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State of Technology for MSW Processing:
Smart Technologies for Processing MSW

December 2021
By Brad Kelley, Senior Project Engineer
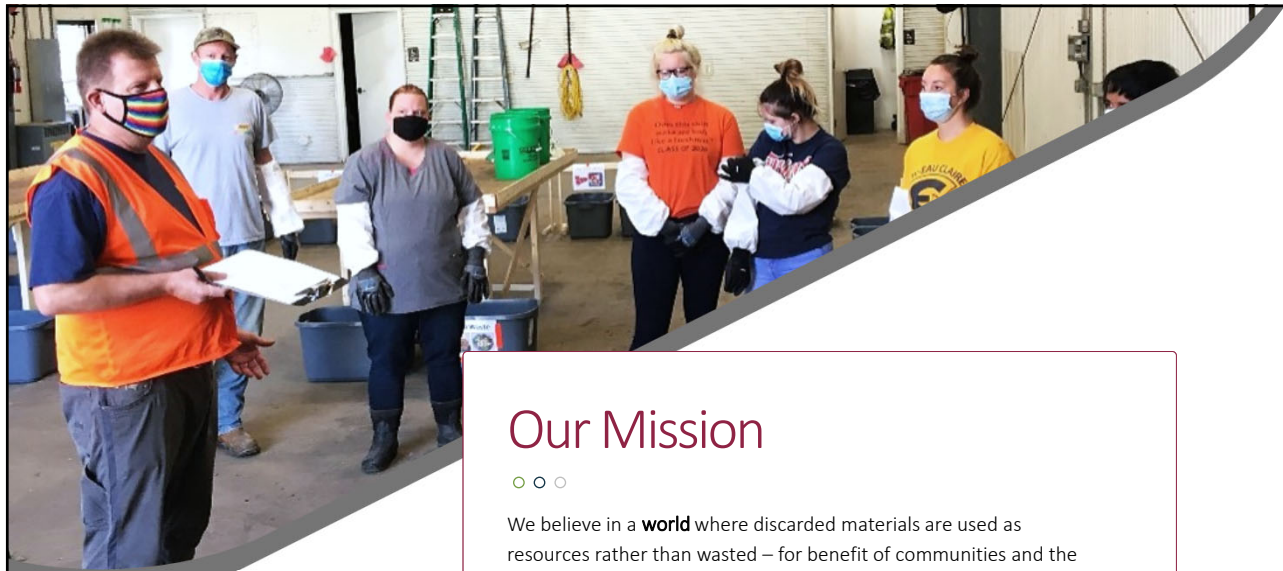*Gershman, Brickner & Bratton, Inc.*

