

**GUIDELINES ON THE ENVIRONMENTALLY SOUND MANAGEMENT
OF CATEGORY III MULTILAYERED PLASTIC PACKAGING WASTE**



CENTRAL POLLUTION CONTROL BOARD

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September 2026

CONTENTS

Chapter	Details	Page No.
1	Background	2
2	Objective and Scope	2
3	Regulatory Framework: PWM Rules, 2016	3
4	Institutional Framework and Responsibilities	8
4.1	Responsibilities of Local Bodies	9
4.2	Responsibilities of Producers, Importers and Brand Owners	11
4.3	Responsibilities of SPCBs/PCCs	12
5	Multilayered Plastic Packaging (Category III)	13
5.1	Current Status of MLP Waste Processing Infrastructure	14
5.2	Sources of MLP Wastes	14
6	Collection, Segregation and Channelization of MLP Waste	16
6.1	Operational Methodology	19
6.2	Documentation, Traceability and Monitoring	20
6.3	Collection Models for MLP Waste	21
6.4	Collection and Channelization by PIBOs	23
7	Recycling of MLP Wastes	23
7.1	Mechanical Recycling Process of MLP	25
7.2	Advanced Recycling Technologies	29
7.2.1	Chemical Recycling	30
7.2.2	Eddy Current Separation for Aluminium Recovery	31
7.2.3	Aluminium Recovery from Foil-based MLP	34
7.2.4	Hydro-pulping (Mechanical)	35
7.2.5	Hydro-pulping (Enzymatic)	35
7.2.6	Selection of Recycling Technology	38
7.3	Environmental Safeguards and Regulatory Requirements	38
8	Application of Recycled MLP	39
9	End of Life (EOL) route for non –recyclable fractions	40
10	Quality Control and Testing of Recycled MLP	41
11	Monitoring of EPR Compliance	42
12	Protocol for Evaluation of Technology for Waste Management	43
13	Alternative to Multi Layered Plastics	44
14	Way Forward	45
15	References	47

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1. Background

Hon'ble National Green Tribunal (NGT) in the matter of Execution Application (E.A) No. 05 of 2024(SZ) in Original Application (O.A) No. 22 of 2022(SZ) vide its order dated 12.11.2025 directed the Central Pollution Control Board (CPCB) to explore the possibility of issuing common guidelines on Multilayered Plastic Packaging Waste Management. In continuation, the Hon'ble NGT vide its order dated 09.02.2026 taken on record that the CPCB, which was directed to explore the possibility of issuing common guidelines. While it would be appropriate to explore alternative solutions, it is imperative that the MoEF&CC either facilitate the establishment of units for the extraction and separation of single layered plastic and aluminium layers and do the same in a phased manner or identify biodegradable alternatives. The MoEF&CC and the CPCB shall also bring out appropriate guidelines in this regard.

In compliance, CPCB filed a status report on 15.04.2026, and the matter was heard on 16.04.2026. Hon'ble NGT, however, recorded that the replies of MoEF&CC and CPCB were *“not satisfactory and not in compliance with the directions that have been issued in the O.A”* and directed filing of *“a comprehensive, workable solution in the form of report”*.

2. Objective and Scope

The CPCB had issued the Guidelines for the Disposal of Non-Recyclable Fraction (Multilayered) Plastic Waste in 2018 to facilitate environmentally sound management of MLP waste. In view of the subsequent amendments to the Plastic Waste Management (PWM) Rules, 2016, notification of the Extended Producer Responsibility (EPR) Guidelines for Plastic Packaging, introduction of the Solid Waste Management (SWM) Rules, 2026, advancements in recycling technologies, and the experience gained during implementation, it has become necessary to develop the Guidelines with the current regulatory framework, implementation

mechanisms and technological developments for Category III - Multilayered Plastic packaging (at least one layer of plastic and at least one layer of material other than plastic).

The objective of these Guidelines is to provide a comprehensive and uniform framework for the environmentally sound management of Category III waste in accordance with the PWM Rules, 2016 (as amended), the EPR Guidelines and other applicable regulatory provisions. The Guidelines are intended to assist Producers, Importers and Brand Owners (PIBOs), Plastic Waste Processors (PWPs), Urban Local Bodies (ULBs), State Pollution Control Boards (SPCBs), Pollution Control Committees (PCCs) and other stakeholders by providing technical and operational guidance on collection, segregation, transportation, channelization, recycling, End of Life (EOL) management, technology evaluation, institutional responsibilities and implementation of the EPR framework.

The Guidelines cover the Category III waste management, from generation, Collection, Segregation, Material Recovery Facilities (MRFs), Recycling, EOL processing etc. Also incorporate recent regulatory developments, strengthened implementation mechanisms and technological advancements to promote resource efficiency, improve traceability and accountability in MLP waste management, encourage environmentally sound recycling and recovery, and support the transition towards a circular economy.

Remarks: *The term “MLP” in this guidelines shall mean Category III: Multilayered Plastic packaging (at least one layer of plastic and at least one layer of material other than plastic) unless a specific category is expressly stated. All Category II multilayer (more than one layer with different types of plastic) packaging is outside the scope of these Guidelines.*

3. Regulatory Framework: PWM Rules, 2016

The Ministry of Environment, Forest and Climate Change (MoEFCC) has notified the PWM Rules, 2016, mandate the generators of plastic waste to take steps to

minimize generation of plastic waste, not to litter the plastic waste, ensure segregated storage of waste at source and hand over segregated waste in accordance with rules. The rules also mandate the responsibilities of local bodies, gram panchayats, waste generators, retailers and street vendors to manage plastic waste.

The following entities are mandated to comply with EPR obligations, namely:

- 1) Producer of plastic packaging, other than micro and small enterprises as defined under the Micro, Small and Medium Enterprises Development Act, 2006;
- 2) Importer of plastic packaging including intermediate material used for manufacturing plastic packaging such as films and preforms and plastic packaging of imported products;
- 3) Brand Owners including online platforms / marketplaces and supermarkets / retail chains other than micro and small enterprises.
- 4) Plastic Waste Processors (PWPs);
- 5) Manufacturers and Importers of plastic raw material;
- 6) Manufacturers of items made from compostable plastics or biodegradable plastics

The plastic packaging is classified in to five categories for the purpose of EPR obligations:

- Category I: Rigid plastic packaging;
- Category II: Flexible plastic packaging of single layer or multilayer (more than one layer with different types of plastic), plastic sheets or like and covers made of plastic sheet, carry bags, plastic sachet or pouches;

- **Category III: Multilayered plastic packaging (at least one layer of plastic and at least one layer of material other than plastic);**
- Category IV: Plastic sheet or like used for packaging as well as carry bags and commodities made of compostable plastics.
- Category V: Plastic sheet or like used for packaging as well as carry bags and commodities made of biodegradable plastics.

As per Section 3 (n) of the PWM Rules, 2016, “Multi-layered plastic packaging” means any material used or to be used for packaging and having at least one layer of plastic as the main ingredients in combination with one or more layers of materials such as paper, paper board, polymeric materials, or aluminium foil, either in the form of a laminate or co-extruded structure”. *Accordingly, for the purpose of these Guidelines, only such packaging falling under Category III having at least one layer of plastic and at least one layer of material other than plastic is covered.*

The Section 9(3) of the PWM Rules, 2016 stipulates that manufacture and use of Multilayered plastic packaging which is non-recyclable or non-energy recoverable or with no alternate use should be phased out in Two years’ time. To operationalize the mandate, the CPCB has developed a **Guidelines for the Disposal of Non-Recyclable Fraction (Multilayered) Plastic Waste** in April 2018.

These guidelines emphasize minimizing generation, ensuring proper collection and segregation, and mandating disposal through co-processing in cement kilns or advanced technologies like plasma pyrolysis. They were issued to provide a structured framework to phase out non-recyclable, non-energy recoverable MLP. The PWM Rules emphasizes EPR, mandating Producers, Importers and Brand Owners (PIBOs) to ensure safe end of life management of MLP through recycling and End of Life disposal pathways. The rules also permit the use of such materials in cement kilns, road construction, and waste-to-energy projects. Further, the guidelines outline a regulatory framework mandating that:

- PIBOs establish collection systems for non-recyclable fractions.

- Urban Local Bodies (ULBs) set up infrastructure for secondary segregation and sorting of collected non-recyclable fractions.
- SPCBs/PCCs authorize and monitor end-use facilities (such as cement plants or road projects) to ensure proper disposal operations.
- PIBOs collaborate with ULBs to develop a systematic collection mechanism.

In addition to the above, **Guidelines on Extended Producer Responsibility (EPR) for Plastic Packaging** was published on 16.02.2022 by MoEF&CC under Schedule-II, Rule 9(1) of the PWM Rules, 2016. The Guidelines shall be applicable to both pre-consumer and post-consumer packaging plastic waste which includes MLP. The roles and responsibilities have been clearly defined for PIBOs, and Plastic Waste Processors (Recyclers or Waste Processors including industrial composting facility).

The Guidelines define the roles and responsibilities of Producers, Importers, Brand Owners (PIBOs), recyclers, and waste processors for effective implementation of EPR. The key provisions of the Plastic Waste Management Rules, 2016, mandating collection of plastic packaging waste including Multilayered Plastics (MLP), are as follows:

Clause 10.5: Producers, Importers, Brand-Owners and manufacturers, and manufacturers of commodities made from compostable plastic or biodegradable plastic may operate schemes such as deposit refund system or buy back or any other model in order to develop a separate waste stream for collection of plastic packaging waste for directly fulfilling Extended Producer Responsibility obligations to prevent mixing of plastic packaging waste with solid waste.

Clause 14.1: Producers, Importers & Brand-Owners while fulfilling their Extended Producer Responsibility obligations may develop collection and segregation infrastructure of plastic packaging waste, as required, based on the category of

plastics. It may include the following based on implementation modality of Extended Producer Responsibility adopted by Producers, Importers & Brand-Owners:

- (a) establish waste plastic collection points and Material Recovery Facilities (MRFs);
- (b) ensure the collection of the plastic packaging waste from the collection points, with a frequency that is proportionate to the area covered and the volume;
- (c) offer the collection of plastic, from the entities like urban local bodies, gram panchayats, other public authorities or third parties carrying out waste management, and provide for the collection from all entities that have made use of that offer; provide for the necessary practical arrangements for collection and transport;
- (d) ensure that the plastic packaging waste collected from the collection points are subsequently subject to recycling in a registered facility by a recycler or its permitted end use in the designated manner.

Clause 14.2: Producers, Importers & Brand-Owners may ensure the network of collection points taking into account population size, expected volume of plastic or packaging waste, accessibility and vicinity to end-users, not being limited to areas where the collection and subsequent management is profitable.

Clause 14.3: The entities involved in waste collection will hand over the waste for treatment and recycling or for identified end uses.

