixed number of positions to cover the designated attributes. However, given that different recyclates are formed through different processes, all attributes may not be applicable to all recyclate forms. In such cases, the positions shall be filled with code letter 'z'. This is to maintain uniformity in the block sizes.

3.1.7 Data blocks shall be separated from each other by a hyphen. Compositions of the individual data blocks, other than the default data block, are explained in **3.2** to **3.8**.

3.2 Data Block 1

3.2.1 This data block provides information on the polymer type and the intended use of the recyclate. This data block covers only one attribute that is applicable to all recyclate forms. The intended information is provided in one position by a code comprising two parts as follows:

Code's Part 1: 'RPET' to indicate recycled PET.

Code's Part 2: '*N' to indicate non-food application.

3.2.2 Thus, this data block will have a fixed code of 'RPET*N' for all forms of recyclates made from post-consumer PET.

3.3 Data Block 2

3.3.1 This data block provides information on the basic process history deployed in the recyclate formation (*see* Annex A with its block diagram). Attributes covered in this data block are placed in two positions and are applicable to specific recyclate forms as stipulated below:

Position 1: Form of the recyclate.

Position 2: Filter-opening rating (applicable only for the recyclate in the pellet form).

Data Block Structure for the Designation System for Recyclates

Mandatory Data Blocks														*Optional Data Block*		
Information — Based				Measurement — Based										Information — Based and/or Measurement – Based		
Indian Standard Number Block	DATA BLOCK 1	DATA BLOCK 2		DATA BLOCK 3	DATA BLOCK 4			DATA BLOCK 5			DATA BLOCK 6			DATA BLOCK 7		
	Polymer Type	Process History		Recycled Content	Contaminants (Routine)			Properties - Chemical			Properties - Physical					
	Pos 1	Pos 1	Pos 2	Pos 1	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3
IS 16630 (Part 1)	Recycled polymer type and intended use-category	Form of recyclate	Filter opening	(*see* 3.4)	Labels	PVC	Polyolefins	Intrinsic viscosity	Moisture	Residual alkalinity	Size	Bulk density	Colour			

NOTE — In the data block structure above, ‘position’ is abbreviated as ‘Pos’ wherever column width is limited.

Table 1 Code Letters for Various Attributes

(*Clause* 3.1.4)

Sl No.	Code Letter	Attribute	Code Letter	Attribute	Code Letter	Attribute	Code Letter	Attribute
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	A	Residual alkalinity	H	Melt volume — Flow rate (MVR) (optional, *see* note below)	O	—	V	—
ii)	B	Label and similar content	I	—	P	Pellet	W	Powder
iii)	C	Coloured recyclate	J	Filter opening	Q	Moisture content	X	No indication (colour)
iv)	D	Bulk density	K	—	R	Recycled content	Y	PVC content
v)	E	Polyolefin content	L	Size: Large (flakes and pellets)	S	Size : Small (flakes and pellets)	Z	Blank character
vi)	F	Flake	M	Size: Medium (flakes and pellets)	T	Intrinsic viscosity		
vii)	G	Melt-flow rate (MFR) (optional, *see* note below)	N	Non-food	U	Natural (colour)		

NOTE — The code letters ‘G’ and ‘H’ are reserved for melt mass-flow rate (MFR) and the melt volume- flow rate (MVR), respectively, in the event that they are used in the optional data block (**3.8.2.1**). These code letters will be a part of the alpha-numeric code as explained in **3.1.4**.

3.3.2 Position 1 relates to recyclate formation process. Multifarious mechanical recycling processes exists leading to recyclates in the form of flakes and/or pellets and/or powders. A combined information on the recycling process and the resultant recyclate form is provided through an alpha-numeric code.

3.3.3 Position 2 relates to the rating of the melt filter. Flakes are melt-extruded into pellets for which polymer filters having different openings (micron ratings) are used. These filter openings are segregated into two groups and codes. For recyclates in the form of flakes and powder, the code letter ‘Z’ will be used.