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Today's Agenda

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Introduction

MSW Processing

Processing Systems of the Future

Smart Technologies

Optical Units

Robotics

Conclusions

Q&A

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Our Mission

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We believe in a **world** where discarded materials are used as
resources rather than wasted – for benefit of communities and the
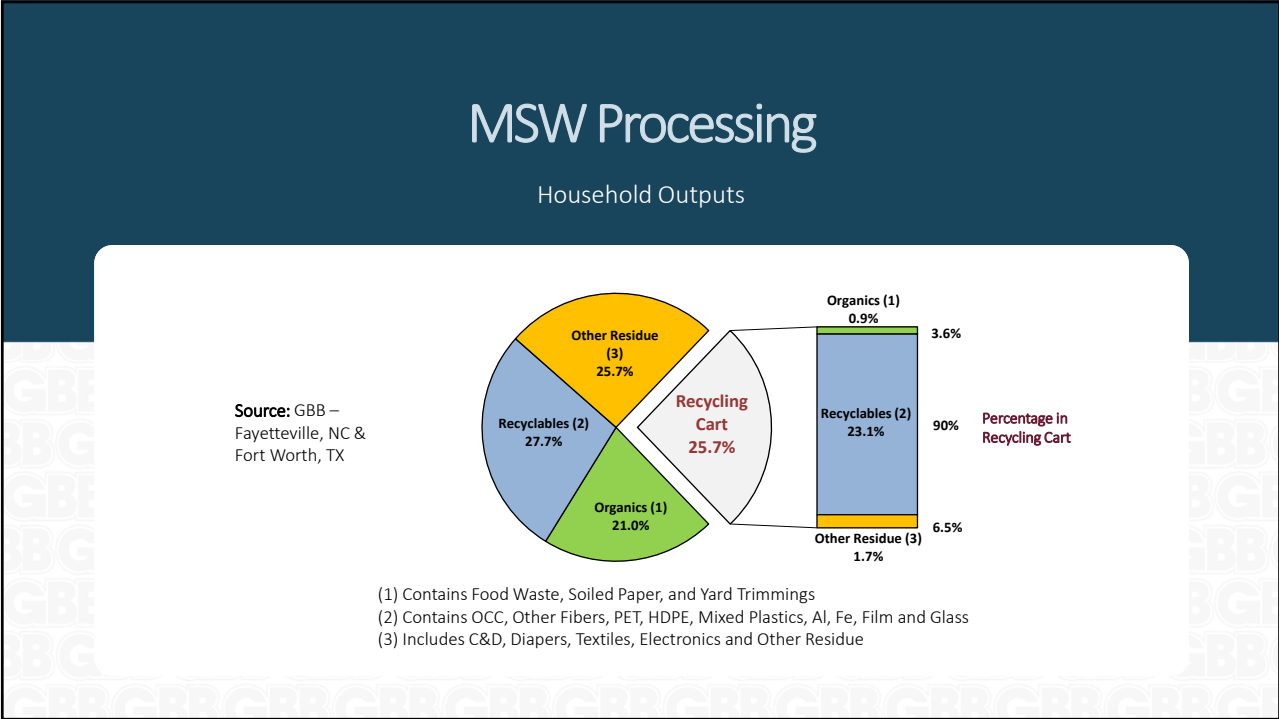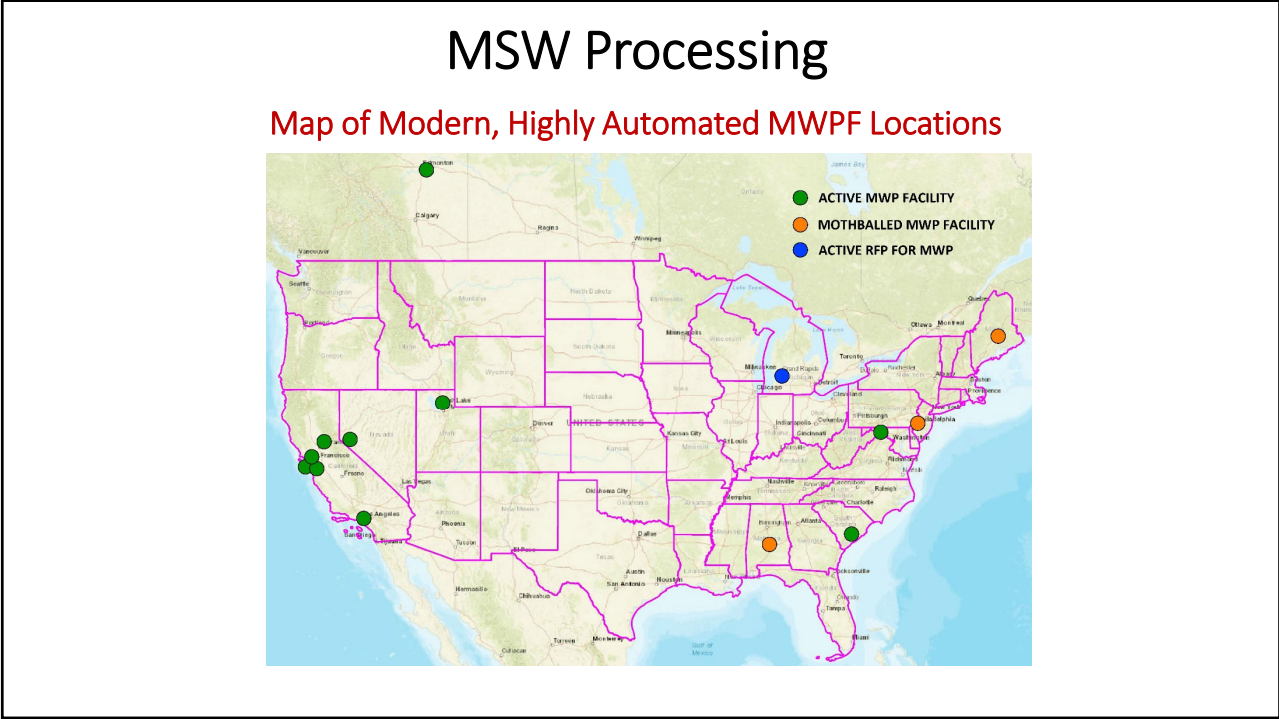environment. **Both today and far into the future.**