Clause 14.4: Participation of voluntary collection points - voluntary collection points will hand over plastic packaging waste to the Producers, Importers & Brand-Owners or third-party agencies acting on their behalf with a view to their treatment and recycling or their identified end use

Under the EPR framework, the obligations of registered PIBOs are linked to the quantity and category of plastic packaging introduced into the market. The fulfilment of such obligations is facilitated through the collection and channelization of plastic packaging waste to registered PWPs for recycling or other authorized processing and End of Life applications, as applicable. The processing of plastic waste and generation of EPR certificates are monitored through the centralized EPR Portal developed by CPCB.

The EPR framework thus provides an important regulatory mechanism for ensuring traceability and accountability in the management of MLP waste by linking the quantity of plastic packaging introduced into the market with its collection and environmentally sound processing.

4. Institutional Framework and Responsibilities

Effective management of MLP waste requires coordinated action among various stakeholders across the plastic value chain. The PWM Rules, 2016 (as amended), together with the EPR Guidelines, assign clear roles and responsibilities to PIBOs, PWPs, ULBs, SPCBs/PCCs, and the CPCB. The successful implementation of environmentally sound management of MLP waste depends upon effective coordination among these stakeholders, supported by regulatory oversight, digital monitoring through the EPR Portal, and adequate collection and processing infrastructure.

The responsibilities of the various stakeholders are summarized below

Stakeholder	Major Responsibilities
MoEF&CC	Policy formulation, Rules and amendments
CPCB	Development of guidelines, EPR Portal, monitoring, technology evaluation
SPCB / PCC	Registration, authorization, inspections, enforcement
ULBs	Collection, segregation, MRF operation, transportation Regularising and channelization of Informal sectors

PIBOs	Collection, fulfilment of EPR targets
PWPs	Recycling, EPR certificate generation
Waste Generators	Source segregation and handing over waste

4.1 Responsibilities of Local Bodies

Scientific collection and segregation constitute the foundation for environmentally sound management of MLP waste. The Solid Waste Management (SWM) Rules, 2026 provide for mandatory source segregation of municipal solid waste into separate waste streams to facilitate efficient collection, recovery and processing. Plastic waste, including MLP waste, forms part of the dry recyclable waste stream and is required to be segregated at source and handed over separately for further processing.

Under the SWM Rules, 2026, ULBs play a pivotal role in ensuring environmentally sound management of plastic waste, including MLP waste. The key responsibilities include:

- a. Establish and operate an efficient system for source segregation, collection, storage, transportation and processing of municipal solid waste, including plastic waste.
- b. Ensure separate collection and channelization of dry waste, including MLP waste, to registered recyclers or authorized Plastic Waste Processors without causing any adverse impact on the environment.
- c. Establish, operate and maintain Material Recovery Facilities (MRFs), dry waste collection centres and other necessary solid waste management infrastructure for secondary segregation, storage and channelization of recyclable waste.
- d. Prevent open dumping, littering and open burning of plastic waste and ensure environmentally sound management in accordance with the applicable Rules.

- e. Promote source segregation through awareness programmes, Information, Education and Communication (IEC) activities and stakeholder participation.
- f. Integrate waste pickers, informal waste collectors and their organizations into the formal solid waste management system to improve collection efficiency and resource recovery.
- g. Maintain records of collection, segregation, processing and disposal of plastic waste and ensure reporting through the designated online monitoring systems, wherever applicable.
- h. Coordinate with Producers, Importers and Brand Owners (PIBOs), Plastic Waste Processors and other stakeholders for effective implementation of Extended Producer Responsibility (EPR).
- i. Facilitate channelization of plastic waste to registered recyclers and authorized End of Life (EOL) facilities to maximize recycling and resource recovery.

The municipal collection system, together with MRFs, registered recyclers and authorized EOL facilities, forms an integrated supply chain for environmentally sound management of plastic packaging waste including MLP. This collection mechanism also complements implementation of the EPR framework by facilitating traceable movement of plastic waste from the point of generation to its final processing.

Under the PWM Rules, 2016 (as amended) and the EPR Guidelines, registered PWPs are authorized to generate EPR Certificates for the quantity of plastic packaging waste processed. Such certificates may be issued in favour of registered PIBOs or Local Bodies, as applicable, in accordance with the provisions of the EPR Guidelines.

To facilitate implementation of this mechanism, CPCB has developed a dedicated Urban Local Body (ULB) Module on the centralized EPR Portal. The module enables Urban Local Bodies to:

- a) Procure EPR Certificates from registered PWPS against plastic waste supplied, Material Recovery Facility (MRF) infrastructure created, or other support extended to the Plastic Waste Processors. The procured certificates may subsequently be transferred to registered PIBOs towards fulfilment of their EPR obligations.
- b) Establish and register their own PWPs facilities on the centralized EPR Portal and generate EPR Certificates for transfer to registered PIBOs, subject to compliance with the applicable provisions of the EPR Guidelines.

4.2 Responsibilities of Producers, Importers and Brand Owners (PIBOs)

The PWM Rules, 2016 (as amended) and the EPR Guidelines define the roles and responsibilities of PIBOs, PWPs and other stakeholders for environmentally sound management of plastic packaging waste, including MLP waste.

As per Rules, the PIBOs to establish or support appropriate mechanisms for collection and segregation of plastic packaging waste so as to develop a dedicated waste stream and prevent its mixing with municipal solid waste. To fulfil their EPR obligations, PIBOs may implement collection systems individually or collectively through mechanisms such as deposit-refund schemes, buy-back arrangements or any other suitable collection model.

The Rules further provide that PIBOs may establish or support collection points, MRFs and other collection and segregation infrastructure, either independently or in collaboration with ULBs, Gram Panchayats, other public authorities or authorized agencies. Such systems should ensure regular collection, transportation and channelization of MLP waste to registered Plastic Waste Processors.

Plastic packaging MLP waste collected through these mechanisms shall be channelized only to registered recyclers for recycling or to authorized EOL facilities for environmentally sound processing, in accordance with the PWM Rules, 2016 and the EPR Guidelines

4.3 Responsibilities of State Pollution Control Boards / Pollution Control Committees (SPCBs/PCCs)

SPCBs and PCCs are the prescribed authorities under the PWM Rules, 2016 (as amended), shall play a pivotal role in registration, monitoring and enforcement of compliance by PIBOs and PWPs within their respective jurisdictions. The key responsibilities include:

- SPCBs/PCCs register PIBOs operating in one or two states, and PWPs on CPCB's common EPR portal.
- SPCBs /PCCs by itself or through a designated agency or Registered Environment Auditor, shall verify compliance of PIBOs and PWPs through inspections and audits, as deemed appropriate in their jurisdiction.
- SPCBs/PCCs shall ensure that certificates issued to PWPs do not exceed their installed recycling / processing capacity.
- SPCBs/PCCs shall impose Environmental Compensation (EC) for violations and coordinate with CPCB for settlement of EPR obligations.
- Coordinate with ULBs, PIBOs and PWPs to strengthen collection, segregation and channelization of plastic waste, ensuring convergence with authorized processing infrastructure.

The SPCBs/PCCs shall carryout following verification at the time of registration:

- a) Confirm that the processing facility is duly authorized for the Category III MLP waste stream claimed and that the proposed process is suitable for the declared plastic / non-plastic composition.
- b) Ensure PWPs comply with consent / authorization conditions, pollution-control norms and environmental safeguards relating to emissions, effluent, residues, storage and handling of MLP waste.

- c) Undertake inspections of Category III MLP processing facilities, collection /aggregation arrangements and authorized EOL facilities, and verify input material, processing records, output / recovery, rejects and residue management.
- d) Verify traceability of Category III MLP waste through weighment slips, invoices, transport documents, processing / output records and mass-balance information, and coordinate with CPCB where discrepancies are observed in EPR Portal data.
- e) Ensure non-recyclable Category III MLP fractions are channelized only to authorized EOL routes, preventing open dumping, littering, open burning or other unauthorized disposal.
- f) Encourage documentation of technology performance, recovery efficiency and environmental safeguards, particularly for facilities emerging or advanced technologies.

5. Multilayered plastic packaging (Category III)

Multilayered packaging (MLP) - at least one layer of plastic and at least one layer of material other than plastic, has emerged as the dominant format for processed foods, snacks, confectionery, dairy products, personal care items, and a wide range of fast-moving consumer goods in India. Its prevalence is attributable to the superior barrier properties of Multilayered laminates against moisture, oxygen, and light, achieved at a fraction of the weight and cost of rigid alternatives. These attributes extend shelf life, reduce food wastage, and lower the carbon footprint of distribution.

The engineering that makes MLP highly effective also makes it difficult to manage at the End of Life. MLP waste is typically lightweight, soiled, of low bulk density, and composed of two or more inseparably bonded materials. For many years, MLP waste was regarded as difficult to recycle, which lead to widespread mismanagement such as littering, open burning etc.

MLP waste can be managed through appropriate material recovery, recycling of suitable plastic fractions, recovery of non-plastic constituents such as aluminium or paper, and other technically demonstrated recycling or recovery routes. Depending on composition and process suitability, fractions that cannot be materially recovered may be directed to authorized End of Life (EOL) routes.

5.1 Current Status of MLP Waste Processing Infrastructure

The implementation of the EPR framework has significantly strengthened the infrastructure for environmentally sound management of Category III MLP waste. Under the PWM Rules, 2016 (as amended) and the EPR Guidelines, Plastic Waste Processors (PWPs), including recyclers and End of Life (EOL) processors, are required to register on the centralized CPCB EPR Portal for undertaking authorized processing of Category III plastic packaging waste.

As on 25.06.2026, a total of 615 PWPs are registered for Category III (MLP) plastic packaging under the EPR framework, comprising 440 registered recyclers and 175 authorized End of Life (EOL) processors. The total authorized processing capacity of these facilities is 63,35,379 tonnes per annum (TPA), including 10,04,392 TPA through registered recyclers and 53,30,987 TPA through authorized End of Life processors.

The availability of a large number of registered PWPs with substantial processing capacity demonstrates that a well-established recycling and End of Life management infrastructure is available in the country for environmentally sound management of MLP waste. These facilities, together with the centralized EPR Portal, facilitate traceable collection, processing and monitoring of MLP waste and support effective implementation of the EPR framework.

5.2 Sources of MLP Wastes

MLP waste arises from distinct packaging formats, each defined with characteristic construction that guides suitable recovery routes for recyclers. Category III MLP

waste refers to packaging structures in which plastic is combined with one or more non-plastic layers.

The following Category III streams are relevant to these Guidelines. All-plastic multilayer packaging, which falls under Category II, is excluded from the scope herein.

- a) Category III MLP waste includes packaging structures in which plastic is combined with a non-plastic layer, such as aluminium foil, paper/paperboard or other non-plastic barrier materials. Representative streams include foil-based laminates, paper-plastic laminates, aseptic cartons, laminated tubes, pharmaceutical strip packs and lidding foils, subject to verification of the actual packaging structure.
- b) Foil-containing biscuit and confectionery laminates that meet the Category III definition may be managed through suitable material separation/recovery or other authorized processing routes. All-plastic BOPP/PE or similar structures are Category II and are excluded.
- c) Category III sachets comprising plastic and aluminium foil or other non-plastic layers are typically difficult to collect and may require aggregation followed by suitable recycling, material separation/recovery or authorized EOL processing.
- d) Paperboard-based aseptic cartons, comprising paperboard, plastic and aluminium are classified as Category III, such packaging may be processed through hydropulping with subsequent PolyAl recovery. Multilayer polyethylene (PE) milk and oil pouches, without a non-plastic layer are classified as Category II. Liquid and beverage packaging shall be included only where the packaging structure conforms to the Category III definition.
- e) Other Category III laminates, such as aluminium-plastic toothpaste tubes, pharmaceutical strip packs, lidding foils and other foil-containing plastic/non-plastic laminates, may be directed to aluminium recovery, material recycling,

composite-product manufacture or authorized EOL processing, as technically appropriate.

