THOUGHTS??

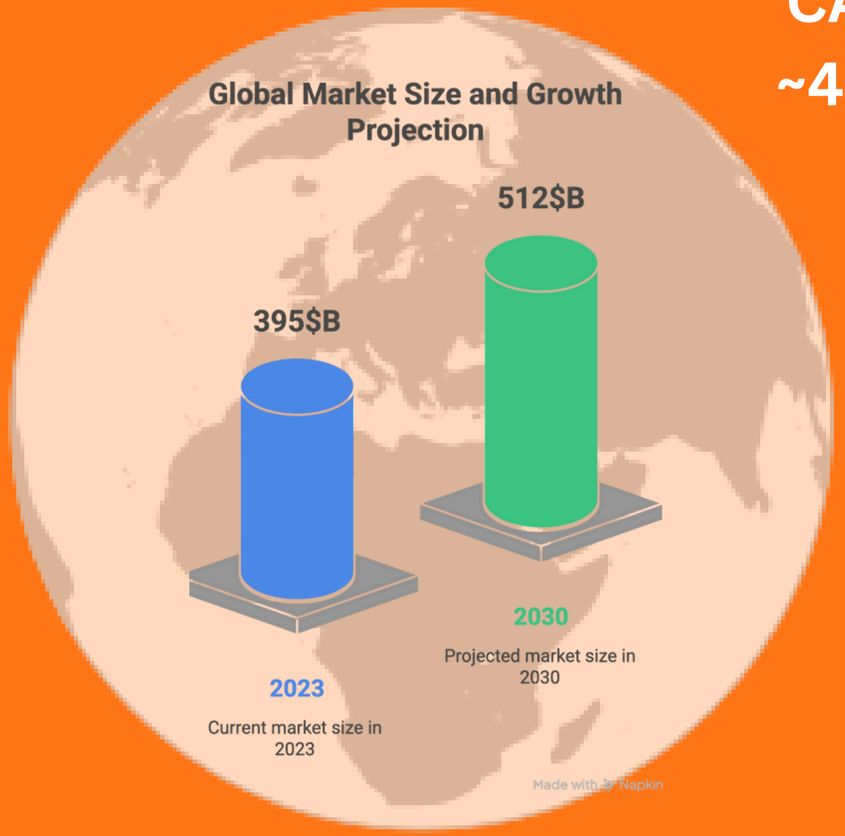

Lay's
India's
Magic Masala
Potato Chips


Kurkure
Masala
Munch

PLASTIC PACKAGING INDUSTRY
(FOOD SECTOR FOCUSED)