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MSW Processing

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MSW Processing

Household Outputs

Source: GBB – Fayetteville, NC & Fort Worth, TX

Recycling Cart 25.7%

Other Residue (3) 25.7%

Recyclables (2) 27.7%

Organics (1) 21.0%

Organics (1) 0.9% — 3.6%

Recyclables (2) 23.1% — 90% — Percentage in Recycling Cart

Other Residue (3) 1.7% — 6.5%

(1) Contains Food Waste, Soiled Paper, and Yard Trimmings
(2) Contains OCC, Other Fibers, PET, HDPE, Mixed Plastics, Al, Fe, Film and Glass
(3) Includes C&D, Diapers, Textiles, Electronics and Other Residue

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MSW Processing

Map of Modern, Highly Automated MWPF Locations

ACTIVE MWP FACILITY
MOTHBALLED MWP FACILITY
ACTIVE RFP FOR MWP

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Automated Mixed Waste Processes

- Infeed
- Pre-Sort/Bag Opening
- Fines Separation
- Air Classification
- 2D/3D Screening
- Metals Removal
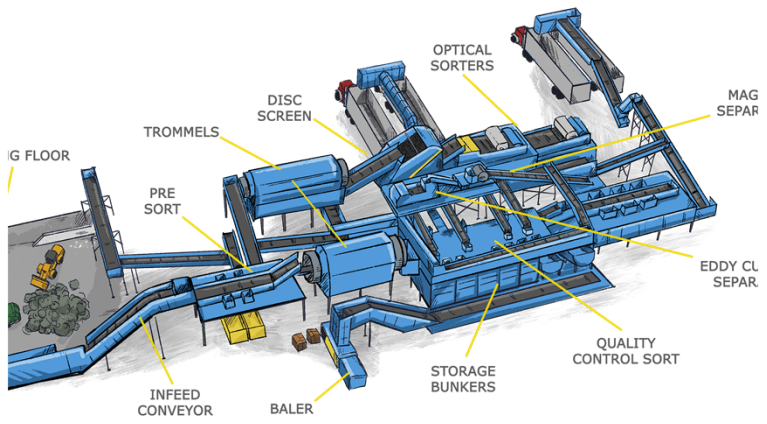- Optical Units for Containers/Film/Fiber

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MWPF – Utah

WASATCH
I N T E G R A T E D
waste management district

Modern MWP Process

- Web videos posted to website (Construction, operations, etc.)
- Tours / Virtual Tours to Students / Education Center
- www.wasatchintegrated.org

Stylized System Layout

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MWPF System Vision

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MSW Processing
MBT Processing

Source: GBB – Entsorga

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Processing Systems of the Future

The Future Material Recovery Facilities (MRF)

New Processing Systems will Consists of More of the Following:

- **Combined Systems**
  - Systems will be capable of processing more than one type of stream, with some equipment processing multiple streams
- **More Optical Units, less Screens**
  - Optical units will be utilized to recover more materials including fiber
  - Streams need only be divided by size/density prior to optical units (instead of by shape)
- **Robotic Sorters**
  - Both for QC and for Pre-Sort – can positively pic multiple materials

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Processing Systems of the Future

Combined Systems

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Smart Technologies for MRFs - Optical Units

If you can see it, you can collect it...

Source: CP Group / BHS

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Smart Technologies for MRFs - Optical Units

1. Feeding of unsorted material
2. Spektrometer scanner
3. Separation chamber
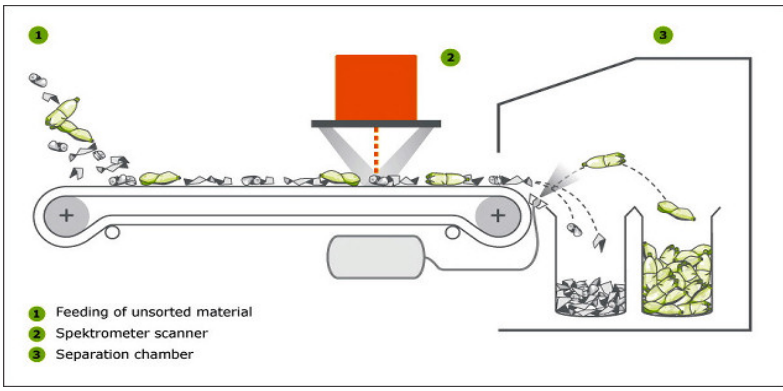
Source: TiTech/Tomra

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Smart Technologies for MRFs

Improved Optical Units

- With improvements in algorithms, shape recognition and attention to air flow characteristics, optical units can now better recover:
  - Types of Fiber
  - Clean Wood
  - Film
  - Flexible Packaging
  - Cartons
  - Other potential target materials (i.e. Black Plastics)