Stream	Construction	Recovery Route
Foil-containing biscuit /confectionery wrappers	Plastic + aluminium foil (where present)	Material recovery / delamination / authorized EOL, as appropriate
Foil-based sachets	PET or other plastic + aluminium foil / other non-plastic layer	Material recovery, aluminium recovery or authorized EOL, as appropriate
Foil-based stand-up / refill pouches	Plastic + aluminium foil / other non-plastic barrier layer	Delamination / material recovery / authorized EOL, as appropriate
Aseptic cartons	75% paperboard, 20% PE, 5% foil	Hydrapulping + PolyAl conversion
Laminated Tubes	ABL / PBL laminates	Aluminium recovery / boards or co-processing
Pharma Strips packs and lidding foils	Al-foil / PE laminates	Foil-rich, Al recovery, boards or co-processing
Post-industrial Category III converter waste	Plastic + paper / aluminium foil / other non-plastic layer	Segregated recycling, material recovery or suitable authorized processing

Paper-plastic and foil-plastic packaging streams, including aseptic cartons and foil-based laminates, may be directed to hydropulping, aluminium recovery, delamination, composite-product manufacture or other suitable recycling routes depending on composition.

Post-industrial MLP from converting plants i.e. trims, rejects and skeletons is clean, of known composition, and commands the highest feedstock value, often blended with washed post-consumer material.

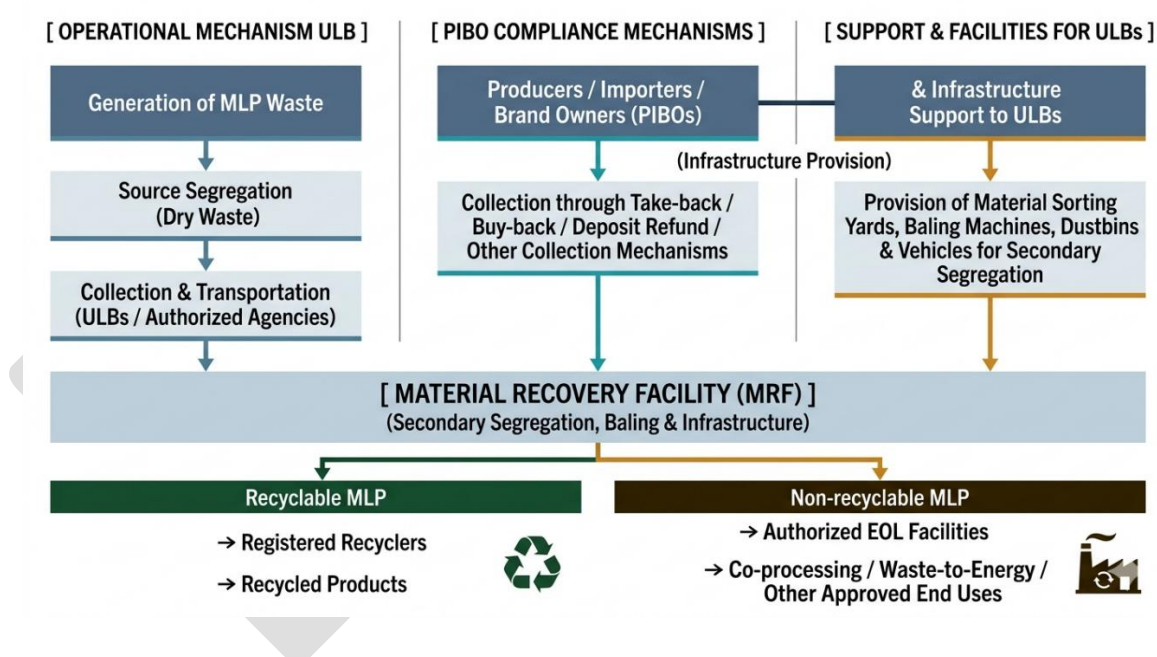
6. Collection, Segregation and Channelization of MLP Waste

The environmentally sound management of Multilayered plastic packaging (MLP) waste requires an integrated system for its collection, segregation, aggregation, transportation and channelization to authorized PWP. Geographically, MLP arises

wherever Fast-Moving Consumer Goods (FMCGs) are sold, and collection and channelization remain the binding constraint rather than processing technology.

The SWM Rules, 2026 and the PWM Rules, 2016 (as amended), together with the EPR Guidelines, provide the regulatory framework governing the collection, transportation, segregation, recycling and environmentally sound processing of plastic packaging waste, including MLP waste.

Source segregation of municipal solid waste forms the foundation of this framework. Under the SWM Rules, 2026, plastic waste, including MLP waste, is classified as part of the dry waste stream and is required to be segregated at source and separately collected to facilitate recovery, recycling and environmentally sound processing. The overall methodology for collection and channelization of MLP waste is illustrated in Figure below:



The collection system should ensure that MLP waste generated from households, commercial establishments, institutions and industries is systematically collected, transported to Material Recovery Facilities (MRFs) or other designated aggregation centres for secondary segregation, and thereafter channelized to registered recyclers or authorized EOL facilities based on its recyclability.

MLP waste is generally generated in dispersed quantities and, particularly in the case of flexible and low-value packaging, individual collection may not be economically viable. Aggregators, waste collection agencies, waste picker organizations, cooperatives, self-help groups and other collection networks may therefore play an important role in consolidating MLP waste from multiple sources for further transportation and processing.

Urban Local Bodies, PIBOs and other stakeholders may support the development of such aggregation systems through suitable arrangements for collection, segregation, storage and transportation of MLP waste. Existing waste picker organizations, informal waste collectors, self-help groups and other community-based collection systems may be integrated with the formal waste management system, wherever feasible.

Such support may include provision of designated collection and sorting spaces, personal protective equipment, training, awareness, collection infrastructure and appropriate linkage with registered recyclers or authorized Plastic Waste Processors. The objective should be to improve recovery of low-volume and dispersed MLP waste while ensuring that the waste is channelized to authorized processing facilities

- a. **ULB-based collection model:** Collection of segregated dry waste through the municipal collection system, followed by secondary segregation and aggregation at Dry Waste Collection Centres or Material Recovery Facilities.
- b. **Waste collector or aggregator model:** Collection and aggregation through waste picker organizations, cooperatives, self-help groups, authorized waste collection agencies or other aggregators, followed by channelization to registered Plastic Waste Processors.
- c. **PIBO-supported collection model:** PIBOs may establish or support collection, aggregation and transportation systems independently or in collaboration with Local Bodies, waste collection agencies or other stakeholders.

- d. **Industry and commercial collection model:** Clean post-industrial or commercial MLP waste may be collected directly from packaging converters, manufacturing units, commercial establishments and other bulk waste generators for channelization to registered processing facilities.
- e. **Citizen-based collection model:** Suitable voluntary mechanisms, including collection drives, drop-off centres, take-back arrangements or other collection systems, may be developed to facilitate recovery of MLP waste generated by households and other dispersed sources.

6.1 Operational Methodology: Collection and Channelization Framework

The operational methodology for collection and channelization of MLP waste consists of the following sequential stages:

Step 1 – Source Segregation: MLP waste generated from households, commercial establishments, institutions and industries shall be segregated at source as part of the dry recyclable waste stream. Proper source segregation minimizes contamination, improves recyclability and facilitates efficient downstream processing.

Step 2 – Collection: MLP waste may be collected through municipal collection systems established by Local Bodies or through dedicated collection systems established by PIBOs under the EPR framework. Collection mechanisms may include Door-to-door collection; Dry Waste Collection Centres (DWCCs); Material Recovery Facilities (MRFs); Buy-back centres; Deposit-refund systems; Reverse logistics; Collection drives; Collection through Self-Help Groups (SHGs), waste pickers and authorized agencies. Both systems should function in a complementary manner to maximize recovery of plastic packaging waste.

Step 3 – Aggregation and Secondary Segregation: Collected MLP waste shall be transported to MRFs, Dry Waste Collection Centres or other designated aggregation centres where secondary segregation is carried out. At these facilities,

MLP waste should be sorted into recyclable, foil-based, paper-based and non-recyclable fractions for subsequent processing.

Category	Typical Examples	Processing Route
Recyclable MLP	PE laminates	Mechanical Recycling
Paper-based	Beverage cartons	Hydropulping
Foil-based	Blister packs	Delamination / Aluminium Recovery
Contaminated MLP	Food residue	Co-processing / WtE

Step 4 – Channelization: Following segregation, MLP waste shall be channelized only to registered PWPs based on the suitability of the processing technology.

- Recyclable MLP shall be sent to registered PWPs.
- Paper-based aseptic packaging may be processed through hydropulping or enzymatic recycling.
- Foil-based laminates may be processed through delamination, aluminium recovery or other advanced recycling technologies.
- MLP waste that cannot be recycled shall be sent only to authorized End of Life facilities for co-processing, waste-to-energy or other approved end uses.

6.2 Documentation, Traceability and Monitoring

All stakeholders involved in the collection, aggregation, transportation and processing of MLP waste shall maintain complete and verifiable records to ensure end-to-end traceability from the point of generation to its final environmentally sound processing. Documentation shall include details of the quantity of MLP waste collected, source of collection, aggregation centre or MRF, transportation details, name and registration number of the receiving PWP, processing route adopted (recycling or EOL processing), and final utilization or disposal.

The movement of MLP waste from ULBs, PIBOs, or other authorized collection agencies to registered PWPs shall be supported by valid tax invoices (GST

invoices), along with transport documents such as e-way bills, delivery challans or weighbridge slips, wherever applicable. These documents shall serve as evidence of actual transfer of MLP waste and facilitate verification of quantities reported under the EPR framework.

6.3 Collection Models for MLP Waste

Depending upon local conditions, population density and availability of infrastructure, one or a combination of the following collection models may be adopted:

Collection Model	Suitable Area	Lead Agency
Door-to-door collection	Urban	ULB
MRF based collection	Urban	ULB
DWCCs	Urban/Semi-urban	ULB
Deposit-refund / Buy-back schemes	Urban & Semi-urban	PIBOs
Plastic banks and collection drives	Rural & Urban	PIBOs / ULBs
SHG / Waste Picker-led collection	Urban & Rural	ULB / Panchayat
Cluster-based MRFs	Small ULBs & Rural Areas	ULBs / Gram Panchayats / PIBOs
Mobile collection systems	Rural Areas	ULB / Panchayat / PIBOs

For rural areas and small Urban Local Bodies where dedicated recycling infrastructure may not be economically viable, cluster-based collection, aggregation and transportation systems involving neighbouring ULBs, Gram Panchayats and PIBOs should be encouraged to ensure environmentally sound channelization of MLP waste to registered Plastic Waste Processors.