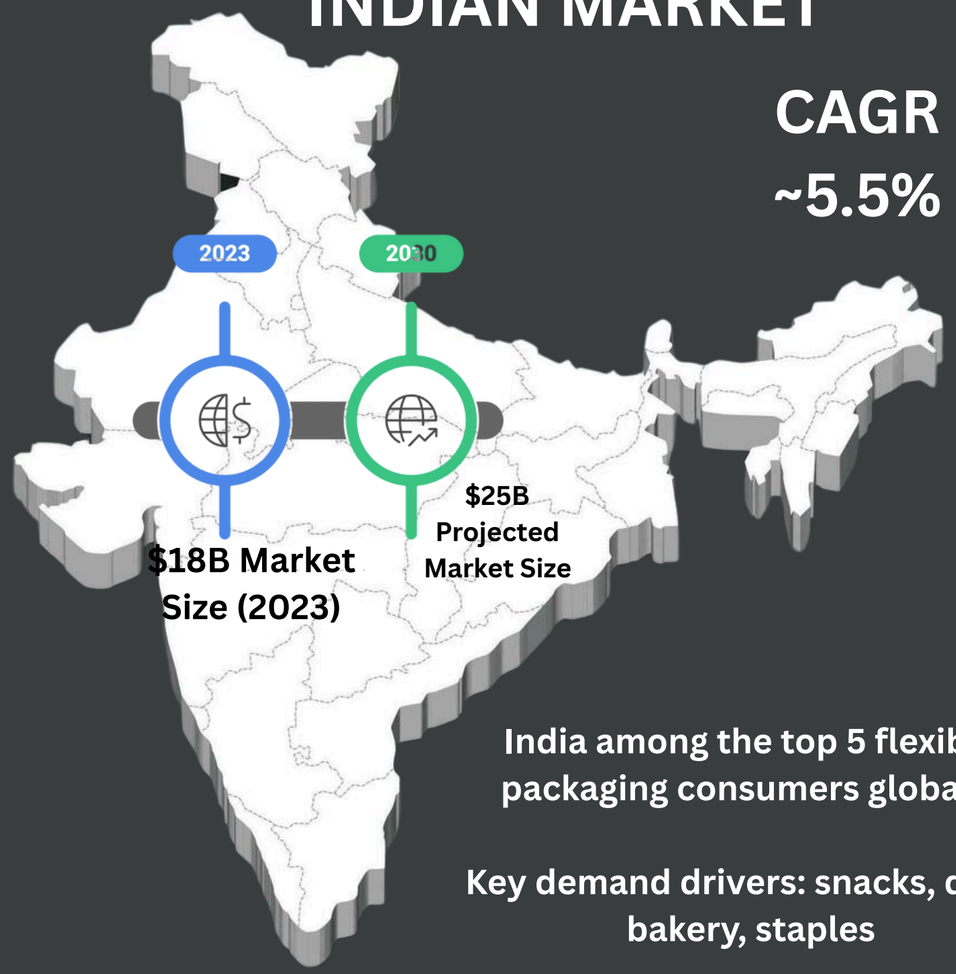
GLOBAL MARKET

CAGR
~4.2%



INDIAN MARKET

CAGR
~5.5%



India among the top 5 flexible packaging consumers globally

Key demand drivers: snacks, dairy, bakery, staples

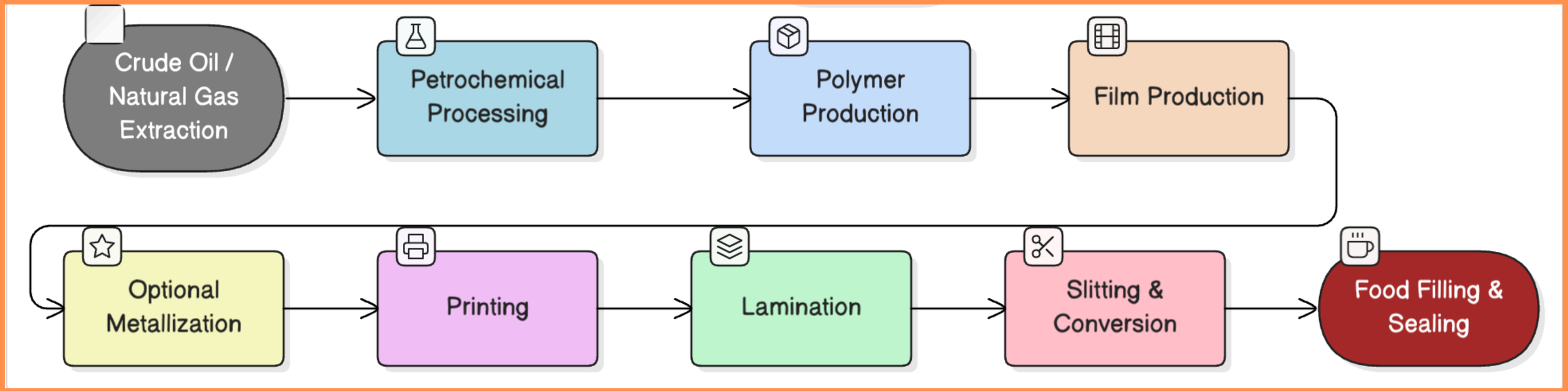
THE PLASTIC PACKAGING INDUSTRY

Role: Ensures freshness, safety, and shelf-life extension of FMCG products (snacks, biscuits, dairy, staples).

Companies of Study:

RM Packers	MSA Packaging

COMPLETE SUPPLY CHAIN



COMPLETE SUPPLY CHAIN

Crude Oil / Natural Gas Extraction – Source of feedstock hydrocarbons.

Petrochemical Processing – Refineries convert crude to intermediates like ethylene, propylene, PTA

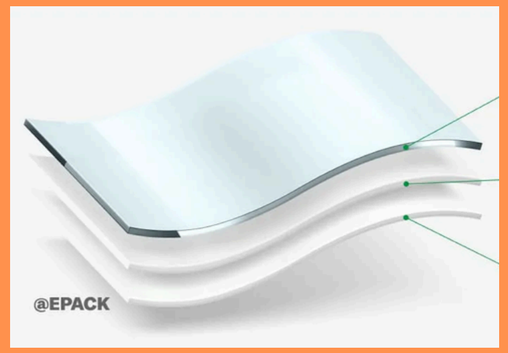
Polymer Production – Conversion into resins/pellets

PP → for BOPP films(Biaxially Oriented Polypropylene)

PET → for BOPET films(Biaxially Oriented Polyethylene Terephthalate)

LDPE/LLDPE → sealing layers

COMPLETE SUPPLY CHAIN



Film Production – Extrusion & orientation to produce strong, thin films.

