



## MRF BEST PRACTICES: A DETAILED VIEW

### GENERAL

The best glass handling practices will vary depending on your collection system, the equipment installed at your Material Recovery Facility (MRF) and end-markets.

### PROCESS GOALS

Processes should minimize glass cross-contamination with other commodities:

- Non-glass residue (NGR) must be minimized for highest value/lowest cost of glass recovery from MRFs. Glass should have a minimum of moisture, organics, dirt, fines and light fraction materials (i.e. shredded paper, plastics, and other trash);
- For glass to be considered for further secondary processing into cullet:
  - Maximum allowable NGR is <35% for outbound MRF-derived glass for secondary processing,
  - <1/8" fines are not considered glass in most MRFs and are counted as disposable residue,
- Contaminants (paper, organics, dirt and fines) in glass hold moisture after processing. These properties reduce the yield of the material, increasing subsequent disposal.
- No matter what equipment your MRF has installed, you can improve the quality of glass recovery by following best operator practices from the tipping floor, to good preventative maintenance systems, to minimizing glass breakage.

### MATERIAL RECOVERY FACILITY DESIGN

- The design and configuration of glass removal and cleaning systems have a big impact on their effectiveness.
- Before designing or purchasing glass equipment in a MRF:
  - Check with 3 to 6 equipment suppliers, compare the systems proposed, and their system's references. Get a wide series of options that fit your need.
  - Consult your local glass processor or end market for their feedback on the equipment being considered.

- Store unprocessed and processed glass under cover until shipment to eliminate undue moisture (both from matting with other materials and moisture absorbing in the fines), and maintain quality.
- Plan facility to allow an area for effective composition analysis of materials, including glass.
  - Measuring glass composition for quality to check against market quality feedback reports. This is critical to insure you are receiving the highest price for your material.
  - Leave dedicated room to audit loads for waste composition.
- Label areas of the plant and equipment for quick identification of glass equipment and hazards.
- Dust catchment/removal ports and appropriately-sized particulate air quality systems should be considered for large-scale glass processing. Check your local Air Quality Management and OSHA. Regulations.
- Location Analysis before building: Site MRF's at the closest practicable point for end-use processors and manufacturers. This must be balanced by distance from front-end MRF service customers.
  - Location analysis done correctly will lead to long-term access to markets by saving on transportation costs.
  - If you have control over where to put your facility, analyze impacts on freight to market for both secondary glass processing and direct furnace consumption.

### LOADERS & TIPPING FLOOR

- Loader operators have a direct impact on the quality of glass and other recyclables on the tip floor. By using simple techniques, residue rates and lost glass rates can be improved and have a positive financial impacts on MRFs.
- The best operators can handle material gently while maintaining high productivity because the capacity of the loader is, in almost all cases, much greater than the in-feed conveyor. They understand the bucket blade



and wheels of the loader and can minimize the potential to grind glass into other materials and pulverize it into unusable fines.

- Minimize constant push-up of tipped recyclables. Don't re-pile or stack unless absolutely necessary!
  - When possible handle materials only once.
  - Mixing and re-dumping exacerbates breakage, reducing the yield of the material and increasing subsequent disposal.
- Gently scoop and load inbound recyclables into the feed hopper or onto feed conveyor.
  - Collection vehicles should be monitored so they dump loads gently and do not roll back over dumped material.
  - Avoid driving over glass, mixed containers, or single-stream with the front-wheeled material loader. Solid tires pulverize and mix, causing loss of glass to fines.

