

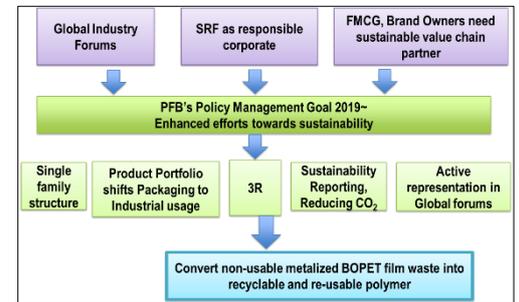
Project: Conversion of non-usable metalized BOPET film waste into usable polymer by unique De-metallization and recycling process

Organisation: SRF Limited, Packaging Films Business (PFB), Dhar (Indore), India

UN Sustainability Goals impacted: Goal 12: Responsible Consumption and Production
Goal 9: Industry, Innovation and Infrastructure

Imperative and Goal:

PFB is India's largest exporter of BOPET films, part of SRF, a multi-business chemical conglomerate which has won two Deming Prizes. Metallised (MET) films, constituting ~24% of total production of 90.1 KTPA at two sites, provide barrier protection to laminates used in packaging by brand owners like Unilever. About 2.51% of MET film (535 TPA, FY 19) made is non-recyclable waste, and is salvaged by unorganised players before its end of lifecycle in landfill. In line with the business' environmental policy as a responsible manufacturer, our goal was to create a breakthrough in *eliminating this non-usable waste and re-use it through recycling at full scale production.*



Methodology:

SRF's Task-achieving problem-solving process was used from new process development to scale up, with FMEA in process design and lean methods in layout planning and implementation.

Requirements and Challenge:

- Complete removal of aluminium coating needed recycle MET waste to make contamination-free resin
- No known method of scaling up of above recyclable material use beyond lab scale for BOPET films

Exploration, Solution generation (Lab scale to prototype and pilot establishment):

Lab studies were done using PDPC to select one suitable solvent combination, considering used solvent treatment and disposal. Fluff was analysed for ash content, moisture and contamination, compared with regular fluff for recycling use. For piloting, a prototype equipment set was developed using adjacencies and collaborating with an equipment supplier. Design iterations were carried out for residence time, flowability and surface area renewal. Various supplier end trials were done and the de-metallized film fluff introduced in 4-sequential trials on the main film line to confirm runnability.

Implementing detailed solutions, Commissioning PDCAs

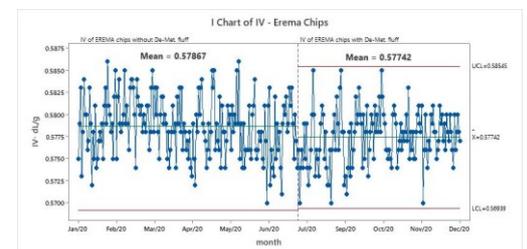
Applying FMEA, supplier side pre-order trials were conducted with large quantities. Further design PDCAs were done during detailed design and a full-scale plant ordered. During commissioning, plant floor layout space was reduced by 49% using lean principles.

Full scale operation posed a challenge to use de-metallized fluff in a uniform mix. At 5% loading, filter mesh choked, caused by carry over of polymer fines generated during the upstream shredding process. Changes were made to blade angle & gap, filter mesh, upstream screening and back-feeding, reducing output loss from 28.1% to 1.5%. As a result, demetallized fluff input was raised to targeted levels, while maintaining product quality and filter life. Existing part-time people executed the project end-to-end in 17 months.

FAILURE MODE & EFFECT ANALYSIS									
Machine - De-Metallizer plant						Process responsibility - Sachin Bhargava		PMEA Date(Obj): 10th Jul 2020	
Core Team - SR, RCV, PI, AT, RD, ST									
Process	Process Function	Potential Failure Mode	Cause	Severity	Occurrence	Existing process controls	Detection	Impact	Recommended Action(s)
Passing of film from NaOH tank	Removal of Metal from the surface of the film	Metal not removed fully	Lower concentration of NaOH	6	7	ph value maintained using ph indicator	5	210	Automatic feeding of chemical
			Excess trim feeding	6	6	Cutting trim before feeding	3	108	Inline trim cutter at all units/litters- Sep 20
			Less residence time for material in tank	4	1	RPM of motor and tank size designed as per the residence time requirement	1	4	

Results and Effects:

- Line stable with recycled fluff use, with Cpk of 1.44 on tensile of final film
- Sale of non-usable waste eliminated from earlier ~45 TPM, resulting in carbon footprint reduction of 918 TPA
- Overall plant waste on 90.1kTPA production reduced from 1.3% to 0.5%, with annual savings of US \$ 230,000 @ 70% ROI



Transfer to DM, Reflection:

Extrusion QCPC was revised; DM, safety standards and operational controls set for the new de-metallization plant. Further, automation of metallized waste feeding and chemical dosing is planned to improve efficiency.

Uniqueness, Overall Impact:

- Project horizontally deployed at PFB's Thailand plant, with plans to deploy at both other overseas locations
- PFB's pioneering and innovative work in establishing a viable commercial recycling process readily adopted by two large Indian competitors, a recognition of our contributions in creating a new industry benchmark
- Increased confidence of FMCG brand owners such as Unilever with SRF as a responsible and innovative partner
- Successful increase of end of life cycle of the polymer to support circular economy

Overall, this breakthrough project represents an important milestone in SRF PFB's capability development, and on our sustainability journey as a responsible manufacturer.