Considering the specialized infrastructure, aggregation network and processing requirements associated with MLP waste, State Governments, Urban Local Bodies, Industrial Development Corporations and other concerned agencies may consider facilitating dedicated plastic recycling clusters or recycling zones,

particularly in major urban centres and regions having significant generation of plastic packaging waste.

Model	Key Stakeholders	Main Approach	Application
ULB– Recycler Model	ULB, MRF, Recycler	Collection → Segregation → Aggregation → Recycling	Urban areas
Waste Picker / Cooperative Model	Waste Pickers, Aggregators, PIBOs	Door-to-door / dry waste collection → Aggregation	Flexible and dispersed MLP
PIBO- Supported Model	PIBO, ULB, Aggregator	Infrastructure and collection support	Areas with low recovery
Citizen Take- Back Model	Citizens, Recycler, Aggregator	Drop-off / courier / collection drives	Low-volume dispersed waste
Industrial Collection Model	Converters, Industries, Recyclers	Direct collection of clean scrap	Post-industrial MLP
Innovative Recycling / Upcycling Model	Technology provider, Recycler, SHGs	Material recovery and value addition	Specialized MLP streams

Such recycling zones may provide an enabling ecosystem for aggregators, recyclers, PWPs, technology providers and other stakeholders by facilitating access to common infrastructure and utilities, including waste aggregation and storage facilities, sorting and pre-processing infrastructure, transportation linkages and other common facilities, as feasible.

The development of such clusters may facilitate aggregation of MLP waste, reduce transportation and logistics costs, promote collaboration among different stakeholders and encourage the adoption, demonstration and scaling-up of suitable recycling technologies. Such facilities may also provide opportunities for small and medium recyclers and emerging technology providers to establish environmentally sound processing facilities, subject to compliance with applicable environmental requirements and statutory approvals.

6.4 Collection and Channelization by PIBOs

PIBOs may, individually or collectively, strengthen the collection and channelization of MLP waste by establishing or supporting collection points, aggregation centres, MRFs, storage and baling infrastructure and transportation systems. May also collaborate with Urban Local Bodies, Gram Panchayats, aggregators, waste picker organizations, Self-Help Groups, NGOs and other authorized agencies for collection and aggregation of dispersed quantities of MLP waste.

To improve recovery of MLP waste, PIBOs may adopt collection support measures, buy-back arrangements, transportation assistance or other incentive-based mechanisms, thereby preventing littering, open burning or landfill disposal.

Collected MLP waste should be aggregated in economically viable quantities and channelized to registered recyclers or authorized EOL facilities. PIBOs shall maintain appropriate records relating to collection, aggregation, transportation, weighment, transfer, and receipt at the processing facility to ensure traceability and verification of environmentally sound processing.

7. Recycling of MLP Wastes

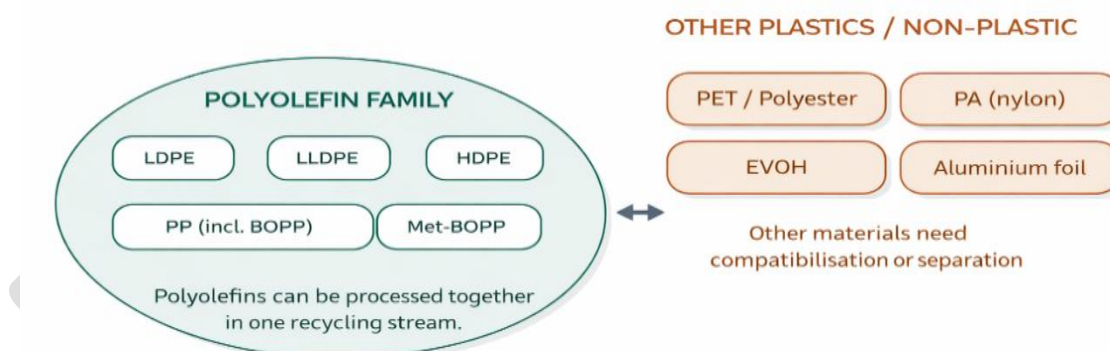
The decisive factor for recycling of MLP waste is not a number of layers but the polymer families and other constituents present. For Category III MLP, technology selection shall primarily consider the identity, proportion, and bonding of the plastic and non-plastic layers, including paper/paperboard and aluminium, together with contamination and the intended recovery route. The presence and degree of liberation of the non-plastic layer are critical to determining whether mechanical recycling, hydropulping, delamination / physical separation, aluminium recovery, chemical / solvent-based processing or another demonstrated technology is appropriate.

- a. **Plastic–aluminium laminates:** Packaging containing plastic layers bonded with aluminium foil or other non-plastic barrier layers. Depending on the structure, suitable routes may include delamination, aluminium recovery,

mechanical recycling of the plastic fraction, composite-product manufacture or authorized EOL processing.

- b. **Plastic–paper/paperboard laminates:** Packaging containing plastic and paper/paperboard layers, including aseptic cartons. Hydropulping or other suitable separation processes may be used to recover paper fibre, with the residual PolyAl or other fraction managed through appropriate recovery or authorized EOL routes.
- c. **Other plastic–non-plastic laminates:** Complex structures containing plastic together with other non-plastic materials. Technology selection shall be based on demonstrated recovery efficiency, environmental performance and the intended end use of recovered materials.

Polymer Family Recycling Compatibility

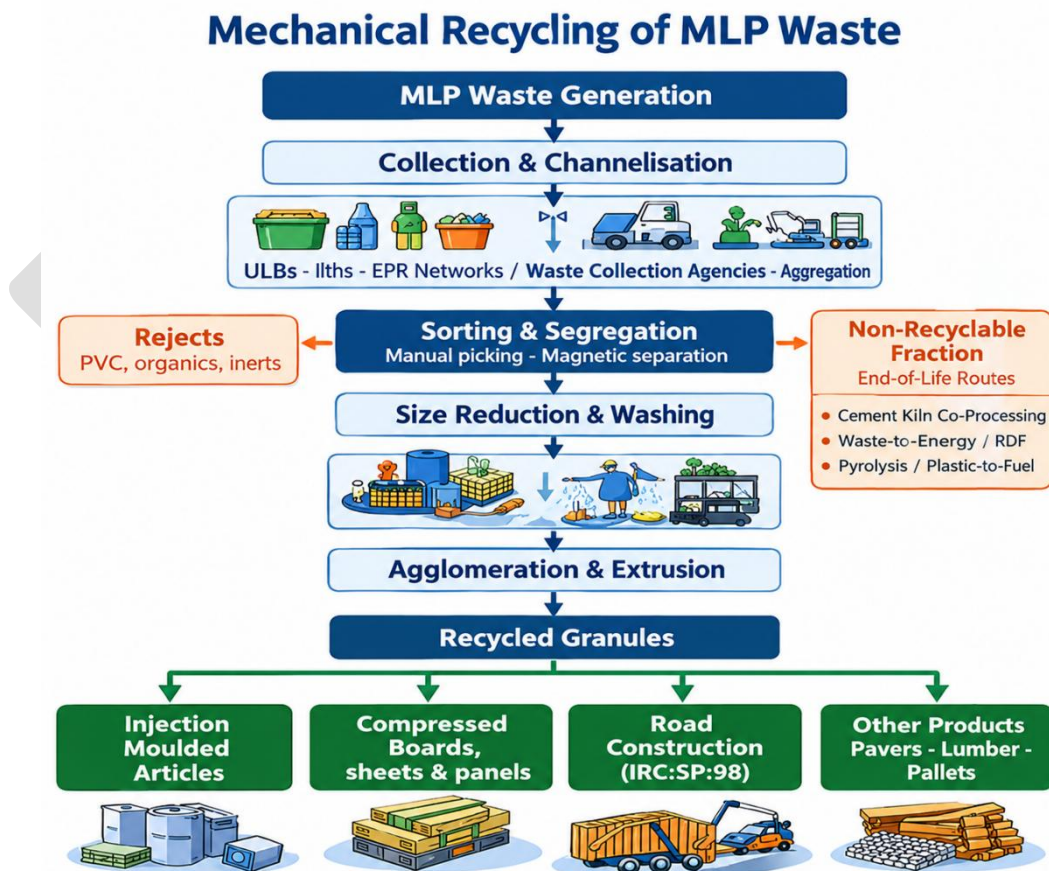


Recycling is the preferred option for management of Multilayered plastic packaging (MLP) waste as it minimizes disposal of plastic waste and promotes circular use of materials. Owing to the heterogeneous composition of MLP, comprising two or more layers of different plastic polymers and, in certain cases, aluminium foil or paper, recycling requires appropriate segregation and technology selection based on the material composition and product design

7.1 Mechanical Recycling Process of MLP

Mechanical recycling is most established and commercially adopted technology for recycling suitable MLP waste. The process generally involves collection, sorting, removal of contaminants, shredding, washing (where required), drying, agglomeration or pelletization to produce recycled plastic granules or flakes. These recycled materials are subsequently utilized for manufacturing various non-food contact products such as plastic pallets, crates, benches, dustbins, pipes, cable ducts, plastic lumber, composite boards, sheets, paver blocks, road furniture and other value-added plastic products.

The complete process chain for the mechanical recycling of MLP waste, from generation to certified recycled granulate, together with the routing of non-recyclable fractions to approved End of Life destinations is presented in a process flow chart below:



Stage 1: Collection, Channelization and Baling

Post-consumer MLP mainly occurs in the mixed dry fraction of municipal solid waste and through informal collection. Recycling starts with channelization i.e. Urban Local Body Material Recovery Facilities (MRF), waste pickers, and aggregators consolidate MLP into transportable lots. Since loose MLP film has a very low bulk density (20–40 kg/m³), hydraulic baling at aggregation points is vital for economic transport. Compressed bales of 50–500 kg increase density nearly tenfold and prevent littering during transit. Bales should be dry, clean, and sent to registered processors with the required documents to the PWP.

STAGE 1 Collection, channelisation & baling



Stage 2: Sorting and Segregation

Incoming bales shall be opened on sorting conveyors to remove materials that could affect processing or product quality. Sorting aims to: (1) remove non-plastic items like paper, textiles, and metals; (2) remove incompatible plastics, especially PVC; and (3) separate all-polyolefin MLP from mixed-family MLP where required. Manual picking is the main method, supported in advanced facilities by Near-Infrared (NIR) automatic sorters.

