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Building lifetime relationships
with our clients and employees.

EREF WEBINAR SERIES

MRF 101

June 2015

PRESENTATION OVERVIEW

- Continuation of Educational Series Presented by EREF
- Introduction to Material Recovery Facilities
- Presented Today by Cornerstone Environmental Group
- Presentation is Organized into Six (6) Sections

PRESENTATION OUTLINE

- 1.0 INTRODUCTION
- 2.0 TERMINOLOGY/DEFINITIONS
- 3.0 TYPES OF MRF’s
- 4.0 PHYSICAL FEATURES
- 5.0 PLANNING YOUR FACILITY
- 6.0 SUMMARY

1.0 INTRODUCTION

- What is a Material Recovery Facility (MRF)?
- Definitions Vary Based On:
  - Practical Definition - What Materials Are Handled and Marketed?
  - Regulatory Definition – Within Which City/State/Province Is The Facility Located?
- Overview of the Different Types of MRF's

2.0 TERMINOLOGY

- Material Recovery Facility
- Types Of Material Recovery Facilities
  - Citizen Drop-Off Center
  - Dual Stream Recyclables
  - Single Stream Recyclables
  - “Dry” Waste
  - Mixed Waste (Municipal Solid Waste)
  - Construction and Demolition Debris
  - Others

Material Recovery Facility

- Acronym is “MRF”
- A Solid Waste Management Facility Where Solid Waste Materials Are Received, Separated, and Processed To Meet Market Requirements
- Typically The Incoming Materials Are Source Separated Recyclables – Mixed Waste Facilities Would Be An Exception
- Most Newly Constructed Facilities Include a Building To Enclose The Equipment And Operations – C&D Facilities And Yard Waste Facilities Could Be The Exception

Material Recovery Facility (Cont'd)

- Here In New York State, We Have A Different Title For This Type of Facility – Imagine That……
- These are referred to as Recyclables Handling and Recovery Facilities, or "…a solid waste processing facility, other than collection and transfer vehicles, at which non-putrescible recyclables are separated from the solid waste stream or at which previously separated non-putrescible recyclables are processed…"

3.0 Types Of Material Recovery Facilities

- In This Section We Will Cover Seven Types of MRF's / Recycling Facilities
- There Is Much Overlap With Types of Equipment Used at MRF's – Tailored To Meet Specific Market Requirements
- We Will Provide An Overview Description Of The MRF
- We Will Present A Few Photos And Text For Each Type of MRF

3.1 Citizen Drop-Off Center - Overview

- Typically Co-Located With A Transfer Station
- Make Them Convenient So That Citizens Use Them
- Basic Material Separations Based On Regulations
- Many Facilities “Step Out Of The Box” And Include Additional Materials
- Materials Usually Dropped Into Roll-Off Containers
- As With All Solid Waste Facilities, User Safety Is The Priority (Users Not Always Familiar With Operations)

3.1 Citizen Drop-Off Center - Photos

Outside Drop-Off Area

Inside Drop-Off Area

3.1Citizen Drop-Off Center

- Also referred to as Convenience Centers
- Typically Include Many Waste Materials Such As:
  - Municipal Solid Waste (MSW)
  - Recyclables
  - Yard Waste
  - Household Hazardous Waste (HHW)
  - Electronics (E-Scrap, E-Waste)
  - White Goods
  - Drop – and – Swap (New to You)

3.2 Dual Stream Recyclables - Overview

- Fiber And Containers Are Collected Separately
- Two Unloading Areas On The Tipping Floor
- Tipping Floor Separated From Processing Area
- Two Processing Lines/Sorting Systems
- May Require Duplicate Conveying and Separation Equipment Compared To Single Stream System
- Recovered Recyclables Processed To Meet Market Requirements (Generally Baled, Except Glass)

3.2 Dual Stream Recyclables - Photo

3.2 Dual Stream Recyclables

- Separate Collection of Two Types of Recyclables:
  - Paper (Fiber)
  - Containers (Plastics, Metals, Glass)
- Some Areas of the US Have Collection of Multiple Containers For Source Separated Recyclables
- Not Typical of Most Newly Constructed MRF Facilities – New Facilities Typically Single Stream
- Two Stream Facilities Produce Improved Quality of Marketed Materials (Particularly Paper)

3.3 Single Stream Recyclables - Overview

- All Recyclables Are Commingled When Collected
- One Tipping Area At MRF
- Initial Steps – Separate Containers And Fiber
- Many Unit Operations Are Required to Separate Recyclables By Material Properties and Dimensions
  - Screens (Paper/Containers)
  - Magnetic Separators, Eddy Current Separators (Metals)
  - Optical Sorters (Plastics)
  - Pneumatic (Plastics)
  - Manual QA/QC
  - Balers
  - All Connected By Conveyors!

