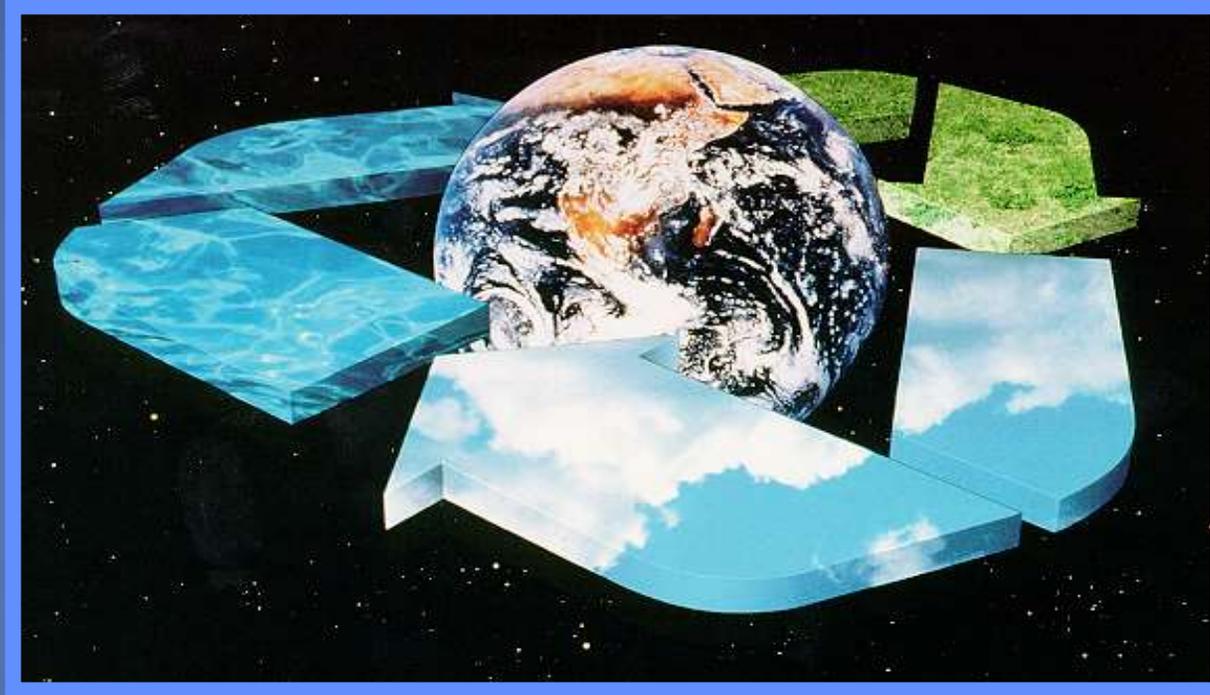


MRF Technology & Trends



Nathiel G. Egosi, P.E., President

May 18, 2021



RRT Design & Construction

Melville, NY- Baltimore, NY -Orlando, FL

Boston, MA- Philadelphia, PA

www.rrtenviro.com



RRT DESIGN & CONSTRUCTION



- **We are known for MRFs**
- 30 years, 450 projects including 150+ complete greenfield plants
- Experts in MRF plant engineering, equipment engineering, plant construction