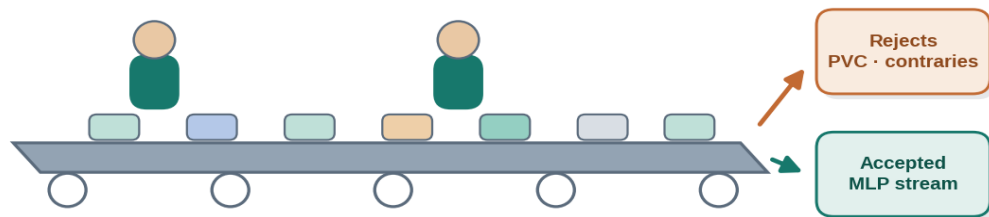
NIR automatic sorters are smart machines used in recycling facilities, to separate plastics, paper, textiles, and other materials with high precision, enabling efficient recovery and reducing contamination in waste streams. These sorters are important in Material Recovery Facilities, Municipal solid waste processing plants,

and specialized industrial recycling units. They also help in identifying and separating MLPs for better recycling at registered recycling facilities.

Rejects are recorded and sent to approved End of Life routes, never to open dumping or burning.

STAGE 2 Sorting & segregation

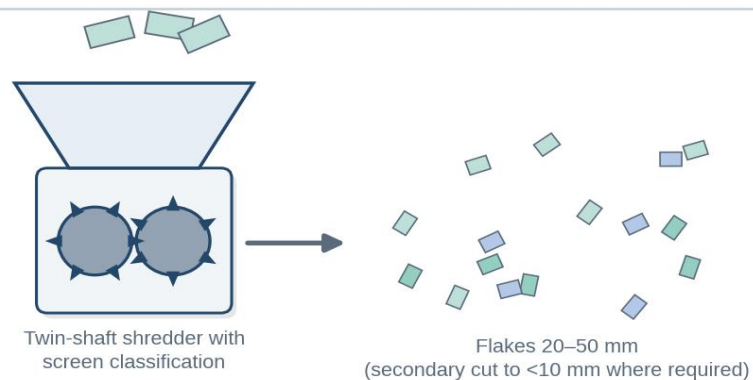
Manual picking + magnetic / NIR-assisted separation



Stage 3: Size Reduction

Sorted MLP is shredded into flakes of 20–50 mm, with further granulation below 10 mm if needed. Size reduction helps remove residues and dust, ensures uniform handling, and produces finer fractions (2.36 mm–600 µm) for road construction as per Guidelines for the Use of Waste Plastic in Hot Bituminous Mixes (Dry Process) in Wearing Courses (IRC:SP:98). Shredders must have screens, dust extraction, and proper housekeeping to prevent film escape.

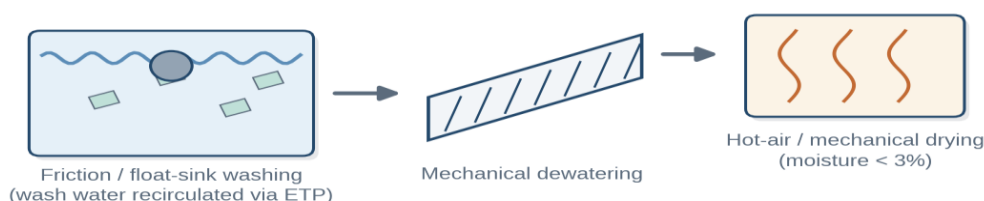
STAGE 3 Size reduction (shredding)



Stage 4: Washing, De-dusting and Drying

Washing depends on the condition of the MLP stream and its end use. Clean post-industrial MLP may go straight to densification after de-dusting, while post-consumer MLP with residues is washed in friction washers and float-sink tanks. Washed flakes are dewatered and dried to below 3% moisture to avoid defects in extrusion. Wash water is treated in an effluent plant, with sludge disposed of as authorised. Facilities handling only clean industrial streams can omit washing, making it a conditional step rather than mandatory.

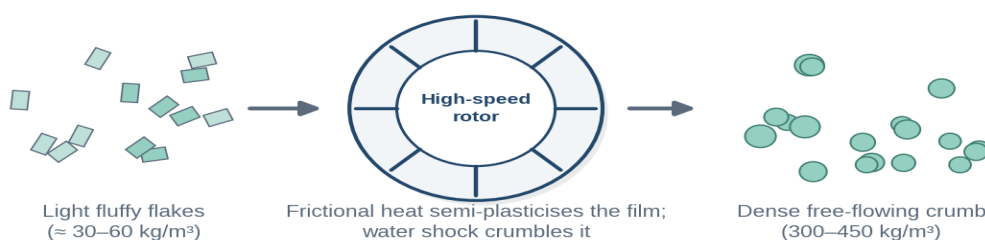
STAGE 4 Washing, de-dusting & drying



Stage 5: Agglomeration / Densification

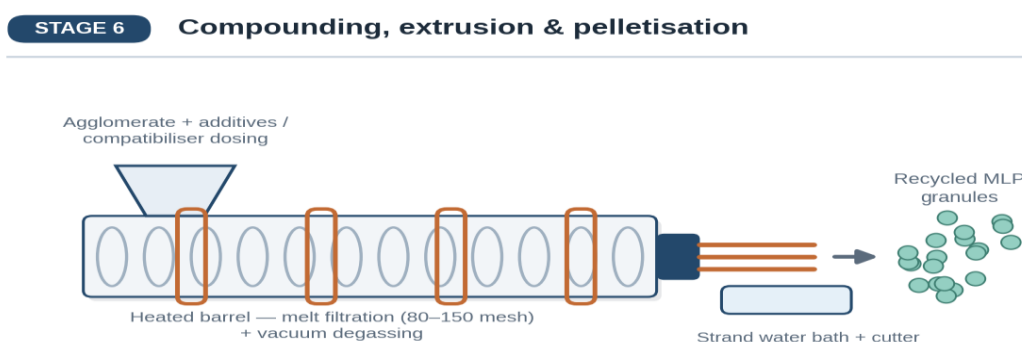
Clean, dry MLP flakes are too light to feed into an extruder. Agglomeration converts them into dense granules ($300\text{--}450\text{ kg/m}^3$) by frictional heating and water-shock cooling. This makes the material extrudable, partially homogenises its layered structure, and can serve directly as feed for applications like compressed boards. Temperature control is critical to avoid degradation and odour, and fume extraction is required.

STAGE 5 Agglomeration / densification



Stage 6: Compounding, Extrusion and Pelletisation

Agglomerate is converted into recycled granules using compounding extruders. Single-screw machines handle standard duty, while twin-screw compounders provide intensive mixing and additive incorporation. Quality depends on three controls: melt filtration (to remove inks, fibres, and aluminium), degassing (to extract moisture and volatiles), and additive dosing (compatibilisers, stabilisers, pigments, fillers). The homogenised melt is pelletised into recycled MLP granules.



7.2 Advanced Recycling Technologies

With continuous advancements in plastic recycling technologies, several advanced recycling processes are being developed and adopted for management of Multilayered plastic packaging waste. These technologies aim to recover polymers or convert plastic waste into valuable feedstock, chemicals or other raw materials.

Some of the emerging technologies include Solvent-based Dissolution and Purification, Pyrolysis, Depolymerization, Gasification, Hydro-pulping, Enzymatic recycling etc

These technologies are particularly useful for processing MLP waste streams that are not technically or economically suitable for conventional mechanical recycling. Their deployment should be based on demonstrated technical performance, environmental safeguards, resource efficiency and compliance with applicable statutory requirements.

7.2.1 Chemical Recycling:

Chemical recycling refers to processes in which plastic polymers are converted into chemical feedstocks, monomers, oils or gases that can subsequently be utilized for manufacture of new plastics, chemicals or industrial fuels. Unlike mechanical recycling, which preserves the polymer structure, chemical recycling breaks down polymer chains into lower molecular weight products, thereby enabling processing of mixed, contaminated and difficult-to-recycle MLP waste.

The principal chemical recycling technologies applicable for MLP waste include:

Pyrolysis: Thermal decomposition of polyolefin-rich MLP waste under oxygen-free conditions to produce pyrolysis oil, combustible gases and char. Aluminium present in foil laminates generally remains in the solid residue and may subsequently be recovered through appropriate separation techniques.

Solvent-based Dissolution: Selective dissolution of compatible polymer layers using suitable solvents followed by purification and precipitation of high-quality recycled polymer. Aluminium foil, PET, paper and other insoluble materials remain separated, thereby facilitating recovery of individual constituents.

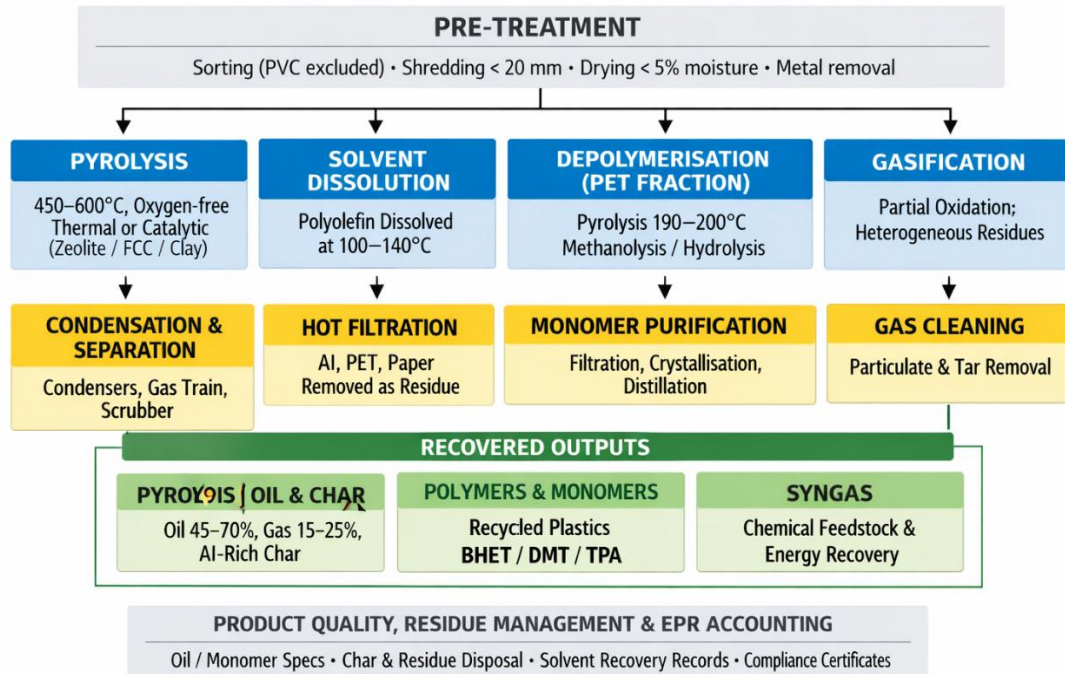
Depolymerization (Solvolysis): Chemical conversion of polyester (PET) layers into monomers or oligomers through glycolysis, methanolysis or hydrolysis, enabling manufacture of virgin-equivalent polymer resin.

Gasification: Controlled partial oxidation of heterogeneous MLP waste at elevated temperatures to produce synthesis gas (syngas), which may be utilized as chemical feedstock or for energy generation after suitable gas cleaning.

Chemical recycling facilities shall operate with appropriate feed preparation systems, emission control equipment, solvent recovery systems (where applicable), residue management practices and environmental safeguards in accordance with applicable statutory provisions. Product recovery, mass balance and residue management should be properly documented and maintained.