3.3 Single Stream Recyclables - Photo

3.3 Single Stream Recyclables

- All Recyclables Set-Out in One Container At the Curb
- Paper, Metals, Plastics, And Glass Commingled
- Lower Collection Cost – One Truck, One Person, Full Truck
- MRF's Separate These Recyclables Into Marketable Commodities
- Quality of Some Recyclables Marketed From MRF Is Somewhat Diminished Due To The Materials Processed – The Combined Collection of Recyclables

3.4 “Dry” Waste - Overview

- Typically Commercial Waste, Primarily Paper
- Plastics Are A Challenge
- Less Equipment, More Streamlined Operation Than MRF With Container Separation Operations
- Equipment Includes Screens, Sort Stations, Balers
- Other Equipment Can Include Separators, Optical Sorters

3.4 “Dry Waste” - Photo

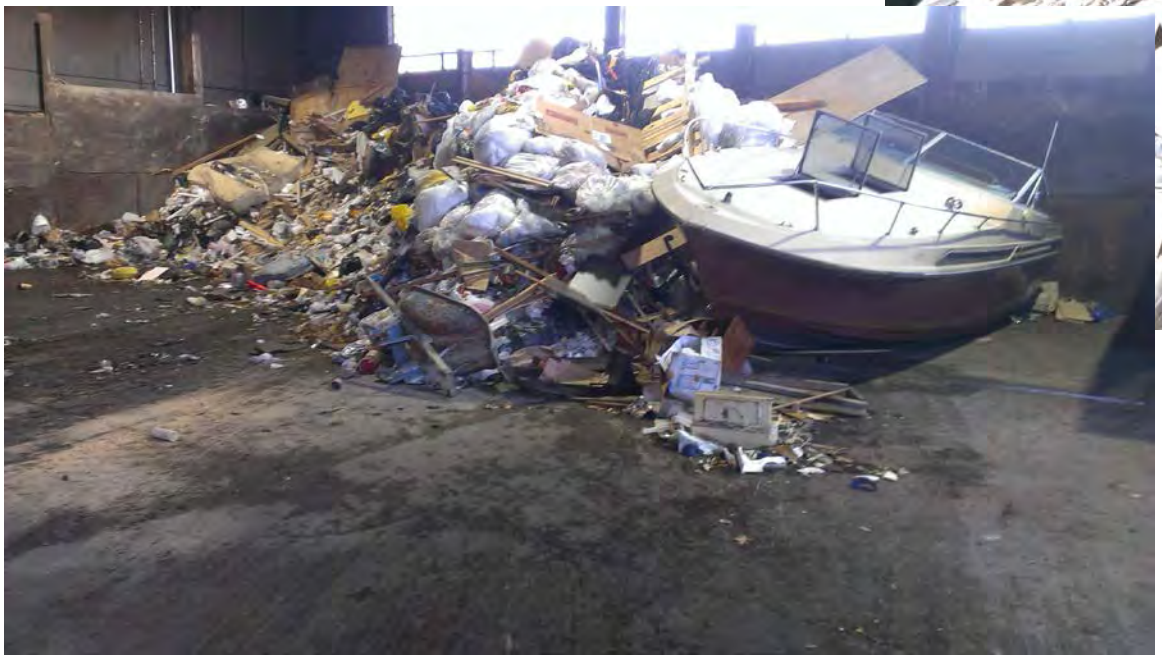
3.4 “Dry” Waste

- Commercial Waste, Primarily Paper, Much of This In Plastic Bags
- In Large Cities, Best Described As “Office Mix”
- Office Waste In Plastic Bags. Can Be Placed Into Separate Dedicated Recycling Roll-Off
- Organics Handled Separately (Not Always Separated)
- Plastics Are A Challenge To Effectively And Economically Open And Release Contents Of Bags
- Good Quality Paper Commodities