Metallization – Vacuum coating with aluminum for barrier properties (moisture, oxygen).

Printing – High-quality rotogravure/flexo printing (reverse print for protection).

Lamination – Combine multiple layers (outer, barrier, inner sealing).

Slitting & Conversion – Cut into machine rolls; convert into pouches/sachets.

Food Filling & Sealing – FMCG & dairy companies fill products and heat-seal packages.

PROJECT FOCUS

[Blown Film Extrusion]
└── LDPE/LLDPE melted, blown into thin film, wound into rolls

[Printing]
└── Rotogravure/Flexographic printing for branding & product info

[Lamination]
└── Adhesive bonding with other films (BOPP/BOPET/Metallized layer)
OR single-layer for milk pouches

[Slitting]
└── Cut laminated or printed rolls to exact widths for packaging machines

RM Packers

ABOUT COMPANY

RM Packers

Manufacturer of LDPE films, using LDPE pellets as the primary raw material.
Equipped with multi-layer extrusion machines for high-quality, customizable films.

Supply lamination-grade films to printing & lamination firms.
Key applications in flexible packaging, especially for food sector (e.g., rice packaging).

Our Role in the Supply Chain
Provide durable films that serve as the base layer for flexible packaging.
Enable downstream partners to create safe, sustainable, and high-performance packaging solutions.

INDUSTRIAL CLASSIFICATION BY POLLUTION CATEGORY (CPCB)

Red Category (High Pollution)
Highest pollution load → strict monitoring.
Examples: Thermal power plants, tanneries, cement, petrochemicals.

Orange Category (Moderate Pollution)
Moderate pollution potential.
Examples: Food & beverage units, dairies, paints, packaging, auto servicing.

MSA Packaging falls under Orange Category

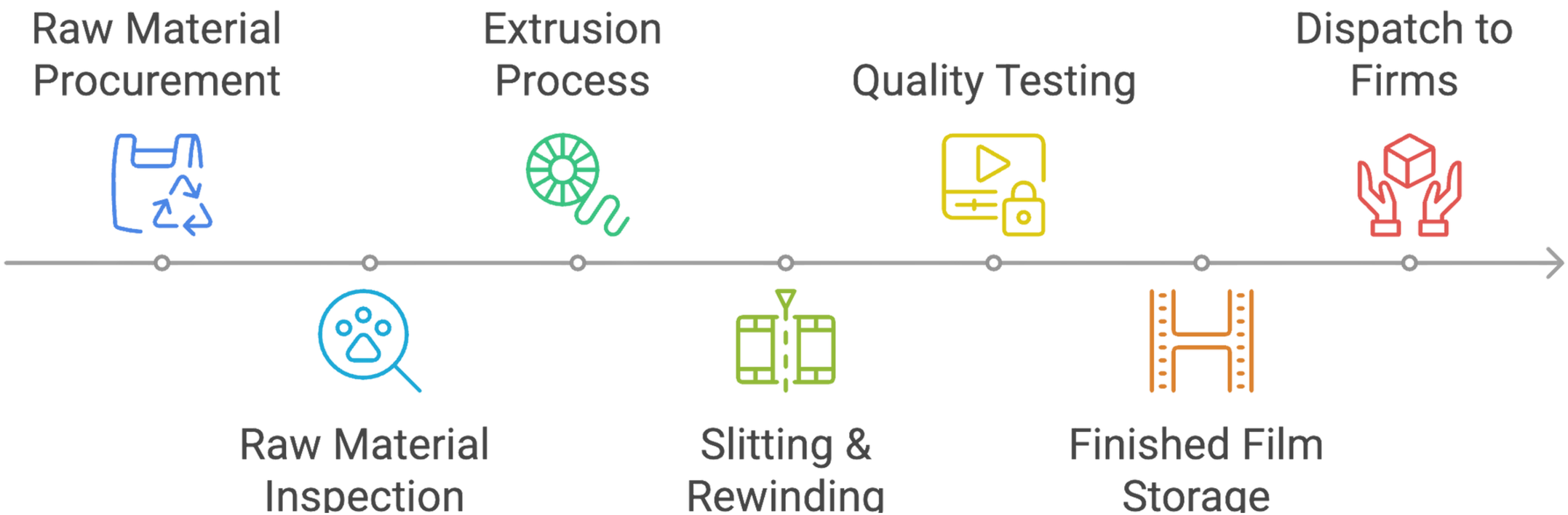
RM Packers falls under Green Category

Green Category (Low Pollution)
Minimal pollution; simplified compliance.
Examples: Textile weaving, tea processing, bakeries, plastic products.