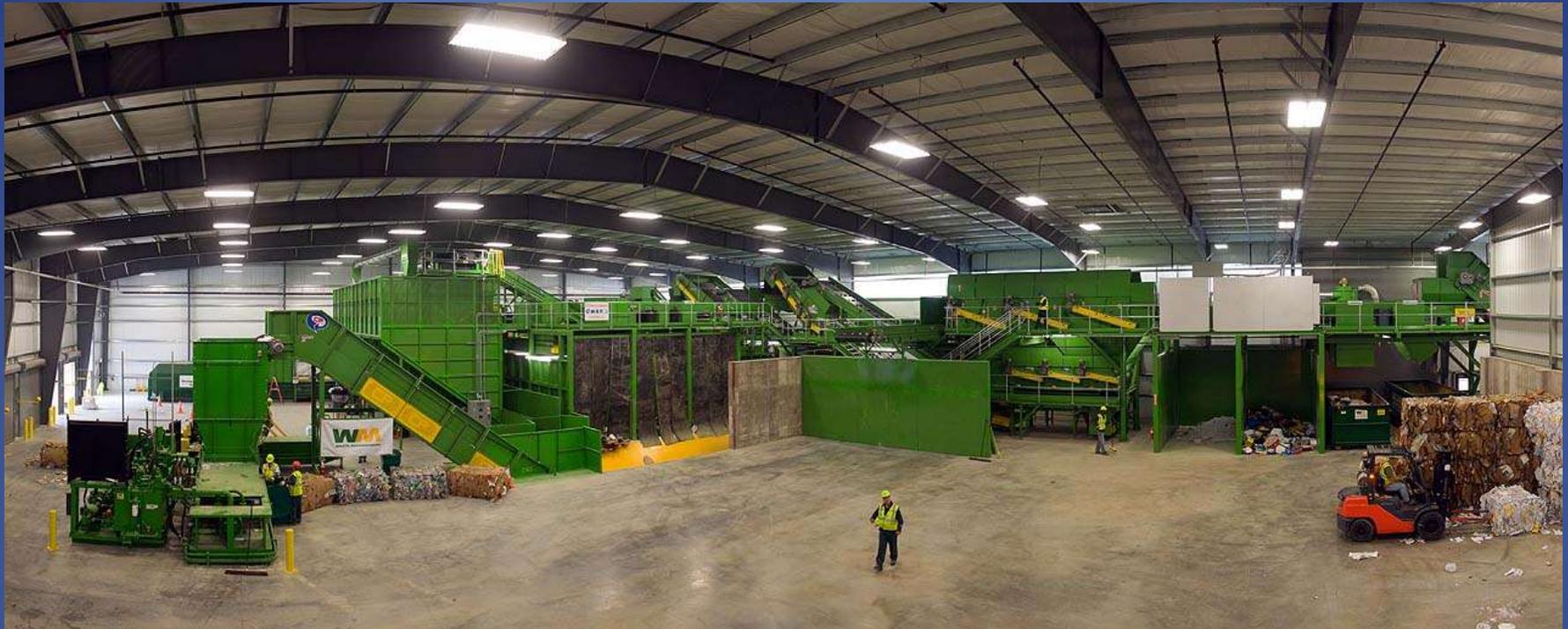
Ocean County, NJ
Single Stream MRF



New York, NY
Container & Paper MRF



Lines of Business



- Engineering and Design
- Equipment Supply
- Design/Build Construction
- MRF Operations Support Consulting