3.5 Mixed Waste - Overview

- Handle Municipal Solid Waste; Variable Composition
- Developed In Conjunction With Waste To Energy Facility, Large Scale Fuel User, Or AD
- Produce a Waste Derived Fuel (Several ASTM Classifications). Technologies Dependent On The Fuel Market And Typically Include:
  - Screening
  - Size Reduction
  - Recyclables Recovery
  - Other Separation and Refinement Operations

3.5 Mixed Waste - Photo



3.5 Mixed Waste

- Handle Commercial, Institutional, Residential Waste
- Few Operating Facilities That Only Handle Mixed MSW
- Primarily Developed to Recover Materials And Produce a Waste Derived Fuel
- Can Be Referred To As MBT Facility In Europe
- Recovery Of Organics At Numerous European Sites
- The Term “Dirty MRF” Is A “Dirty” Term – Use “Mixed Waste”

3.6 C&D Debris - Overview

- Extra Heavy Duty Equipment (Concrete vs. Paper And Containers)
- Operations/Equipment Can Be Outside Or Within Building
- Difficult Material To Handle, Highly Variable Composition
- Several Processing Steps
- Equipment Typically Includes Screens, Metals Separators, Sort Stations, Size Reduction

3.6 C&D Debris - Photo

3.6 Construction & Demolition Debris

- Also Referred To As CDL In Several States
- Handle Waste Materials From Construction And Demolition Activities
- Highly Variable Waste (e.g. Foundation Construction Through Interior Finish Work)
- Some Facilities Handle Land Clearing Debris As Separate Operation
- Clean Wood Recovered From C&D Operation Can Be Fed Into Land Clearing Processing Equipment

3.7 Others - Overview

- Multi-Material (Different Materials In One Facility)
  - Can Be Accomplished By Running Multiple Shifts
    - Each Shift For a Different Type Of Material
    - Not All Equipment Used On Each Shift
  - Or Multiple Equipment Systems Operating On Each Shift
- Separation Facilities For Other Types of Material
  - Green Waste – Grass Clippings, Yard Waste, Landscaping Material (Generally With Composting Operation)
  - Land Clearing Debris Handled As a Separate Operational Area With Dedicated Equipment – Generally Outside

3.7 Others

- Green Waste – Grass Clippings, Yard Waste, Landscaping Material
  - Generally Associated With Composting Operation
  - Land Clearing Debris Handled As a Separate Operational Area With Dedicated Equipment – Generally Outside
- Modify Existing Transfer Station Facilities
  - Transfer Stations Generally Do Not Have Extra Floor Space – Need A Building Addition
  - Modify Transfer Station Operations
  - Adjust Collection Operations

4.0 – PHYSICAL FEATURES

- Information Presented In The Following Sections:
  - 4.1 Site
  - 4.2 Building
  - 4.3 Equipment

4.1 Site – Queuing Prior to Scale

4.1 Site – Scale And Scale House

4.1 Site – Paved Maneuvering Areas

4.1 Site – Stormwater Control

4.2 Building - Exterior

4.2 Building – Tipping Floor

4.2 Building – Tipping Floor

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4.2 Building –Processing Area (Single Stream)