White Category (Non-Polluting)
Practically non-polluting → no consent required (only intimation).
Examples: Solar power plants, LED assembly, handloom, chalk making.

FLOWCHART OF ACTIVITIES AT RM PACKERS FACILITY

LDPE Film Manufacturing Process



WHERE MOST ENVIRONMENTAL HARM IS HAPPENING AT **RM PACKERS**

- **Raw Material Procurement (LDPE Pallets)**

Heavy reliance on virgin LDPE resin → derived from fossil fuels, high carbon footprint in extraction & polymerization.

Packaging of raw pellets often single-use and not eco-friendly.

- **Extrusion Process (Feeding → Melting → Multi-layer Film Formation → Cooling)**

High energy consumption for melting & extrusion.

Potential plastic pellet (nurdle) spillage → a major contributor to microplastic pollution if not contained.

Cooling water (if used) can lead to wastewater generation and thermal load.

Additives (slip agents, stabilizers, etc.) may contain chemicals with downstream disposal impact.

- **Slitting & Rewinding / Storage**

Plastic dust/waste generation from trimming.

Roll wrapping & packaging (often with more plastic) → adds to material footprint.

Virgin LDPE dependence (fossil-based raw material, carbon footprint)

Extrusion energy intensity + risk of pellet leakage (microplastic pollution)

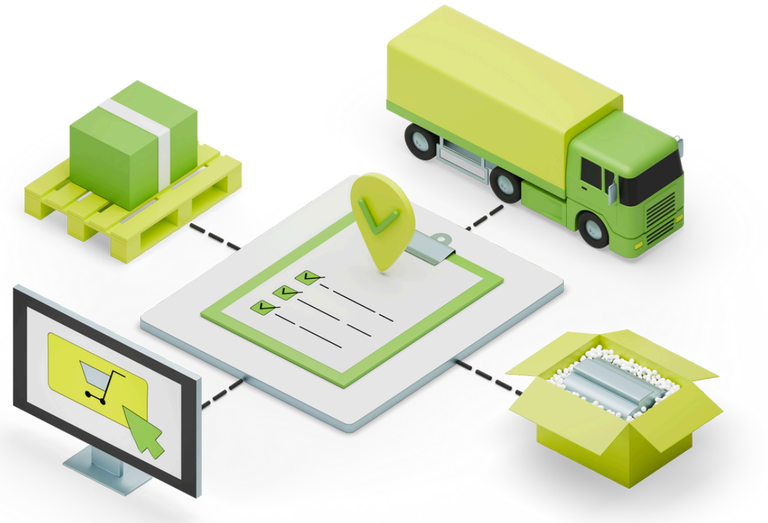
Plastic waste from trimming & packaging

SCOR MODEL

Attribute	KPI	Company Input	Industry Benchmark (Packaging SMEs)	Remarks and Recommendations
Reliability	Forecast Accuracy	~65–70% (RM Packers); ~70–75% (MSA)	80–85%	Seasonal demand (snacks, staples) → Need AI/ML demand forecasting
Reliability	Quality Claims	4–5 per 1,000 rolls	2–3 per 1,000 rolls	Tighten QC in extrusion & lamination, better raw material inspection
Reliability	Customer Satisfaction	Not formally tracked	CSAT/NPS common	Implement customer feedback system with FMCG clients
Responsiveness	Fulfillment Cycle – B2B	8–10 days	5–7 days	Digital order processing, reduce waiting at dispatch
Responsiveness	Export Dispatch	25–30 days (RM)	20–25 days	Scope for digital export documentation, align with logistics partners
Flexibility	Upside/Downside Flexibility	Moderate flexibility	SMEs target ±20% in 30 days	Could integrate blockchain for supplier responsiveness
Cost	SCM / Logistics Cost	6–7% of sales	5–7%	Costly due to road-only logistics; shift to rail/multimodal
Cost	Inventory Carrying Cost	~12%	15–20%	Appears efficient, but may hide capital lock-up
Assets	% Route Mix	~95% Road, 5% Rail	≥70% rail/sea, ≤5% air	High emissions & cost → invest in rail freight partnerships
Assets	Cash-to-Cash Cycle	80–90 days	50–60 days	Need faster collections, supplier financing
Assets	Inventory Days	~65–75 days	40–50 days	Excess capital tied → use digital demand planning & blockchain

GREEN SUPPLY CHAIN

STRATEGIES AT RM PACKERS.