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Smart Technologies For MRFs

CP Groups CIRRUS® FiberMax™

- Utilizes air flow to keep light-weight items from flying off the belt and improve trajectory
- Positive eject on plastics, other materials

Source: CP Group

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Smart Technologies for MRFs

Video of CIRRUS® FiberMax™

5 m/sec (1,000FPM) Speed

Source: CP Group

http://www.mssoptical.com/cirrus-maxselect/fibermax//

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Smart Technologies For MRFs

Other Optical Advancements – Additional Spectrum and Lasers

Steinert Unisort Black

Tomra LOD

Source: Steinert

Source: Tomra

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Processing Systems of the Future

The Rise of the Robots

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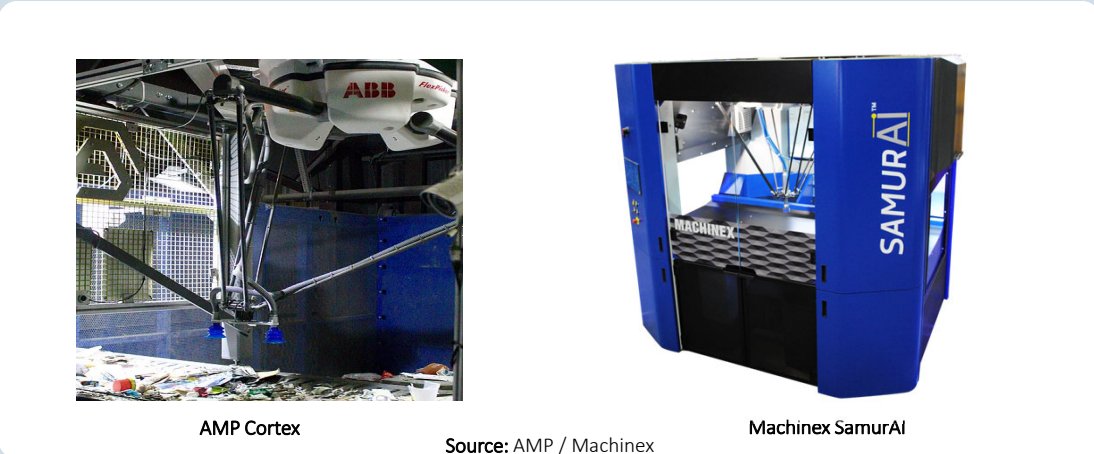
Source: "The Day the Earth Stood Still" 1951

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Smart Technologies for MRFs - Robots
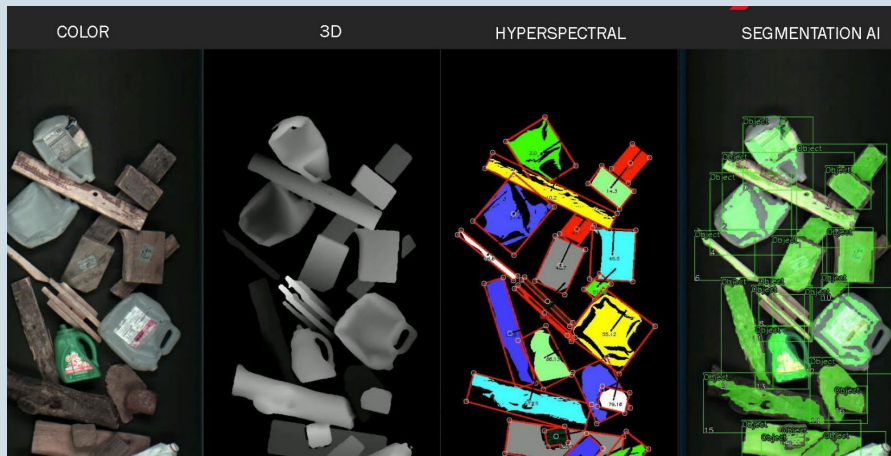
Robotic Sorters

AMP Cortex

Machinex SamurAI

Source: AMP / Machinex

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Smart Technologies for MRFs - Robots

Robotic Sensors with AI

COLOR   3D   HYPERSPECTRAL   SEGMENTATION AI

**Source:
Waste
Robotics**

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Smart Technologies for MRFs - Robots

Video of QC Robotic Sorter Max AI®
at www.max-ai.com

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Smart Technologies for MRFs - Robots

QC Robotic Sorters – Advantages and Disadvantages

- **Advantages**
    - Better Speed and Accuracy (*for most items*) than Manual QC *(Most will achieve 98% purity (or more) after an optical unit for PET or HDPE)*
    - No Pee Breaks!
    - Decent ROI
- **Disadvantages**
    - Expensive (not right for all situations)
    - New, difficult to know lifespan and maintenance needs
    - Still susceptible to items that aren't "seen"
    - Limited belt sizes and throughput (for now)
   - Don't believe all the hype....