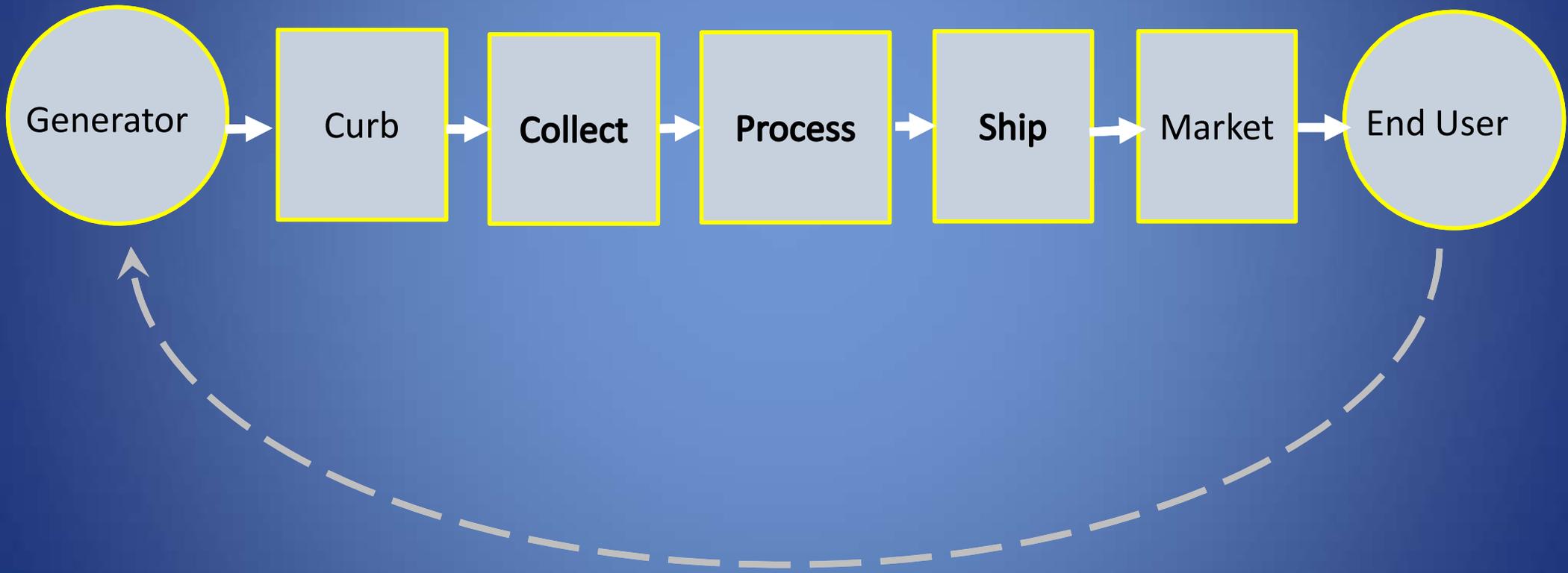


Topics

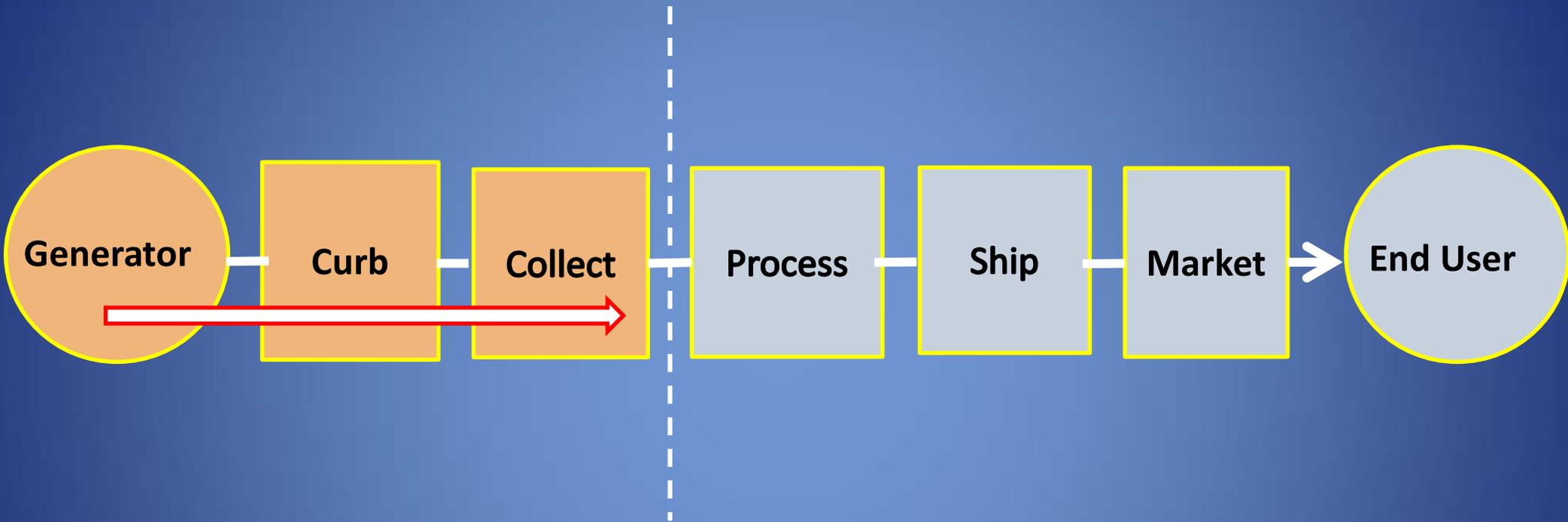
- Industry Overview
- Technology/Systems
- Equipment
- Trends