4.2 Building - Processing Area (C&D Debris)

4.2 Building – Bale Storage

4.2 Building - Loading Dock

4.2 Building – Employee Facilities

4.2 Building – Employee Safety

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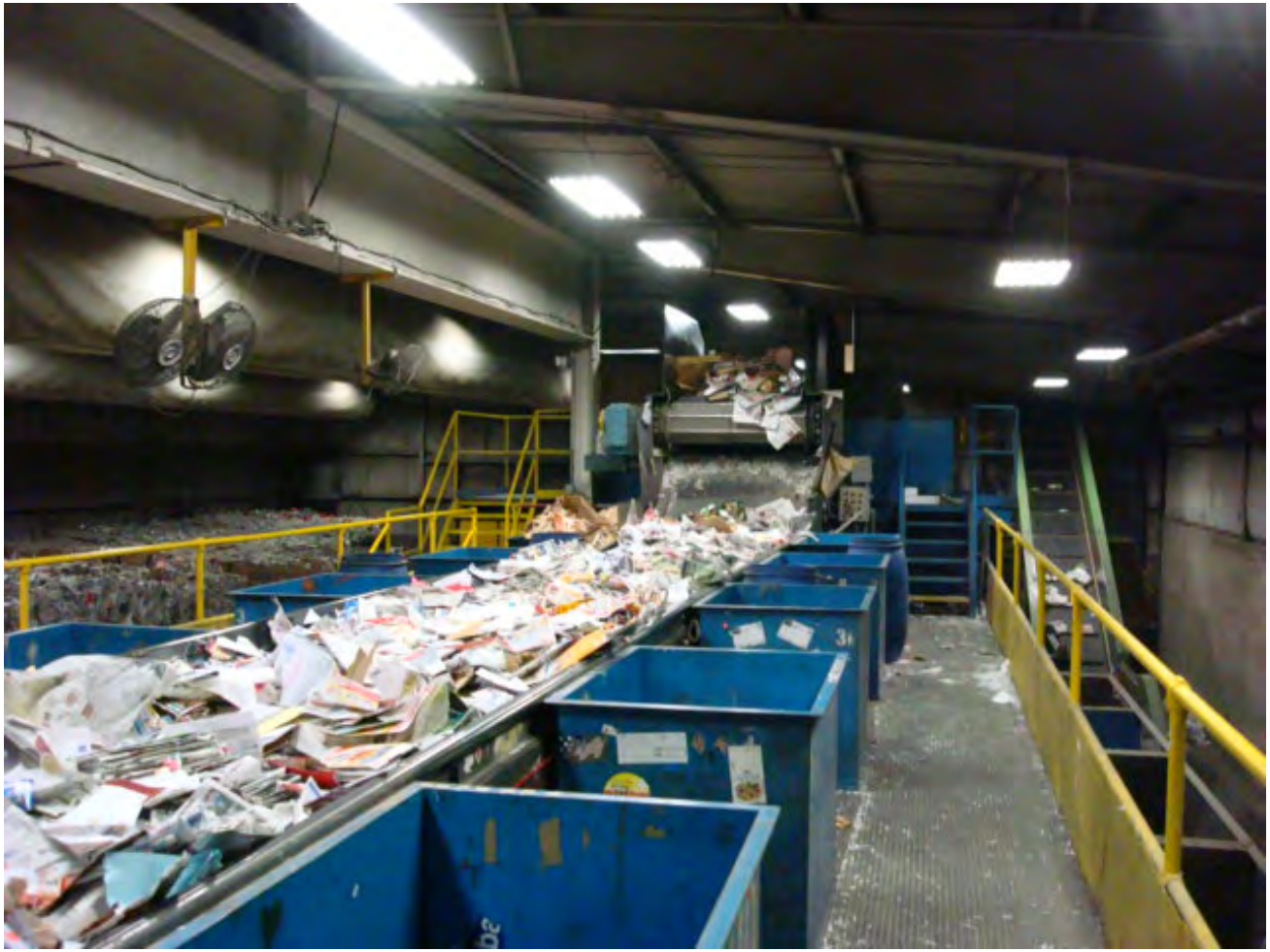
4.3 Equipment – Infeed Conveyor

4.3 Equipment – QC Station and Screen

4.3 Equipment – Trommel Screen

4.3 Equipment - Sort Conveyor



4.3 Equipment -Magnetic Separator

4.3 Equipment – Eddy Current Separator

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4.3 Equipment – Optical Sorter

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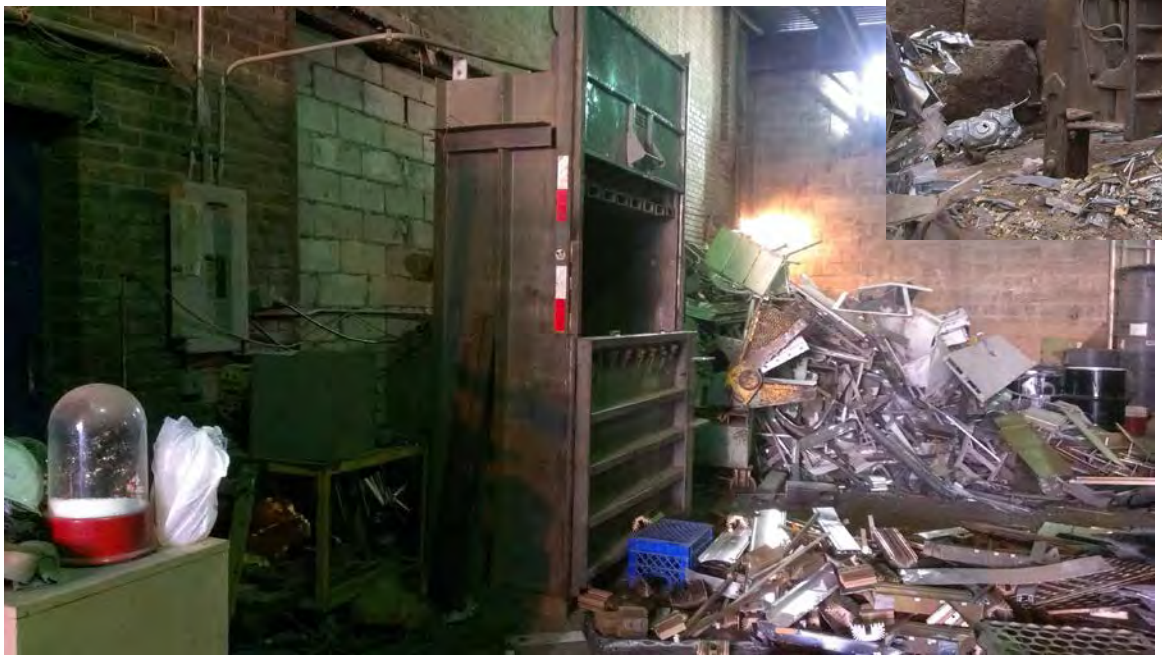
4.3 Equipment - Material Bunkers And Baler Feed Conveyor