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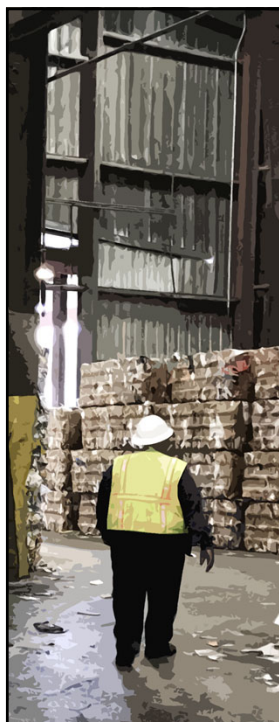
Processing Conclusions

The lines between processing Single Stream,
MSW and C&D will become blurred

o Systems will be capable of processing multiple material streams
o Opticals and robotics will be able to easily target multiple materials not traditionally recovered
o AI and sensors will increase the knowledge regarding what is in both inputs and outputs from processing systems
o The very nature of the processing systems will create new commodity streams that without a market will become residue
o The processing facilities will need to be part of a larger recovery system to be successful (SBP or MMC's)

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Questions and Comments?
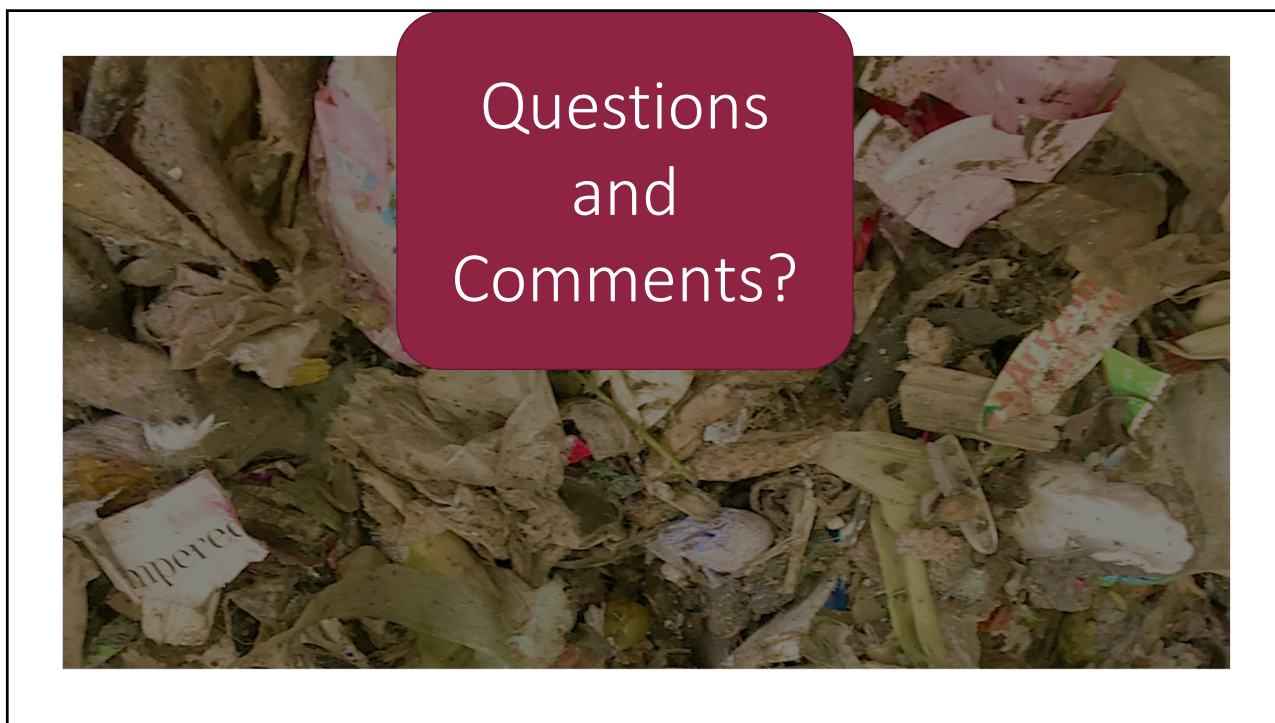
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