3.3.4 The codes for data block 2 are shown below.

Codes for Different Recyclate Forms and their Formation Processes

Position 1				*Position* 2	
Recyclate Form	Recyclate Determination Code	Production Path	Detailed Production Path for the Recyclate	Code	Filter Opening µm
(1)	(2)	(3)	(4)	(5)	(6)
Flakes (F)	F1	MRG	MRG	J 1	≤ 35
	F2	MRA	MRG + alkali wash	J 2	> 35
Pellets (P)	P1	F2 + extrusion	MRA (F2) + extrusion	-	-
	P2	F2 + vacuum extrusion	MRA (F2) + vacuum extrusion	-	-
	P8	P1 + MRP (SSP)	MRA (F2) + extrusion + MRP (SSP)	-	-
	P9	P2 + MRP (SSP)	MRA (F2) + vacuum extrusion + MRP (SSP)	-	-
Powder (W)	W1	P1 + pulverization	MRA (F2) + extrusion + pulverization	-	-
	W2	P2 + pulverization	MRA (F2) + vacuum extrusion + pulverization	-	-
	W8	P8 + pulverization	MRA (F2) + extrusion + MRP (SSP) + pulverization	-	-
	W9	P9 + pulverization	MRA (F2) + vacuum extrusion + MRP (SSP) + pulverization	-	-

3.3.5 Illustrative code for data block 2 is as follows:

a) For flakes, made by, the MRA process with filter opening (not applicable for flakes), designation will be ‘F2z’;

b) For pellets, made by the process of MRA (F2) + Vacuum extrusion and with filter opening, say, 60 µm, designation will be ‘P2J2’; and

c) For powder, made by the process of MRA (F2) + Vacuum extrusion + MRP (SSP) + Pulverization with filter opening (not applicable for powder), designation will be ‘W9z’.

3.4 Data Block 3

3.4.1 This data block provides measurement-based information (*see* **3.1.2.2**) on the polymer content devoid of any inorganics in the recyclate. Since the input is only PET articles, it is presumed that the predominant polymer content in the recyclates is PET.

3.4.2 It is to be noted that for compliance with this standard, it is not permitted to add filler and/or reinforcing material intentionally during recyclate formation processes. Hence, the designation code is meant to indicate only the inherent inorganic material in the input post-consumer PET waste (*see* **1.3**).

3.4.3 This data block covers only one attribute that is applicable to all recyclate forms. The intended information is provided in one position by a code comprising two parts as follows:

Part 1: ‘R’ to indicate the recycled nature.
Part 2: ‘nnn’ to indicate the content of recycled PET.

3.4.4 Part 2 (nnn) of the code is derived as follows:

Measure the ash content of the recyclate as per Annex C of IS 14535. Round off the result to the next higher integer. Deduct this integer from 100. Express the result in three digits to form the code. For example, ash content of 1.5 percent is rounded off as 2 percent. Then 100-2 = 98 is expressed as 098).

3.4.5 Illustrative codes in Data block 3 : R100, R098, etc. for all forms of recyclates made from post-consumer PET.

3.5 Data Block 4

3.5.1 This data block provides measurement-based information (*see* 3.1.2.2) on the routine contaminants that remain with the post-consumer PET even after the recycling process. Attributes covered in this data block are placed in three positions and are applicable to only flakes as stipulated below:

Position 1: Label and other similar visible contaminants

Position 2: PVC content

Position 3: Polyolefins (and including adhesives) content

3.5.2 For recyclates in the form of pellets and powder, the code letter 'z' will be used in all three positions.

3.5.3 The codes for data block 4 are given in table below.

3.5.4 Illustrative code for data block 4 is as follows:

3.5.4.1 For flakes, having

a) labels and other visible contaminants ≥ 20 but ≤ 100 mg/kg;

b) PVC ≥ 300 mg/kg; and

c) Polyolefins (and including adhesive) contaminants ≥ 100 but ≤ 300 mg/kg.

'B1Y9E3'

3.5.4.2 For pellets: Not applicable, hence 'z'.

3.5.4.3 For powder: Not applicable, hence 'z'.

3.6 Data Block 5

3.6.1 This data block provides measurement-based information (*see* 3.1.2.2) on the chemical properties of the recyclates. Attributes covered in this data block are placed in three positions and are applicable to specific recyclate forms as stipulated below:

a) Position 1: Intrinsic viscosity (IV) — for all recyclate forms;

b) Position 2: Moisture content — for all recyclate forms; and

c) Position 3: Residual alkalinity — for flakes only.