MLP WASTE RECYCLING FLOWCHART

Mixed-family, metallised and foil-bearing laminates; soiled film



7.2.2 Eddy Current Separation for Aluminium Recovery

(A) Eddy Current Separation (ECS):

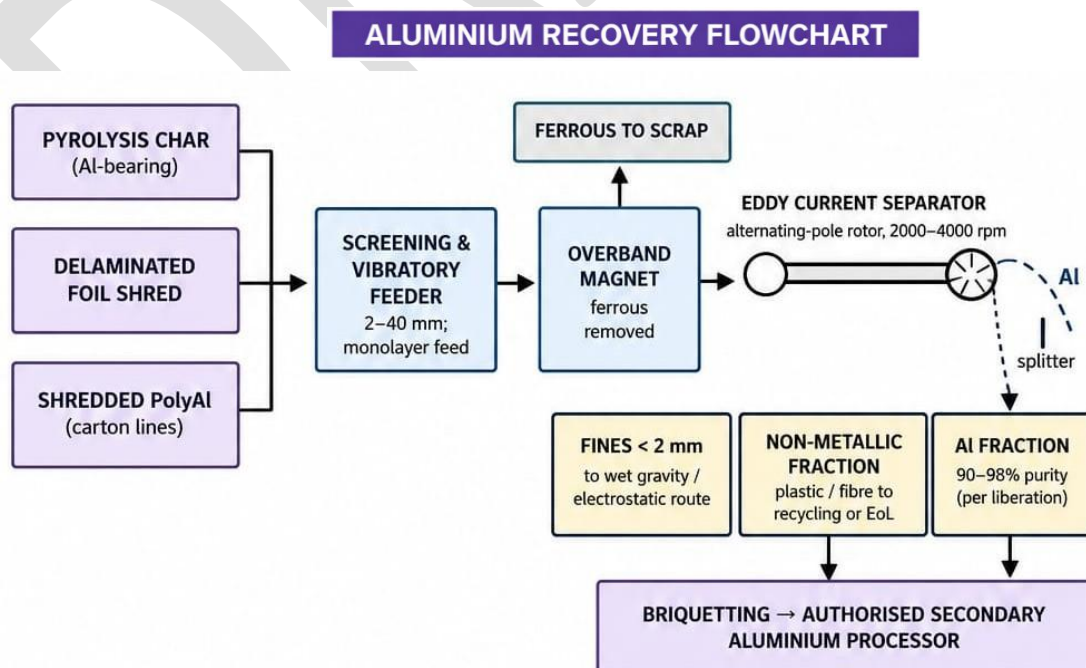
Eddy current Separation is physical separation technology used for recovery of non-ferrous metals, particularly aluminium, from processed MLP waste streams. The technology operates on the principle of electromagnetic induction, wherein a rapidly changing magnetic field induces eddy currents in electrically conductive materials, generating a repulsive force that separates aluminium from non-conductive plastic and fibre fractions.

For effective application in MLP waste management, the aluminium foil must first be liberated from the laminate through suitable pre-treatment processes such as chemical delamination, solvent-based dissolution, pyrolysis or hydropulping of aseptic cartons. Eddy Current Separation is effective only for liberated aluminium and is generally not suitable for intact laminates where the aluminium layer remains

bonded to plastic or paper. Similarly, vacuum-metallized films containing extremely thin aluminium coatings are generally not amenable to recovery through this technique.

The efficiency of aluminium recovery depends primarily on the degree of liberation achieved during upstream processing, particle size distribution and feed quality. Under properly optimized operating conditions, recovery efficiencies of 80–95% with aluminium product purity of 90–98% can generally be achieved for adequately liberated foil fractions. The recovered aluminium can subsequently be utilized by authorized secondary aluminium recyclers for production of aluminium ingots, alloys and other industrial products.

Units deploying Eddy Current Separation shall ensure appropriate feed preparation, removal of ferrous contaminants prior to separation, adequate dust extraction and housekeeping measures, and periodic monitoring of recovery efficiency and product quality. Records of throughput, recovered aluminium quantity, recovery efficiency and product purity should be maintained as part of the facility's quality assurance system. The recovered aluminium shall be channelized only to authorized secondary aluminium processing facilities for environmentally sound recycling.



(B) Electrostatic Separation of Aluminium from MLP Waste:

Advanced electrostatic separation is an emerging dry physical separation technology for recovery of aluminium from foil-based Multilayered plastic packaging (MLP) waste without altering the chemical structure of either the plastic or the metal. The process involves sequential stages of mechanical size reduction, particle classification and electrostatic separation. Initially, MLP waste is subjected to primary and secondary crushing followed by high-speed grinding to liberate aluminium from the bonded plastic matrix. The processed material is subsequently screened to obtain uniformly sized particles while oversized particles are recirculated for further grinding. During grinding and screening, an integrated cooling system maintains the material below the softening temperature of plastics to prevent agglomeration and ensure efficient liberation. The liberated material is then subjected to high-voltage electrostatic separation, wherein electrically conductive aluminium particles are separated from non-conductive plastic particles based on their electrical conductivity. Under optimized operating conditions, the process is capable of achieving aluminium recovery of about 99% with product purity exceeding 97%. The recovered aluminium powder and plastic powder can subsequently be utilized as secondary raw materials in appropriate industrial applications. To ensure environmentally sound operation, the process incorporates a centralized pulse dust collection system operating under negative pressure to capture particulate emissions generated during crushing, grinding and screening, thereby minimizing fugitive dust emissions and releasing filtered air into the working environment. This technology provides an efficient physical route for recovery of aluminium from foil-based MLP waste and complements other advanced recycling technologies such as chemical delamination, solvent-based dissolution and pyrolysis.

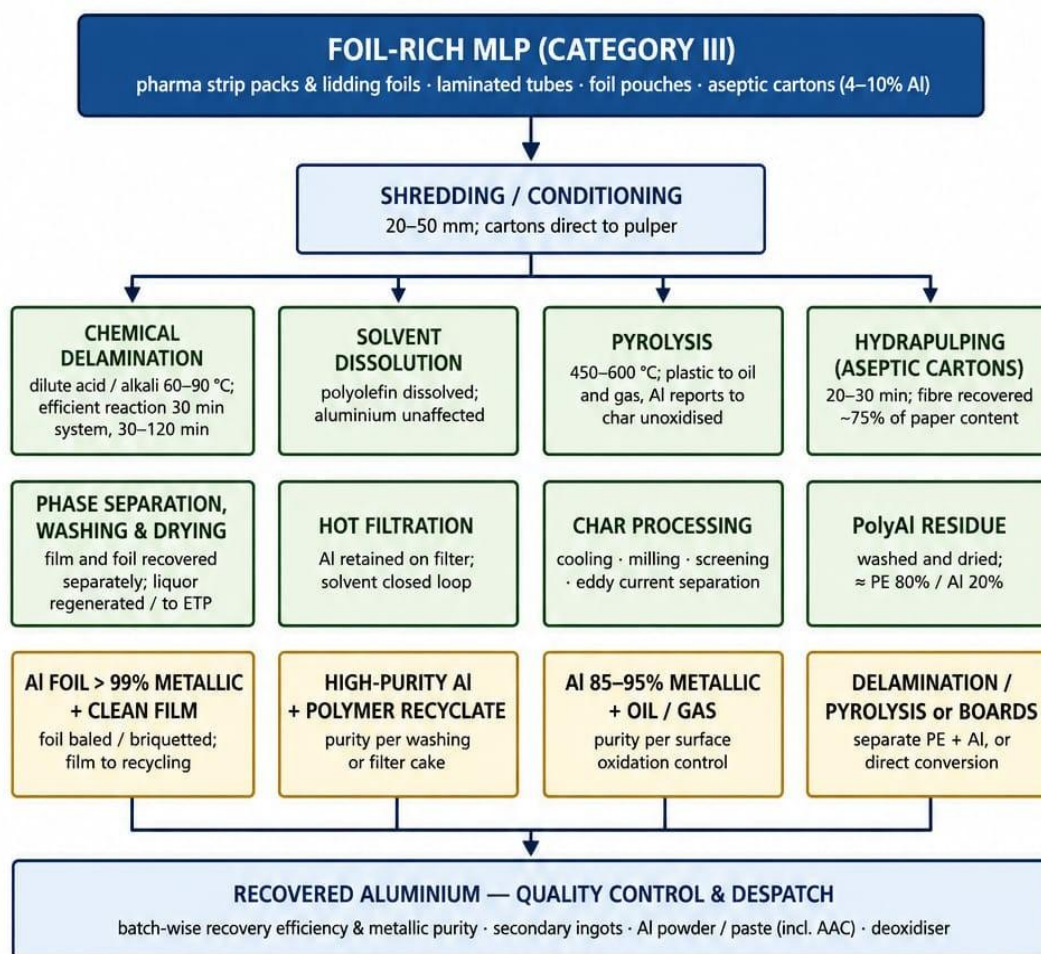
Eddy Current Separation serves as an important downstream process in advanced recycling of foil-based MLP waste by improving recovery of aluminium, reducing dependence on primary aluminium production and enhancing overall resource efficiency and circularity in plastic waste management.

7.2.3 Aluminium Recovery from Foil-based MLP

Several categories of Multilayered plastic packaging, including pharmaceutical blister packs, laminated tubes, aluminium foil pouches and aseptic cartons, contain recoverable aluminium. Recovery of aluminium from such packaging improves resource efficiency, conserves natural resources and reduces dependence on primary aluminium production.

Aluminium recovery may be undertaken through one or more of the following technologies:

- Chemical delamination of foil laminates;
- Solvent-based dissolution processes;
- Recovery of aluminium from pyrolysis residue;
- Hydrapulping of aseptic cartons followed by processing of the PolyAl fraction.



Following liberation, aluminium is generally recovered using Eddy Current Separation or other suitable physical separation techniques. The recovered aluminium may be utilized for manufacture of secondary aluminium products, aluminium powders, deoxidizers and other approved industrial applications. Recovery facilities should maintain records of aluminium recovery efficiency, product quality and environmentally sound management of process residues.

7.2.4 Hydro-pulping (Mechanical)

Hydro-pulping is a recycling technology for paper-based aseptic MLP, particularly beverage cartons comprising paperboard, polyethylene and aluminium layers. The process primarily aims to recover high-quality paper fibres by mechanically separating the paperboard component from the polyethylene-aluminium (PolyAl) laminate using water and mechanical agitation.