## MRF GLASS CLEANING

- Remove glass from system flow as early as possible
- Getting the glass out before screening minimizes screen wear and reduces glass carry over into other products. It also saves on system maintenance and cross contamination.
- In single stream processing this is usually done with a glass breaker/fines screen combinations located immediately below or just after the OCC screen.
  - The goal is to make a uniform product of clean MRF glass with minimum fines under (<3/8" to <1/8" depending on markets and equipment) and non-glass residue.
  - If there is no OCC screen, the glass breaker may be located under a scalping screen or under an ONP screen.
- In dual stream processing glass is taken out immediately by controlled glass breaking and screening materials from other containers. Glass can also be separated from other materials with a glass breaker or a density separator.
  - Density separators make it possible to manually color sort broken glass.
- Glass breaker which mechanically remove glass may be the best approach for separating glass from other recyclables.
- Many MRFs effectively separate light-weight material from glass by use of air devices and screening to eliminate contaminants (paper, metals, dirt, closures, and other fines).
  - Ensure such systems have adjustable air flow (+-), which will result in accurately and efficiently separating these material in different weather and moisture conditions.
  - Positive air flow (blowing/air knife) and negative air flow (vacuum) systems both work for this intended purpose if properly maintained and designed correctly. Ensure such systems have adjustable air flow (+-), which will result in accurately and efficiently separating these material in different weather and moisture conditions.
  - Light fraction removal systems will also extract most plastic bottle caps, aluminum caps and can lids, which many MRFs can then re-process for recovery.
- Remove fines. Depending on your end market, you may need to remove fine materials for highest value and quality of recovery bottle to bottle glass, or, to recover the fines for alternative markets, like filter media and sand blasting.
  - This can be accomplished with any of a number of screening technologies.
  - Vibratory and trommel screens are most commonly used.
- Consider size reduction for alternative markets for some or all remaining glass not captured for bottle to bottle or fiberglass.
  - Some MRFs have installed pulverizer systems (hammer mills, cone crushers, horizontal slow-speed mills) for some fraction of their glass and make it into an aggregate material.
  - Such size reduction makes separating caps and paper from the glass more efficient.
  - The trade-off is pulverizer systems create more glass fines and can lower value of material destined for secondary processing and glass re-melt applications.

- Consider using belly pan liners and fines barriers at the end of slider bed conveyor belts– they can increase durability and extend the life of equipment

## ADVANCED CLEANING

- End markets will pay more for cleaner glass, and all bottle to bottle markets pay more. The amount of cleaning that is optimal for your end market will depend on the use and that market's own cleaning capabilities.
- Some material recovery facilities see the benefits and a steady ROI for cleaning up glass flows by either delivering directly to end markets, or, from premiums paid by secondary processors. Advanced cleaning can include all of the above methods and/or the following:
  - Removal of metals. If your glass stream has a significant metal content, you can use a magnet to capture ferrous metals and an Eddy Current Separator (ECS) to capture non-ferrous metals.
  - Advanced Sizing of glass: Many MRFs have more than one size of glass they produce for different markets.
  - Color sorting using optical sorting for color and ceramic separation;
- Additional glass cleanup can be accomplished by separating 3-dimensional glass from 2-dimensional flat glass with a finger screen. and then using a roll crusher to crush the 3D glass.
- Near-infrared Optical sorter banks and other image-recognition devices (x-ray) can clean up non-fine glass to separate colors effectively and remove prohibitive inerts, like ceramics. Some high volume MRF service providers use these systems to go mill-direct.
- Understanding and communicating with your end market options will help you determine how much glass clean up and secondary processing is needed at your MRF.

## SYSTEM MAINTENANCE

A wide variety of performance from similarly installed systems has been noted in the MRF industry for glass cleaning. Much of it can be tracked to the maintenance levels in the installed equipment. Due to the high wear of glass on machinery, it is critical to have an aggressive preventive and replacement maintenance system, which measures outputs and effectiveness.

- Inspect by checklist before each operating period (shift/ day) and note any deficiencies for immediate repair.
- Perform all equipment manufacturer maintenance requirements according to schedule.
- Obtain the critical wear parts and keep in inventory.
- Use outside parties to inspect and recommend system corrections at least once per year.
- Measure outputs from the system regularly and do a mass balance on saleable clean glass, NGR and unusable fines glass. Work with your maintenance team to maximize and clean highest value glass and minimize lost glass to residue,

## RESOURCES:

- [Machinex](#)
- [Casella](#)
- [Rumpke](#)
- [Strategic Materials](#)
- [Emterra](#)
- [CP Manufacturing](#)
- [Krysteline Technologies](#)