Codes for Routine Contaminants

Position 1		*Position* 2		*Position* 3	
External Contamination Level (only for Flakes) mg/kg					
Code	Label and Other Visible Contaminants	Code	PVC Content	Code	Polyolefins (Including Adhesives) Content
B0	≤ 20	Y0	≤ 20	E0	≤ 20
B1	> 20 to ≤ 100	Y1	> 20 to ≤ 100	E1	> 20 to ≤ 100
B3	> 100 to ≤ 300	Y3	> 100 to ≤ 300	E3	> 100 to ≤ 300
B9	> 300	Y9	> 300	E9	> 300

3.6.2 The codes for data block 5 are given below.

Codes for Chemical Properties of the Recyclates

Position 1		*Position* 2		*Position* 3	
Code	Intrinsic Viscosity, dL/g	Code	Moisture Content, percent	Code	Residual Alkalinity, *p*H
(1)	(2)	(3)	(4)	(5)	(6)
T9	≥ 1.0	Q1	≤ 1.0	A6	< 6.5
T8	≥ 0.8 but < 1.0	Q2	> 1.0 but < 1.5	A7	≥ 6.5 but ≤ 7.5

Position 1		*Position* 2		*Position* 3	
Code	Intrinsic Viscosity, dL/g	Code	Moisture Content, percent	Code	Residual Alkalinity, *p*H
(1)	(2)	(3)	(4)	(5)	(6)
T7	≥ 0.7 but < 0.8	Q9	≥ 1.5	A8	> 7.5
T6	≥ 0.6 but < 0.7	-	-	-	-
T0	< 0.6	-	-	-	-

3.6.3 Illustrative code for data block 5 is as follows:

a) For flakes, having Intrinsic viscosity of 0.659 dL/g, moisture content of 1.72 percent and residual alkalinity of 6.3, the designation will be 'T6Q9A6';

b) For pellets having Intrinsic viscosity of 1.08 dL/g, moisture content of 0.87 percent and residual alkalinity (not applicable for pellets), the designation will be 'T9Q1zz'; and

c) For powder having Intrinsic viscosity of 0.856 dl/g, moisture content of 1.27 percent and residual alkalinity (not applicable for powder), the designation will be 'T8Q2zz'.

3.7 Data Block 6

3.7.1 This data block provides information (*see* 3.1.2.2) on the physical properties of the recyclates. Attributes covered in this data block are placed in three positions and are applicable to specific recyclate forms as stipulated below.

a) Position 1: Size as measured for flakes and pellets;

b) Position 2: Bulk density for all recyclate forms; and

c) Position 3: Colour for all recyclate forms.

3.7.2 The codes for data block 6 are given in table below.

3.7.3 Illustrative code for data block 6 are as follows:

a) For flakes, having average size of 8 mm, bulk density of 280 kg/m^3 and colour, say, uncoloured, the designation will be 'MD1N';

b) For pellets, having average size of 3 mm, bulk density of 385 kg/m^3 and colour, say, amber, the designation will be 'SD2C';

c) For flakes, having average size of 3 mm, bulk density of 385 kg/m^3 and colour, say, amber, the designation will be 'SD2C'; and

d) For powder, having size, (not applicable for powder), bulk density of 470 kg/m^3 and colour, say, no indication, the designation will be 'zD9X'.

3.8 Data Block 7

3.8.1 This is an optional data block. It may comprise information and/or measurements on different attributes of the recyclates. These attributes are not placed in the mandatory data block in view of the non-food applications of the recyclates. These attributes are to be decided by the recycler independently or in consultation with the user and shall not be in conflict with that in the mandatory data blocks.

3.8.2 Attributes covered in this data block are placed in any required number of positions and made applicable to specific recyclate forms as decided.