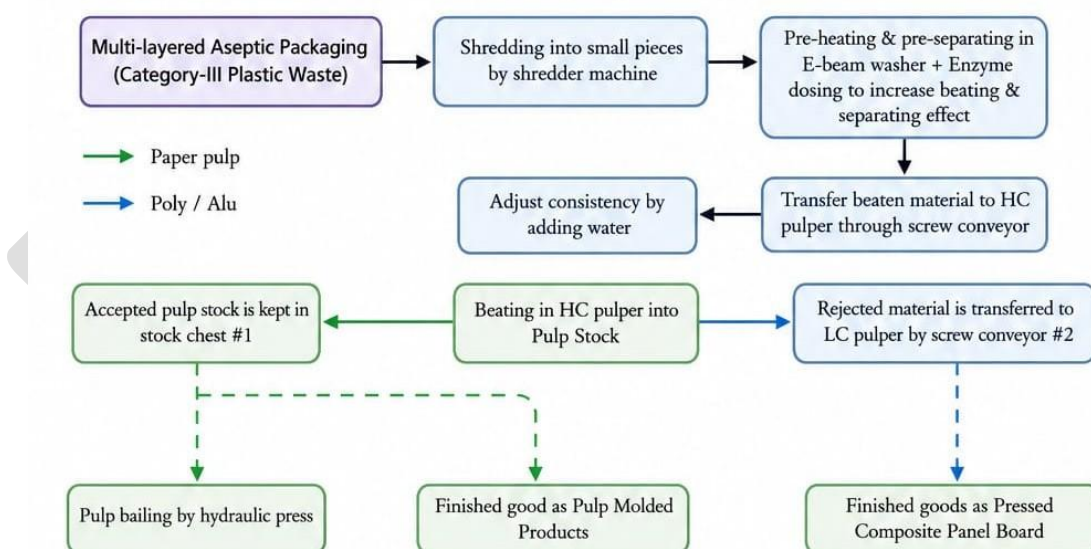
The recycling process generally comprises three stages, namely hydro-pulping, separation of fibre from the PolyAl fraction, and recovery of paper pulp for further manufacture of paper and paperboard products. The recovered paper pulp is subsequently screened, cleaned, thickened and dewatered before being converted into recycled paper products, whereas the residual PolyAl fraction may be utilized for manufacture of composite boards, roofing sheets, moulded products or may be subjected to further recovery processes for separation of polyethylene and aluminium.

7.2.5 Hydro-pulping (Enzymatic)

Enzymatic recycling is an emerging biotechnology-based recycling technology developed primarily for paper-based aseptic Multilayered plastic packaging (MLP), wherein biological catalysts (enzymes) are utilized to facilitate selective delamination and separation of paper fibres from polyethylene and aluminium layers under comparatively mild operating conditions. The process employs enzymes such as cellulases, hemicellulases, laccase, manganese peroxidase and lignin peroxidase to hydrolyse the fibre-adhesive interface, thereby reducing the

requirement for harsh chemicals, excessive mechanical action and high thermal energy during recycling.

The recycling process generally comprises shredding of post-consumer aseptic packaging, followed by enzyme-assisted pre-treatment and pre-separation in an enzyme dosing system to facilitate fibre liberation. The treated material is subsequently processed through high-consistency (HC) and low-consistency (LC) pulpers where the paper fibres are separated from the polyethylene-aluminium (PolyAl) fraction. The recovered pulp is subjected to successive stages of screening, cleaning, fibre separation, thickening, dewatering and hydraulic baling to obtain high-quality recycled paper pulp suitable for manufacture of paper, paperboard and moulded fibre products. The residual PolyAl fraction is separately collected and processed into composite panel boards or other value-added products, or may be further subjected to suitable recycling technologies for recovery of polyethylene and aluminium.



Unlike conventional hydro-pulping, the incorporation of enzymes enhances fibre separation by reducing water surface tension and selectively hydrolysing the adhesive layers binding the composite structure. This facilitates improved liberation of paper fibres while minimizing fibre damage during pulping. Consequently, enzymatic recycling offers improved fibre quality and strength, higher pulp yield,

reduced consumption of chemicals, lower water and energy requirements, improved process efficiency and reduced environmental footprint compared to conventional hydro-pulping.

The technology enables recovery of multiple recyclable fractions, including high-quality paper pulp and polyethylene-aluminium (PolyAl) laminates. The recovered paper pulp can be utilized for manufacturing recycled paper, paperboard, cartons and moulded fibre products, while the PolyAl fraction may be processed into composite boards, roofing sheets, pallets, panels, furniture components and other value-added products or subjected to subsequent recovery processes for separation of polyethylene and aluminium. Considering its potential for improved material recovery and resource efficiency, enzymatic recycling represents a promising technology for sustainable management of paper-based aseptic Multilayered plastic packaging waste. However, as the technology is still evolving, its large-scale deployment should be supported by demonstration of technical feasibility, environmental performance, economic viability and compliance with applicable statutory requirements before wider adoption

Technology	Suitable MLP Waste	Main Recovery	Key Consideration
Mechanical recycling	Relatively clean and compatible polymer streams	Recycled plastic products	Material quality and compatibility
Hydro-pulping	Paper-based / aseptic MLP	Paper fibre and PolyAl fraction	Management of residual PolyAl
Physical separation	Aluminium-plastic laminates after liberation	Aluminium and plastic fractions	Effective liberation is required
Delamination / solvent-based recycling	Complex multilayer structures	Individual material fractions	Solvent/chemical management
Chemical recycling	Difficult-to-mechanically recycle plastic fractions	Oil, monomers or chemical feedstock	Environmental performance and residue management

7.2.6 Selection of Recycling Technology

Selection of an appropriate recycling technology should be based on:

- a. Composition and quality of MLP waste;
- b. Degree of segregation and contamination;
- c. Availability of technically proven recycling facilities;
- d. Environmental performance and regulatory compliance;
- e. Resource recovery efficiency and life-cycle environmental benefits;
- f. Quality and marketability of recycled products; and
- g. Economic viability and operational sustainability.

Where technically feasible, material recycling shall be accorded priority in accordance with the waste management hierarchy. Advanced recycling technologies may be adopted for suitable MLP streams that cannot be efficiently processed through conventional mechanical recycling. Fractions that remain non-recyclable after application of available recycling technologies may be channelized to authorized End of Life (EOL) facilities in accordance with the Plastic Waste Management Rules, 2016 (as amended) and the Extended Producer Responsibility (EPR) Guidelines.

7.3 Environmental Safeguards and Regulatory Requirements

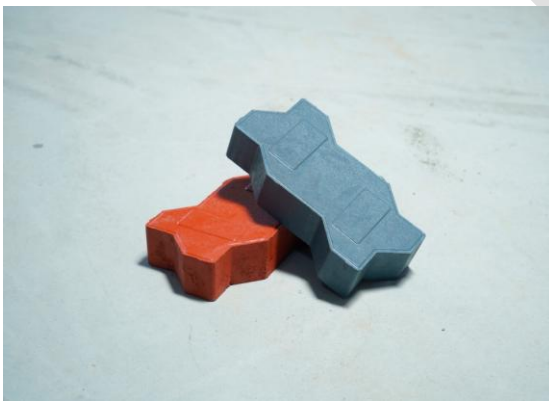
Advanced recycling facilities shall be established and operated only after obtaining applicable statutory approvals under environmental regulations. Such facilities should incorporate appropriate pollution control systems, feed preparation arrangements, solvent recovery systems (where applicable), emission control measures, wastewater treatment facilities and scientifically designed residue management systems.

Operators shall maintain batch-wise records of feedstock, recovered products, residues and overall mass balance. Recovery of polymers, aluminium and other products should be adequately documented to ensure traceability under the Extended Producer Responsibility (EPR) framework. Generation of EPR

certificates shall be in accordance with the applicable EPR Guidelines and based on verified quantities of processed plastic waste.

8. Application of Recycled MLP

Recycled MLP is used in two ways: granulate-based conversion, where pelletised recyclate is processed on standard plastics machinery (injection moulding, extrusion of profiles and sheets); and direct conversion, where shredded or agglomerated MLP is formed into products like moulded articles, compressed boards, sheets, and panels, and other applications (plastic lumber, paver blocks, precast elements, industrial handling products, or road-construction aggregate without pelletising).



Blocks



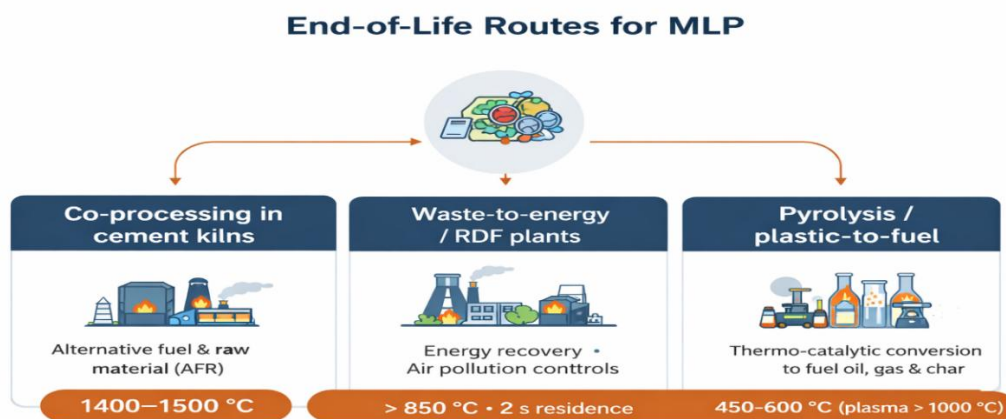
Roof Sheets



Boards / sheets school benches/desks, wall panels, etc.

9. End of Life (EOL) route for non –recyclable fractions

Even efficient processing of Category III MLP inevitably generates fractions that cannot be recovered for material use. These may include sorting rejects, heavily contaminated or degraded packaging, non-recoverable paper/foil/plastic residues and process residues from washing or separation.



For such fractions, this guideline proposes a strict hierarchy of management. Under no circumstances should multilayered plastic packaging be sent to landfills or subjected to open burning, as these practices cause environmental harm and negate the principles of responsible waste management.

- a) The first priority is always material recycling, recovering usable polymers wherever technically feasible. Where direct recycling into granulate is not possible.
- b) The second option is direct-conversion into products such as compressed boards or road-construction aggregate.
- c) For the remainder, energy and resource recovery is permitted through controlled routes like cement kiln co-processing, waste-to-energy, or pyrolysis.

10. Quality Control and Testing of Recycled MLP

To convert recycled MLP granulate into a certifiable industrial raw material, a structured test regime is essential to ensure uniformity, compliance, and market acceptance. The Bureau of Indian Standards (BIS) methods and corresponding ISO/ASTM standards, ensuring reproducibility and credibility for batch certification. Below is a structured test regime that can be adopted for certification of recycled MLP granulate.

Parameter	Indicative method	Frequency	Typical acceptance basis
Melt Flow Index (MFI)	IS 13360-4 / ISO 1133 (190–230 °C, 2.16–5 kg)	Every batch	Within $\pm 20\%$ of declared grade value
Density	IS 13360-3 / ISO 1183	Every batch	0.91–1.05 g/cm ³ per grade
Ash content	ISO 3451-1	Every batch	Declared; typically <8% polyolefin grade, <15% mixed grade
Moisture	Halogen / oven method	Every batch	<0.3% at despatch
Filtration fineness	Process record (screen mesh)	Continuous	≥ 80 mesh declared
Tensile / impact on moulded specimen	ISO 527 / ISO 179	Periodic (per grade)	Declared datasheet values
Odour / volatiles	Internal sensory or VDA-270 type	Periodic	Fit for intended application

For direct-conversion products made from recycled MLP, the testing regime shifts from granulate properties to product-level certification. This ensures that boards, sheets, or road-application shred are treated as standardized industrial materials with defined performance parameters.