GREEN SUPPLY CHAIN INITIATIVES (PROCUREMENT)

1) Optimized Delivery Schedules

- Collaborate with suppliers to plan efficient delivery timings.(like Backhauling)
- Ensure maximum fill rate of transport vehicles.
- Impact: Fewer trucks on the road → reduced fuel use, lower emissions, and cost savings.

2)Packaging Reduction

RM Packers actively engages suppliers to supply LDPE pellets in:

- Recycled packaging
- Recyclable packaging

Focus on minimizing unnecessary packaging material in raw material deliveries.

IMPACT ON GREEN SCM

Incoming Waste Reduction → less disposal, leaner operations.

Circular Supply Chain Support → promotes reuse & recyclability.

Cost Efficiency → lowers handling & waste management costs.

Supplier Collaboration → builds stronger sustainability partnerships.

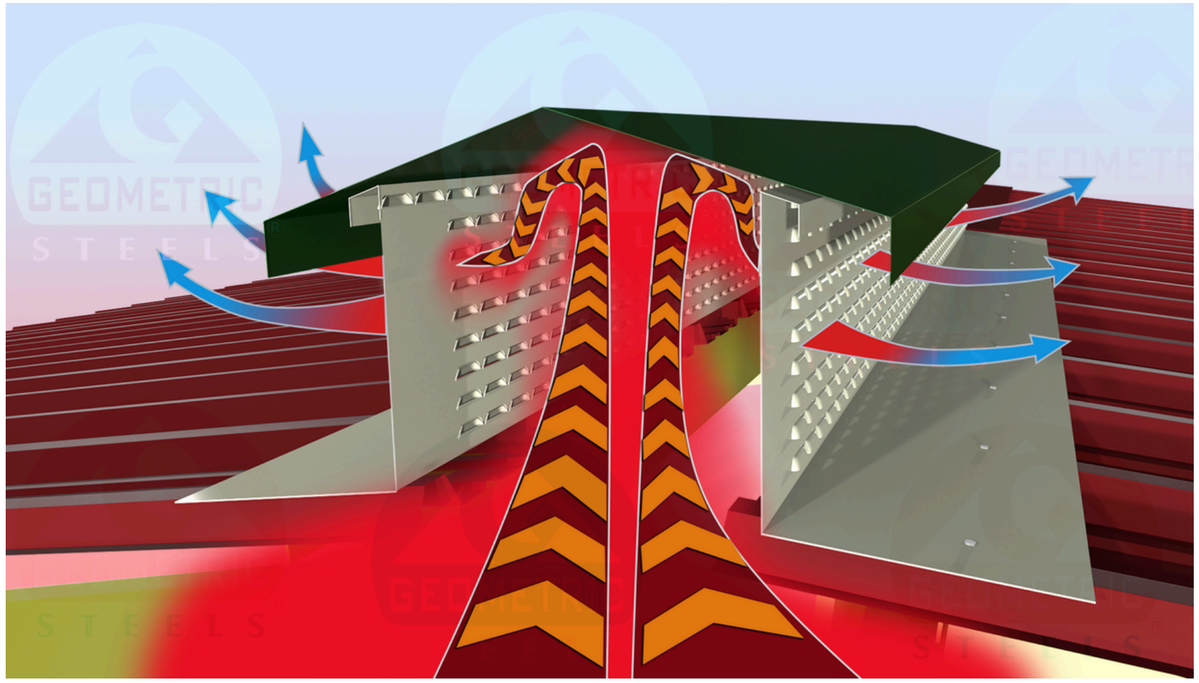
GREEN SUPPLY CHAIN INITIATIVES (FACILITY LEVEL)

Problem at RM Packers

Extrusion generates VOCs, fine particulates & waste heat.
Hot, polluted air rises & stagnates → poor working conditions, uncontrolled emissions, higher AC/power use.

Proposed Solution: Roof Monitor Ventilation

Passive structure along roof ridge.
Uses natural convection: hot air exits through monitor, fresh air enters from lower vents.
Louvers prevent rain entry; no moving parts → low maintenance.



Key Benefits

Energy Efficient: Minimal/no electricity, cuts HVAC load.
Pollution Control: Continuous removal of VOCs & particulates.
Heat Management: Improves thermal comfort & worker productivity.
Scalable & Durable: Custom-designed, long-life, sustainable solution.