Codes for Physical Properties of the Recyclates

Position 1			*Position* 2		*Position* 3	
Code	Flake size mm	Pellet Size mm	Code	Bulk Density kg/m^3	Code	Colour
(1)	(2)	(3)	(4)	(5)	(6)	(7)
S (For flakes or pellets only)	≤ 5	≤ 2	D1	≤ 300	C	Coloured

Position 1			*Position* 2		*Position* 3	
Code	Flake size mm	Pellet Size mm	Code	Bulk Density kg/m^3	Code	Colour
(1)	(2)	(3)	(4)	(5)	(6)	(7)
M (for flakes or pellets only)	≥ 5 but < 10	> 2 but < 5	D2	> 300 but < 400	N	Natural (transparent or family of whites)
L (For flakes or pellets only)	≥ 10	≥ 5	D9	≥ 400	X	No indication
Z (For powder)						

3.8.2.1 *For example:*

Position 1: Intended processing method (information-based parameter)

Position 2: Rheological properties (measurement-based parameter)

Example:

Either melt mass-flow rate (MFR) or the melt volume-flow rate (MVR) (reference IS 16630 (Part 2), using 'G' and 'H' code letters, respectively.

Position 3: Filterability (measurement-based parameter)

Further positions: Parameters related to hazardous substances (for example, BPA, phthalates, heavy metals, unknown degradation byproducts, other harmful contaminants), nitrogen content (measurement-based parameters)

Further positions: Any other parameter(s).

3.8.2.2 The sequence and the contents in **3.8.2.1** are only illustrative, can be changed and not all positions may even be used.

3.8.3 Indication of additional parameters in this optional data block can be a way of transforming the designation of a material into a specification for a particular application. This may be done for example by reference to a suitable national standard or to a standard-like generally established specification.

NOTE — Data block 7 is optional, the parameters and the codes to be mutually decided between the recycler and buyer. The number of positions in the data block will be decided accordingly.

4 EXAMPLE OF DESIGNATIONS

4.1 Designations may be provided in the box form (best suited on packaging of the rPET) or in the text form (best suited in communications).

4.2 The designations will be in the same sequence as listed in **3.1** to **3.8** also shown in data block on next page.

4.3 Examples for all three forms of recyclates, namely flakes, pellets and powders are provided in Annex B.

4.3.1 In each example, details of the recyclate are provided in the short table followed by its designation.

4.3.2 In these examples, data block 7 is kept blank since it is optional and variable. Its designation will follow section **3.8**.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed in suitable form of packing, as agreed to between the purchaser and the supplier.

5.2 Marking

5.2.1 Each bag and/or unit package whichever is smallest in size that is being delivered to the customer shall be clearly marked with the following:

a) Name and type of the material;

b) Designation cod;

c) Net mass of the material;

d) Batch number/lot number;

e) Month and year of manufacture of the material; and

NOTE — Batch number/lot number should reflect month and year of manufacture of the material. If not, it has to be printed separately as mentioned in (e).

f) Name of the manufacturer and trade mark; if any.

5.2.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

Default Data Block	*Data Block* 1	*Data Block* 2		*Data Block* 3	*Data Block* 4			*Data Block* 5			*Data Block* 6			*Data Block* 7		
Position 1	Position 1	Pos 1	Pos 2	Pos 1	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3			
Indian Standard number	Recycled polymer type and intended use	Form of recyclate including recycling process	Filter opening	Recycled content	Intrinsic viscosity	Moisture	Residual alkalinity	Labels + others content	PVC content	Residual alkalinity	Size	bulk density	Colour			

NOTE — Data blocks are to be separated by hyphen (-).

ANNEX A

(*Clause* 3.3.1)

DESCRIPTION OF TYPICAL MECHANICAL RECYCLING PROCESSES FOR POST-CONSUMER PET

A-1 Post-consumer PET is obtained from various sources as depicted in Fig. 1 and reaches the recyclers commonly as compressed bales. The recyclers are of wide variety of capabilities and deploying various variants for cleaning, shredding, processing and analyzing the resultant products. This standard deals with only the processes that are in alignment with IS 14534 which mandates that no additive shall be added during the process of recyclate formation. Code letters used in the text hereunder can be understood by referring to Fig. 1.

A-2 SEGREGATING THE INCOMING POST-CONSUMER PET

As a general first step in any recycling process, incoming post-consumer PET is segregated commonly based on colour – transparent (neutral colour) is separated from coloured (green, amber, etc).

A-3 DIFFERENT PROCESSES FOR RECYCLATE FORMATION

A-3.1 MRG — In this process, the typical elements are using the segregated PET waste, optionally mixing with flakes from bottle crushing machines or reverse vending machines (RVM), removal of labels and caps, decontamination by magnetic separation, float and sink separation, shredding into flakes (F1), water wash and drying.