The convergence of (i) a maturing collection infrastructure, (ii) proven mechanical recycling technologies encompassing sorting, densification, and filtered extrusion, (iii) robust end-use applications in injection-moulded articles, boards, sheets, and

bituminous roads, and (iv) established End of Life routes for residual fractions, ensures that India's MLP stream can now be substantially and gainfully processed.

11. Monitoring of Extended Producer Responsibility (EPR) Compliance

The implementation of EPR for plastic packaging is monitored through the centralized online EPR Portal developed by CPCB. The Portal serves as an end-to-end digital platform for registration of obligated entities, submission of annual plastic packaging data, determination of EPR obligations, generation of EPR certificates and monitoring of compliance.

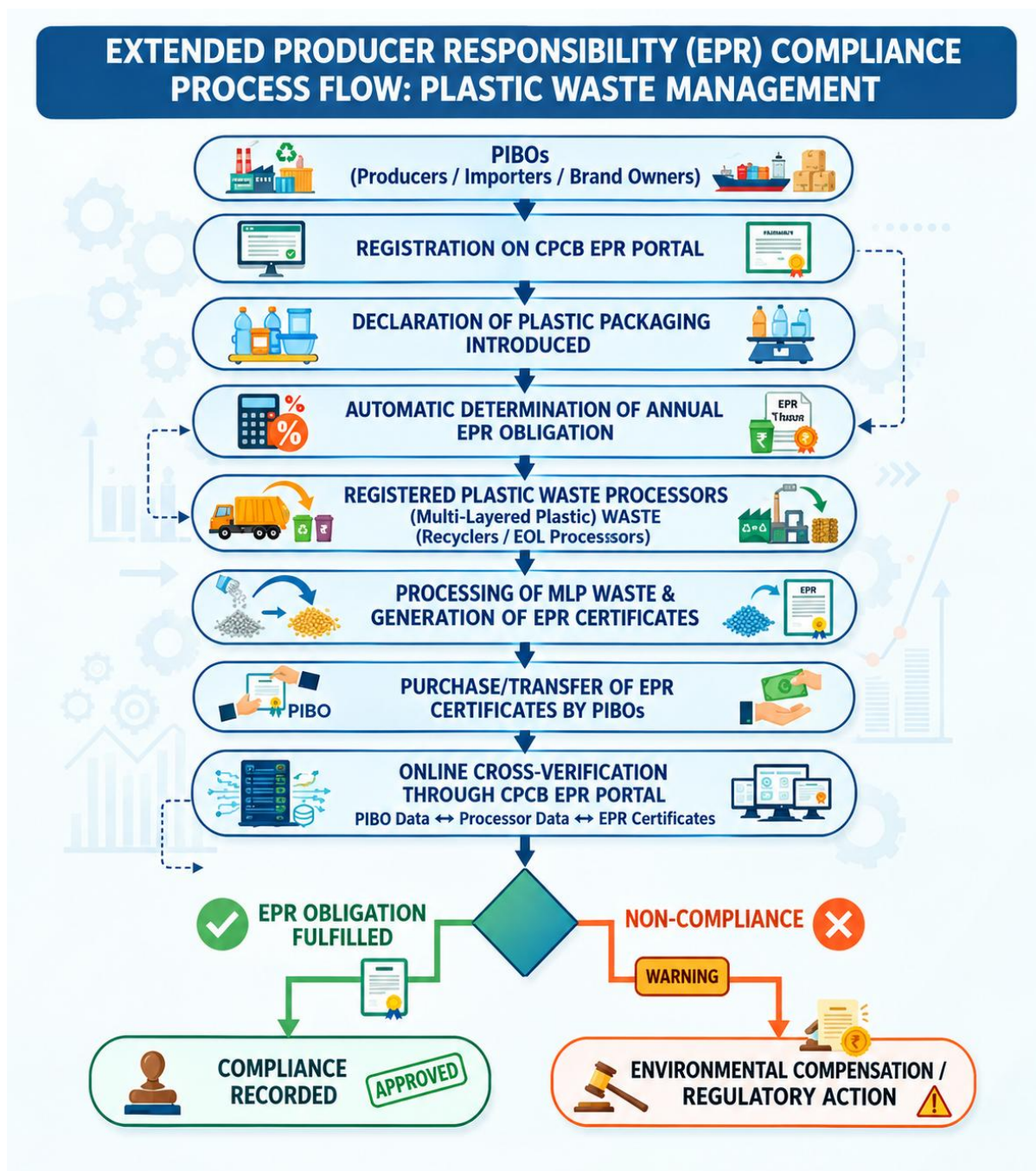
All PIBOs introducing Category III plastic packaging into the market shall report the relevant quantity and category of packaging in accordance with the applicable EPR framework. Category II all-plastic multilayer packaging shall be reported under the applicable Category II provisions and shall not be treated as Category III for the purposes of these Guidelines.

Plastic Waste Processors, including registered recyclers and End of Life processors, upload details of plastic waste processed through authorized recycling or disposal facilities. Based on the verified quantity processed, EPR certificates are generated through the Portal. PIBOs fulfil their EPR obligations by purchasing these certificates from registered Plastic Waste Processors.

The Portal automatically cross-verifies the quantity of plastic packaging introduced into the market, the quantity processed by registered Plastic Waste Processors, and the certificates generated. Any discrepancy between the quantities reported by PIBOs and Plastic Waste Processors is resolved by considering the lower quantity for compliance purposes.

Compliance with EPR obligations is further verified through annual returns, inspections and audits undertaken by CPCB and the respective SPCBs/PCCs. Non-fulfilment of EPR obligations may attract Environmental Compensation in accordance with the notified guidelines. The online monitoring mechanism provides

transparency, traceability and accountability throughout the plastic waste management chain.



12. Protocol for Evaluation of Technology for Waste Management

In compliance with the Order of the Hon'ble NGT dated 10.08.2023, the Ministry of Environment, Forest and Climate Change (MoEF&CC) issued an Office Memorandum (OM) dated 09.07.2026. The OM circulated the Hon'ble Tribunal's directions for consideration of waste management technologies for multilayered

plastic packagings, wherever appropriate, based on scientific evidence and site-specific environmental and techno-economic factors. The OM is given as **Annexure-I**.

In this regard, it is humbly submitted that CPCB has developed a Protocol for Evaluation of Technology for Waste Management in June 2021, which lays down the standard procedure for evaluating waste management technologies to identify and recommend technologies suitable for different types of wastes (Construction & Demolition of Wastes, Solid Waste and Plastic Waste) in the country. The copy of the protocol is given as **Annexure II**.

Proposals regarding dissolution techniques for waste management shall be evaluated under the Protocol for Evaluation of Technology for Waste Management. If found feasible, approval shall be granted by the Standing Committee under the Chairmanship of the Member Secretary, CPCB. The Committee consists of representatives from Department of Science & Technology, National Environmental Engineering Research Institute (NEERI), Technology Information Forecasting & Assessment Council (TIFAC), Maharashtra SPCB and Tamil Nadu SPCB.

13. Alternative to Multi Layered Plastics

Category III MLP packaging combines plastic with paper/paperboard, aluminium foil or other non-plastic layers. Packaging redesign should therefore aim to reduce the number and complexity of material combinations while retaining required barrier and product-protection performance. The following alternatives may be evaluated, subject to product requirements, applicable standards and environmental assessment.

- a. **Mono-material packaging:** Flexible pouches made entirely of polyethylene (PE) or polypropylene (PP) allow easier recycling through existing streams. They provide good barrier properties for most food products.

- b. **Compostable bio-based films:** Materials such as polylactic acid (PLA), polyhydroxyalkanoates (PHA), or cellulose films are suitable for short shelf-life products. They require industrial composting facilities for effective disposal.
- c. **Paper-based barrier packs:** Paper laminated with thin biodegradable coatings offers acceptable moisture and oxygen resistance. These are recyclable or compostable depending on the coating used.
- d. **Recycled-content plastics:** Packaging incorporating post-consumer recycled (PCR) plastics reduces demand for virgin plastic and supports circular economy goals.
- e. **Biodegradable coatings:** Starch blends and bio-resins as coating, can replace aluminum or plastic layers in certain applications, improving End of Life options.

14. Way Forward

The existing regulatory framework for management of MLP waste has evolved considerably through the PWM Rules, 2016 (as amended), the EPR Guidelines, and various CPCB guidelines issued from time to time. The framework provides a comprehensive mechanism covering registration of PIBOs, collection and segregation of plastic waste, recycling and End of Life processing through authorized facilities, and online monitoring of compliance through the centralized EPR Portal.

As a way forward for reducing the complexity of MLP and improving material recovery, the development and adoption of aluminum-free aseptic cartons and renewable-resource-based polymer alternatives may be encouraged. These packaging formats represent a packaging-design approach in which the material structure is modified at the source to facilitate improved recyclability and reduce dependence on difficult-to-separate material combinations.

PIBOs may explore the feasibility of adopting and promoting, in the Indian market, emerging aseptic carton structures that reduce material complexity and improve compatibility with recycling systems. In this context, developments in the European market, including aluminum-free full-barrier aseptic cartons, aseptic cartons incorporating forest-based / renewable-feedstock-based polymers through a mass-balance approach, and combinations of aluminum-free structures with forest-based polymers, may be studied as potential models for packaging redesign.

Aluminum-free cartons replace the conventional aluminum foil barrier with polymer-based barrier structures and high-barrier coatings, thereby enabling a higher paperboard fraction and eliminating the poly-aluminum layer. In addition, forest-based polymers may be produced using renewable feedstocks such as tall oil, a by-product of the paper-pulping process, through certified mass-balance systems such as International Sustainability and Carbon Certification (ISCC PLUS) etc. These developments, which have been commercially introduced for specified applications in European markets, may be evaluated for their technical feasibility, product safety, shelf-life performance, recyclability, compatibility with Indian collection and recycling infrastructure, availability of suitable raw materials, economic viability and conformity with applicable Indian standards and regulations.

PIBOs may, in consultation with relevant stakeholders, undertake pilot projects, technical studies or market assessments to examine the suitability of such alternative packaging structures in India. Such initiatives may be considered as part of a long-term design-for-circularity approach for reducing dependence on complex multi-material structures and improving the recoverability of packaging materials.

In addition, the availability of registered recyclers and End of Life processors with substantial processing capacity demonstrates that the infrastructure required for environmentally sound management of MLP waste is available in the country. The digital monitoring mechanism further enables traceability of plastic waste from generation to its final processing, thereby strengthening implementation of Extended Producer Responsibility.

Continuous efforts shall be made to improve collection efficiency, strengthen MRFs, promote environmentally sound recycling technologies, enhance recycling of difficult-to-process multilayered plastic packagings, and encourage development of technically feasible and commercially viable alternatives to conventional MLP packaging. Periodic review of these Guidelines, capacity building of stakeholders and adoption of emerging technologies shall further strengthen sustainable management of MLP waste in the country.

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