GREEN SUPPLY CHAIN INITIATIVES (FACILITY LEVEL)

Cooling System at RM Packers

Current Practice (Problem)
Open water tanks for cooling extruder & die.
Weekly water replacement due to heating, dust & contamination.
Results in high water wastage + downtime.

Green Alternatives

Closed-Loop Chilling System → recirculates water/glycol in a sealed loop, only occasional top-up.
Energy-Efficient Cooling Towers → filtration & water treatment maintain quality, cut blowdown.
Hybrid / Air-Cooled Chillers → ideal for water-scarce regions, no replacement needed (slightly higher power).

BENEFITS

- Major reduction in water use & wastewater.
- Lower operational costs & downtime.
- Ensures consistent cooling & better film quality.
- Strengthens RM Packers' green supply chain credentials.

GREEN SUPPLY CHAIN INITIATIVES (FACILITY LEVEL)

In-house Recycling System – On-site Granulator

Extrusion and packaging generate film scrap & edge trims.
Without recycling, waste is discarded → higher raw material cost & landfill burden.

Proposed Solution: On-site Granulator
Install a granulator machine to shred film scrap and trims immediately.
Reprocessed granules are fed back into the extrusion line.
Creates a closed-loop recycling system within the facility.

How it Works (Process Flow)
Scrap/trim collected from production lines.
Sent directly to the granulator.
Shredded into small, uniform granules.
Granules mixed with virgin LDPE pellets → reused in production.

BENEFITS FOR RM PACKERS

- Cost Savings: Reduces purchase of virgin raw material.
- Sustainability: Minimizes plastic waste disposal, lowers landfill
- Efficiency: Real-time recycling keeps operations smooth.
- Green SCM Alignment: Supports circular economy & eco-friendly branding.

GREEN SUPPLY CHAIN INITIATIVES
(END-OF-LIFE & CIRCULARITY)

rLDPE Utilization at RM Packers

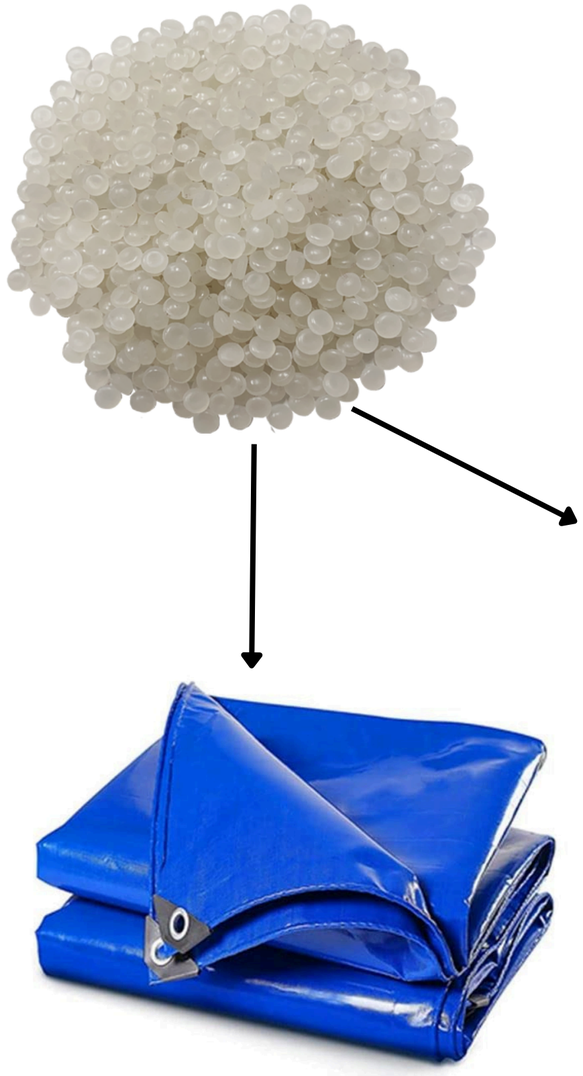
Current Practice at RM Packers

Trimmed & scrap LDPE is recycled into rLDPE pellets.