A-3.2 MRA — In this process, the element of treatment with alkali and/or cleaning formulation(s) is added to the MRG process (F1) followed by rinsing and drying to yield further cleaned PET flakes (F2).

A-3.3 MRP — In this process, elements such as extrusion and/or vacuum evaporation and/or solid-phase polymerization and/or pulverization are added – either singly or in combination – to the MRA process to yield various types of pellets (P1, P2, P8, P9) or powders (W1, W2, W8, W9).

A-3.3.1 *Solid-State Polymerization*

Here, the pellets P1 and P2 are subjected to solid-state polymerization to yield P8, P9.

A-3.3.2 *Pulverization*

Here crystallized pellets or solid-state polymerized pellets are subjected to cryogenic grinding to yield W1, W2, W8, W9.

A-3.4 Different sequences and levels of sophistication to the above process elements may be practiced while converting post-consumer PET into its various recyclates.

A-4 There are various possible routes for mechanical recycling.

Figure 1 details the different routes to arrive at the three recyclate forms and their four categories of utilization.

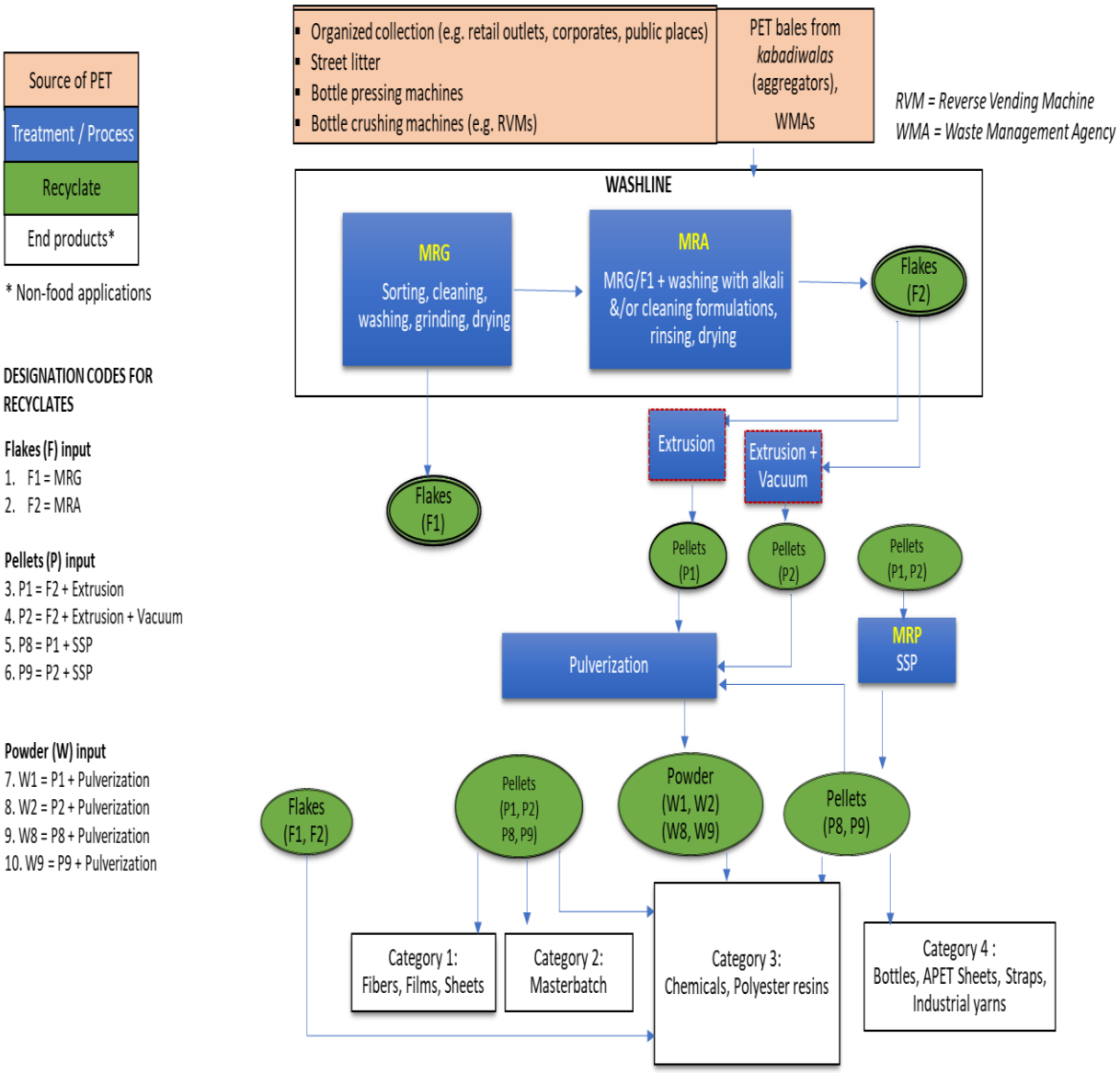

FIG. 1 AN OVERVIEW OF THE CONVERSION OF PCR-PET INTO ITS RECYCLATES

ANNEX B

(*Clause* 4.3)

ILLUSTRATIVE DESIGNATIONS FOR ALL THREE FORMS OF RECYCLATES WITH VARIOUS HISTORIES

Default Data Block	*Data Block* 1	*Data Block* 2		*Data Block* 3	*Data Block* 4			*Data Block* 5			*Data Block* 6			*Data Block* 7		
Position 1	Position 1	Pos 1	Pos 2	Pos 1	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3	Pos 1	Pos 2	Pos 3			
Indian Standard Number	Recycled polymer type and intended use	Form of recycle including recycling process	Filter opening	Recycled content	Labels + others content	PVC content	Polyolefins content	Intrinsic viscosity	Moisture	Residual alkalinity	Size	bulk density	Colour			

