Summary Report
Renewal and Re-use of Non-usable waste for Sustainability

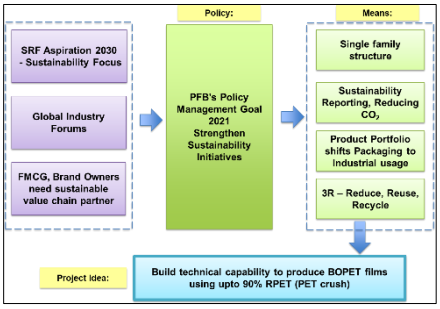
Project: Build technical capability to produce BOPET films using up to 90% of RPET (PET Bottle Crush)

Organization: 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 that has won two Deming Prizes. BOPET films, which make up about 57% of our total films production, are largely used for packaging produced by printing, lamination by converters for brand owners like Unilever. These films are produced with 100 % virgin raw material with final multi-family laminate packages finding end of life cycle in waste bins or at best recycling into sub-standard alternate moulded products. In line with the business' sustainability policy as a responsible manufacturer and brand owners thrust, our goal was to create a breakthrough to *produce virgin raw material with RPET in phases of 30%, 50% and 90% loading.*



Methodology:

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

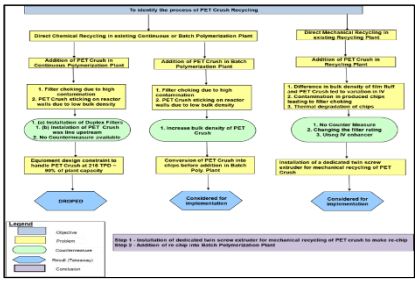
Requirements and Challenge:

- High level of impurities and contamination in PET Bottle Crush
- Technical suitability of using PET Bottle crush in BOPET films manufacturing is a challenge

Exploration, Solution generation, Implementation:

CTQs for PET Bottle crush were established using Quality Tables. A combination of mechanical recycling followed by chemical recycling was ideated using PDPC. Upstream improvements were done in mechanical recycling process to reduce contamination in output. Owing to high capital cost for chemical recycling equipment, existing batch polycondensation plant was used. Output of Batch polymerization plant was established to meet the chips requirement.

5 batch RPET chips trial was conducted with subsequent BOPET film trials as different levels of dosage of recycled polymer. Although, film properties met the specifications, pressure differential across filters of film line showed a steep increase, also line stability needed further confirmation.



Full Scale Set up, Commissioning PDCAs

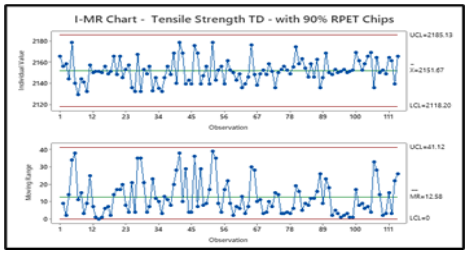
Using FMEA, upstream improvements were done in the mechanical recycling process by installation of Near Infra Red sorter (NIR), thus reducing contamination. Post installation of mechanical recycling plant, scaling up RPET dosage to 90% led to reduced filter life of film line filters. This led to challenges in meeting the replenishment cycle time of filters. Countermeasures such as addition of a pre-heating station with additional filters, reducing filter rating in the upstream process were taken to mitigate this risk.

As a result, reducing the filter replenishment cycle time, leading to orders with even 90% RPET being executed successfully.

Existing part-time people executed the project end-to-end in 18 months.

Results and Effects:

- Line stable with PCR-PET as RM for BOPET films at 60% and 90% loading with Cpk of 1.44 on tensile of final film
- Usage of PCR-PET resulting in carbon footprint reduction of 1020 TPA
- Annualized savings of INR 18.81 Mn, equivalent to US$235,140 @ 57% ROI



Transfer to DM, Reflection:

Batch Polycondensation QCPC was revised; DM, safety and controlling standards were established for new mechanical recycling plant. Further, collaboration with vendors to improve quality of incoming PET crush and envisaging having own wash-line for better control on the process

Uniqueness, Overall Impact:

- Established new process for recycling and re-using PET crush, this is now an IP for SRF
- SRF being the first company to visualise and set up a commercially viable process at a large scale in a film plant and that too at high speeds
- Partenered with external vendor, improved technical understanding and capability of equipment vendor as part of project

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