- **Since rLDPE affects film quality, RM Packers does not reuse it internally.**
- **Instead, pellets are sent to external vendors for alternate applications.**

Applications of rLDPE

- **Garbage & Carry Bags – liners, shopping bags.**
- **Agricultural Films – mulch films, greenhouse covers.**
- **Industrial/Construction Uses – tarpaulins, geomembranes, pallet wraps**
- **Non-Food Packaging – courier bags, bubble wrap, e-commerce mailers.**
- **Injection-Moulded Products – buckets, bins, pots, crates, pipes.**
- **Composite Materials – plastic lumber, pallets, outdoor furniture.**

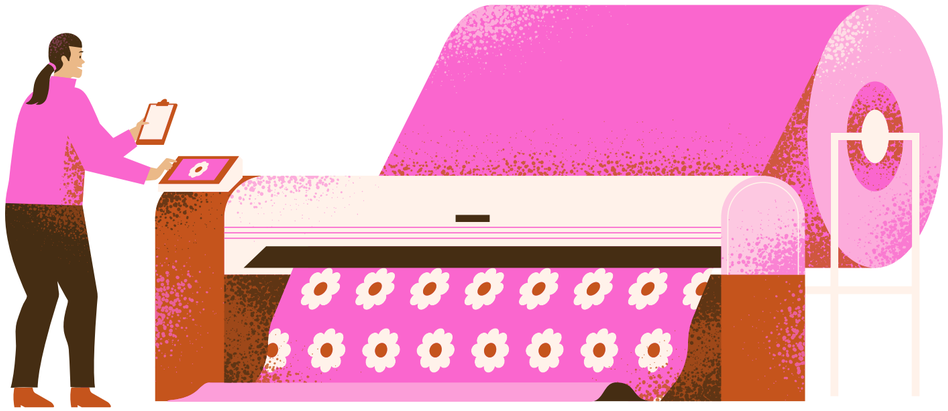


RM PACKERS

MSA PACKAGING

MSA Packaging Solution

ABOUT COMPANY



MSA Packaging Solution

MSA Packaging Solution is a specialized printing and lamination firm engaged in the production of high-quality flexible packaging materials for the food industry and other consumer goods.

The company procures LDPE films from manufacturers such as RM Packers and transforms them into durable, attractive, and functional packaging solutions.

Its product portfolio includes rice bags, flour pouches, snack wrappers, and laminated rolls for FMCG brands. Equipped with advanced rotogravure printing machines (Pelican) and lamination facilities, MSA combines superior aesthetics with protective barrier laminations, ensuring both brand visibility and product safety.

Currently, ink drying relies on blower systems, which are energy-intensive, and the plant is categorized under the Orange Category of Pollution due to the environmental impact of solvents and adhesives used in production.

FLOW OF ACTIVITIES AT MSA PACKAGING

Procurement of LDPE Films (from RM Packers)

↓

Printing Process (Rotogravure / Flexographic)

↓

Lamination Process (Bonding LDPE with BOPP, PET, Metallized Films, etc.)

↓

Slitting & Rewinding (into smaller rolls)

↓

Conversion & Pouching (Cutting, Sealing, Bag/Pouch Making)

↓

Quality Testing & Inspection

↓

Finished Packaging Storage

↓

Dispatch to Clients (Food companies, FMCG brands, etc.)

WHERE MOST ENVIRONMENTAL HARM IS HAPPENING AT MSA PACKAGING

Printing Process

- Solvent-based inks → VOC emissions.
- Blower drying → high energy consumption.

Lamination Process

- Petroleum-based adhesives → toxic and non-biodegradable.
- Multi-layer laminates → poor recyclability.

Facility Operations

- Energy-intensive Pelican machines.
- High dependency on grid electricity.

Procurement

- Virgin LDPE films → fossil fuel-based, non-biodegradable.

GREEN SUPPLY CHAIN STRATEGIES AT MSA PACKAGING.

GREEN SUPPLY CHAIN INITIATIVES IN PROCUREMENT

CHALLENGE: DEPENDENCE ON VIRGIN LDPE AND WASTEFUL PACKAGING OF RAW ROLLS.

SOLUTIONS

- Source PCR (post-consumer recycled) LDPE films to reduce virgin plastic use.
- Work with RM Packers for bulk, reusable, or recyclable roll packaging.
- Explore bio-PE (plant-derived polyethylene) or blends for specific clients willing to adopt greener packaging.
- Push Vendors to adopt responsible waste handling and green energy use in their production.
- Prioritize local/regional suppliers for LDPE rolls and laminates to reduce transportation-related emissions.

GREEN SUPPLY CHAIN

INITIATIVES IN PRINTING STAGE

CHALLENGE: VOC EMISSIONS, HIGH ENERGY USAGE IN DRYING.

SOLUTIONS

- Shift to water-based or UV-curable inks to minimize VOCs.
- Replace blowers with infrared (IR) or UV curing systems, reducing electricity demand.
- Install a basic condensation/recovery unit for capturing solvents during drying.Recovered solvents can be reused in cleaning or reblended into ink, cutting purchase costs
- Deploy ink management software that tracks usage and minimizes wastage during job changeovers.