Example:

1 FLAKES

IS 16630 (Part 1)	Recycled PET, Non-food applications	Flake, MRG process	NA	97 % Polymeric, 3 % Inorganics	> 100 but ≤ 300 mg/kg For example 138	> 300 mg/kg For example 317	> 20 but ≤ 100 mg/kg For example 69	≥ 0.7 but < 0.8 dl/g For example 0.712	≥ 1.5 % For example 0.712	TBD	> 10 mm For example 12	≤ 300 kg/m^3 For example 264	Coloured (non white) —
Resultant designation (box format)													
16630 (Part 1)	RPET*N	F1	Z	R097	B3	Y9	E1	T7	Q9	A8	L	D1	C

Resultant designation (text format)

IS 16630 (Part 1)-RPET*N-F1z-R097-B3Y9E1-T7Q9A8-LD1C

Example: 2 PELLETS													
IS 16630 (Part 1)	Recycled PET, Non-food application	PELLET, MRA + Extrusion + MRP (SSP)	20 microns	98 % polymeric, 2 % inorganics	NA	NA	N A	≥ 0.8 but < 1.0 dL/g for example, 0.84	≤ 1.0 % for example, 0.21	NA	>2 but < 5 mm for example, 3.4	>300 but < 400 kg/m^3 for example, 381	Natural shade (white)
Resultant designation (box format) :													
IS 16630 (Part 1)	R PET*N	P 8	J1	R098	z	z	z	T8	Q1	z	M	D2	u

Resultant designation (text format):

IS 16630 (Part 1)-R PET*N-P8J1-R098-zzz-T8Q1z-MD2U

Example 3 : POWDER													
IS 16630 (Part 1)	Recycled PET, non-food applications	Powder, MRA + Vacuum extrusion + pulverization	NA	100 % Polymeric, No inorganics	NA	NA	NA	≥ 0.6 but < 0.7dl/g for example ,0.63	> 1.0 but < 1.5 % for example, 1.34	NA	NA	> 400 kg/m^3 for example, 542	Not classifiable

Resultant designation (box format)												
IS 16630 (Part 1)	RPET*N	W2	z	R 100	z	z	z	T 6	Q2	z	z	D9	X

Resultant designation (text format)

IS 16630(Part 1)-RPET*N-W2z-R100-zzz-T6Q2z-Zd9X

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Plastics Sectional Committee, PCD 12