4.3 Equipment - Balers

4.3 Equipment - Balers



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4.3 Equipment – Yellow Iron

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4.3 Equipment – Yellow Iron (Cont'd)

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5.0 – PLANNING YOUR FACILITY

DEVELOP A PLAN – “Pencil It Out”

- 5.1 Why Are You Considering A MRF?
- 5.2 What Materials Are You Considering?
- 5.3 MARKETS
- 5.4 Who Controls The Materials?
- 5.5 Overall System
- 5.6 Site
- 5.7 Permitting
- 5.8 Financing
- 5.9 Construction
- 5.10 Operation

5.1 – Why Are You Considering A MRF?

- Regulatory Changes
  - New Updated Environmental Regulations
  - Material Separation Mandates
- Collection Contracts Require Recyclables Collection
- Changing Market Conditions
  - “Going Green”
  - More To Recycling, Less To Landfill (Cost Avoidance)
  - Services Offered By Others And Need To Offer Competitive Collection Services

5.2 – What Materials Are You Considering?

- Source Separated
  - Single Stream Residential / Commercial Recyclables
  - Two Stream Residential / Commercial Recyclables
- Mixed Waste
- Multiple Types of Material
- Tonnage
- How Is Material Delivered?

5.3 – MARKETS

- This Is The Most Important Step
- Identify And Talk To Markets For All Materials
- What Are Their Material Specifications (ISRI)?
- Letters Of Commitment

5.3 MARKETS - Know Your Markets

MARKETS,
MARKETS,
MARKETS

5.4 – Who Controls The Materials?

- Materials That You Currently Collect?
- Guaranteed Flow Offered By Municipality?
- Need Long Term Contract For Material Supply To Your Proposed MRF
- It Is Not “Build It And They Will Come”

5.5 – Overall System

- Collection
  - Materials To Be Collected
  - Carts For Set-Out
  - Trucks
  - Distance From Collection Route To MRF
- MRF Operations
- Markets
  - Markets (Hauling, Revenues)
  - Non-Recoverable Material Disposal (Hauling, Tip Fee)

5.6 – Site

- Site Selection Criteria
- Discuss Location With Local Approval Agencies
- Permitting Process Time Frame
- Professional Design Services

5.7 – Permitting

- Site Plan Approval
- Environmental Permitting Agencies
  - Multiple Levels Of Governmental Permitting
  - Solid Waste, Air, Stormwater, Transportation
- Construction
  - Site
  - Building

5.8 – Financing

- Not The Last Stop In The Project Development Process
- This Should Be Developed Along The Way As The Project Viability Is Being Evaluated
- Many Financing Options Are Available

5.9 – Construction

- New Construction or Retrofit
- Many Types Of Building Construction Have Been Used
- Meet All Code Requirements
- Consider Long Term Durability of Construction Materials

5.10 – Operation

- Many Contract Options Are Available
- Operator Experience Is Key
- MARKETS, MARKETS, MARKETS

6.0 – SUMMARY

- Thank You For Your Attention As We Discussed:
  - What Is A MRF?
  - Seven Types Of MRF's
  - Overview Of The Inside and Outside Of MRF's
  - Planning Considerations and Viability Of A MRF