GREEN SUPPLY CHAIN INITIATIVES IN LAMINATION STAGE

CHALLENGE: NON-RECYCLABLE LAMINATES, SOLVENT ADHESIVES.

SOLUTIONS

- Adopt solvent-less adhesives (widely available, same bonding quality).
- Shift gradually to water-based adhesives where product specs allow.
- Pilot all-PE mono-material pouches for rice/flour packaging (easy recyclability). Already, big FMCG brands (Nestlé, Unilever) are piloting mono-PE pouches for dry goods and detergents. For rice/flour, it’s technically possible, but cost is higher and barrier performance must be carefully tested.
- Offer recyclability-focused packaging designs in collaboration with clients.

GREEN SUPPLY CHAIN

INITIATIVES AT FACILITY LEVEL

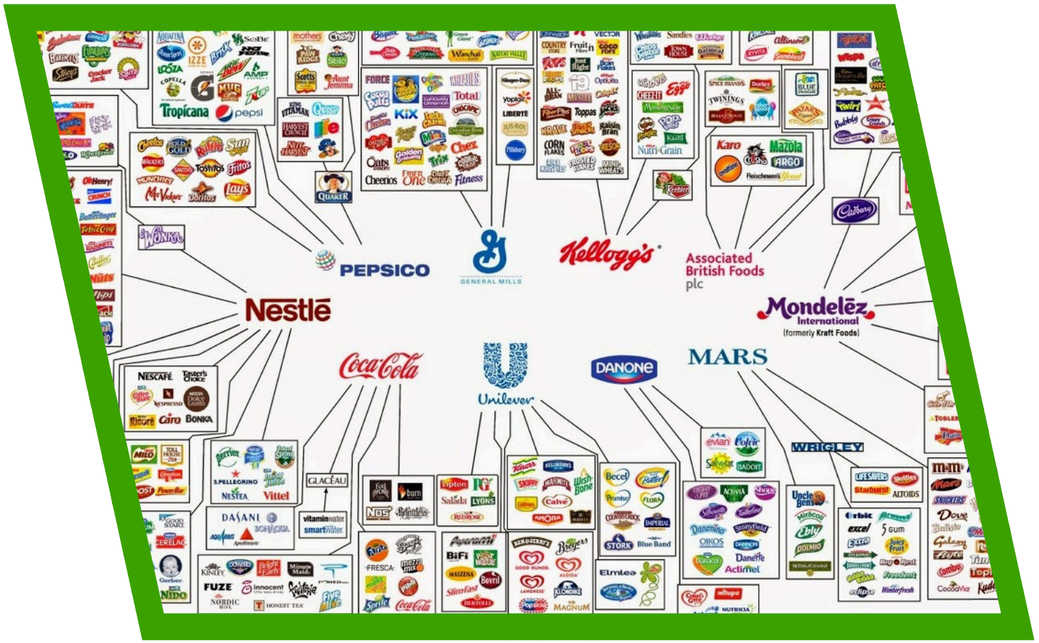
CHALLENGE: ENERGY-INTENSIVE EQUIPMENT, HIGH CARBON FOOTPRINT

SOLUTIONS

- Install rooftop solar with live monitoring → track generation & optimize usage in real time.
- Add roof insulation + heat monitoring sensors → reduces indoor cooling demand.
- Implement production scheduling software → minimize machine idle time & energy waste.
- Conduct annual third-party carbon & energy audits → verify savings and identify new efficiency opportunities.

GREEN SUPPLY CHAIN INITIATIVES AT END-OF-LIFE & CIRCULARITY

CHALLENGE: PACKAGING WASTE ENDS UP IN LANDFILLS DUE TO MULTI-LAYER STRUCTURE.



SOLUTIONS

- Partner with recyclers and FMCG brands to create collection & recycling programs.
- Print clear recyclability labeling with consumer disposal instructions.
- Develop closed-loop collaborations (e.g., LDPE granule recovery from waste).
- Launch eco-grade product lines with thinner laminates, recycled content, and higher recyclability.

THANK YOU

GROUP MEMBERS

GROUP 3

Abhinav Kaushal(A002)
Kalpit Pathak(A023)
Mayank Goyal(A029)
Mayank Arora(A030)
Rahul Dubey(A044)
Mahak Lukkad(A026)

GROUP 1

Diya Singhal (A015)
Harshavardhan S R(A021)
Raghav Mittal (A043)
Sarthak Verma(A054)
Sayan Mukherjee(A056)