Organization	*Representative(s)*
Central Institute of Petrochemicals Engineering & Technology (CIPET), Chennai	DR SHISHIR SINHA **(*Chairperson*)**
All India Plastics Manufacturers Association (AIPMA), New Delhi	SHRI DEEPAK BALLANI
Central Institute of Petrochemicals Engineering & Technology (CIPET), Chennai	DR S. N. YADAV DR SMITA MOHANTY (*Alternate*)
Central Pollution Control Board, New Delhi	SHRIMATI DIVYA SINHA SHRI C. K. DIXIT (*Alternate*)
Chemical and Petrochemical Manufactures Association (CPMA), New Delhi	SHRI UDAY CHAND
Coca-cola India Pvt Ltd, Gurugram	SHRI VIRENDRA LANDGE SHRI RAJENDRA DOBRIYAL (*Alternate*)
CSIR - Central Food Technological Research Institute (CFTRI), Mysuru	SHRI R. S. MATCHE SHRI KESHAVA MURTHY P. (*Alternate*)
CSIR - Indian Institute of Toxicological Research (IITR), Lucknow	DR V. P. SHARMA DR A. B. PANT (*Alternate*)
CSIR - National Chemical Laboratory (NCL), Pune	DR P. R. SURESHA SHRIMATI SANGEETA HAMBIR (*Alternate* I) DR R. V. GUNDLOORI (*Alternate* II)
Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, New Delhi	SHRI O. P. SHARMA SHRI VARUN SINGH POONIA (*Alternate*)
Food Corporation of India (FCI), Delhi	SHRI RAJAGOPAL. A. SHRI A. K. U. B. SINGH (*Alternate*)
Food Safety and Standards Authority of India (FSSAI), Delhi	SHRI CHIRAG GADI
GAIL (India) Ltd, Noida	SHRI MANISH KHANDELWAL
Haldia Petrochemicals Limited, Kolkata	SHRI RAJ K. DATTA SHRI SUVOMOY GANGULY (*Alternate*)
HPCL Mittal Energy Limited (HMEL), Noida	SHRI VINEET KUMAR GUPTA SHRI ALAKESH GHOSH (*Alternate*)

Organization	*Representative(s)*
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Indian Flexible Packaging & Folding Carton Manufacturers Association (IFCA), Mumbai	SHRI ATIN CHAUDHURI
Indian Institute of Packaging (IIP), Mumbai	DR BABU RAO GUDURI DR ATUL JADHAV (*Alternate*)
Indian Institute of Technology, New Delhi	SHRI ANUP K. GHOSH
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ONGC Petro Additions Ltd (OPAL), Dahej	SHRI VIVEK MEHTA
Organization of Plastics Processors of India, Mumbai	SHRI DEEPAK LAWALE
Plastindia Foundation, Mumbai	DR E. SUNDARESAN DR MIHIR K. BANERJI (*Alternate*)
Reliance Industries Ltd (RIL), Mumbai	SHRI S. V. RAJU SHRI SUNIL MAHAJAN (*Alternate* I) SHRI AMIT SHAH (*Alternate* II)
Sabic Innovative Plastics, Bengaluru	DR SUMANDA BANDYOPADHYAY SHRI SUNIL RAUTO (*Alternate* I) SHRI NAGARAJ DHADESUGUR (*Alternate* II)
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Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	SHRI M. A. U. KHAN

Organization	*Representative(s)*
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Member Secretary
SHRI SHIVAM DWIVEDI
SCIENTIST 'B'/ASSISTANT DIRECTOR
(PETROLEUM, COAL AND RELATED PRODUCTS), BIS

Panel Responsible for Preparation of the Standard on 'Plastic — Recyclates from Post-Consumer bottles and Other Forms of Poly(ethylene terephthalate) (PET): Part 1 Designation System and Basis for Specifications (*first revision*)'

Organization	*Representatives(s)*
Reliance Industries Limited, Mumbai	DR SHREERAM WADEKAR **(*Convener*)**
Bisleri International Pvt Ltd, Mumbai	SHRI K. GANESH
Coca-Cola India Pvt Ltd, Gurugram	SHRI VIRENDRA LANDGE
PET Packaging Association for Clean Environment (PACE), New Delhi	DR VIJAY HABBU
Reliance Industries Limited, Mumbai	SHRI GIRISH DESAI
SABIC, Bengaluru	DR SUNIL RAUTO

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