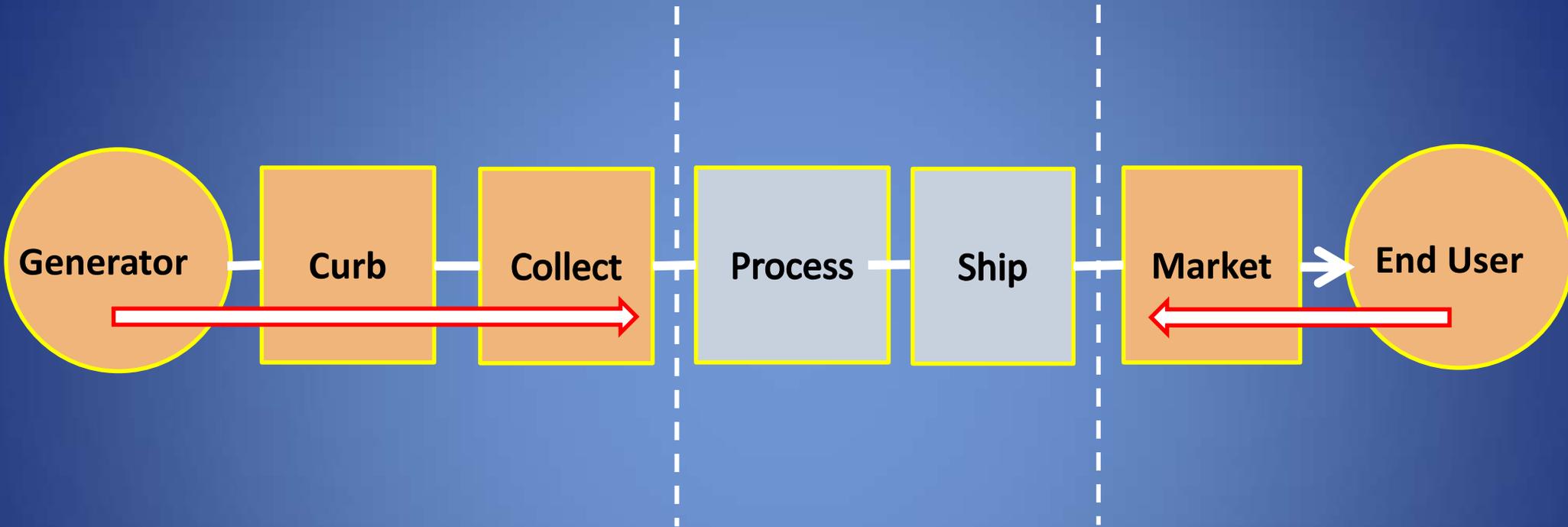
Business Fundamentals



Pressure of Contamination



Pressure of Markets



Industry Overview

- MRFs are slowing down lines and retrofitting, most all have turned the corner in terms of quality.
- MRFs are aging rapidly, and many operators realize their facilities are nearing end of life, prompting the need for capital investment at an inopportune time.
- It costs far more to operate because less TPH through the system.
- Paper screens are a daily battle, can't clean them enough. They are often nothing but a conveyor.
- Average SS residue rate has increased up to 20 percent, increasing maintenance and displacing recyclables.
- Roughly 30 to 60 percent of the material being processed has no value, whether residue or glass.
- Auditing material and understanding composition and recovery rates is not an industry SOP.
- Public is frustrated



Industry Blog

- Abundance of repetitive articles
- Contamination
- Light weighting
- News is all but gone
- Everyone is in love with OCC
- Packaging is complex
- Perception of robots everywhere
- Plastics is evil
- Wish recycling
- Glass, we've accepted what it is
- Single stream vs dual stream re-ignition dead
- All MRF are burning down



Industry Undercurrent

we don't hear enough much about these...

- Contamination levels in dual stream
- Finding good labor can be nearly impossible
- Aging facilities need replacement
- Buildings are too small
- State diversion goals flat
- Admiration & respect toward the industry
- Time it will take for domestic mills to increase capacity
- Commodity prices are strong in most areas



Technology/Equipment

- 4 system vendors in the market, its a commodity.
- Specialty equipment vendors have better IP and technology.
- Baler suppliers are somewhat limited.
- Vendor promises are just that.
- Warranty periods are getting longer.



System Design Strategy

What works

- Presort metering & ergonomics
- Removing the smallest and largest materials from the stream as early as possible to produce the best fiber quality.
- A machine is more consistent and produces higher quality over the long term than people.
- Optical sorters
- Clean-up equipment can add value.
 - Two units in series for recovery
 - Robotics



System Design Strategy

- Chasing containers out of fiber and paper out of containers.
- Corrections: constantly adjusting for equipment shortfalls
- Flexibility
- Expensive labor should not be used to handle material that weighs nothing and has no value (eg. Plastic bags)
- Floor capacity can never be too much.
- Spillage
- Access platforms
- Fire prevention & control



Fiber Equipment

- Screen
- Ballistic separator
- Trommel
- Air Classification
- Optical Sorting
- Robot

Fiber Equipment



Fiber Equipment



Fiber Equipment



Containers



Containers

- Replacing optical sorters, magnets and eddy current separators with more higher efficient machines makes sense.
- Optical sorters and robotics are complimentary. The processing rate of an optical sorter is many times a robot. Robotics today are taking the place of the QC sorter.
- Advancement of robotics taking similar path to optical.
- Bunker/bin sizing for numerous container types
- MRF comparisons remain challenging given local differences (contamination, hub & spoke, bottle bill, demographics, glass in/out)



Final Thoughts...we have lots to do

- Huge Investments need to be spent
- Technology keeps improving
- Reliance on revenues to offsets costs confuses a fee-based business
- Commodity markets reacting to the evolving ton
- Packaging producers reacting to consumers and investors
- Domestic markets are reacting to the global markets
- Continuous improvement works
- Notably, regulators are on the sidelines these days

MRF Technology & Trends



Nathiel G. Egosi, P.E., President

May 18, 2021



RRT Design & Construction

Melville, NY- Baltimore, NY -Orlando, FL

Boston, MA- Philadelphia, PA

www.rrtenviro.com