# State of Technology for MSW Processing:

*Smart Technologies for Processing MSW*

**February 2020**

**By**

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*Gershman, Brickner & Bratton, Inc.*

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# State of Technology

## Gershman, Brickner & Bratton, Inc.

***Innovative, Sustainable Solutions for Solid Waste Management***

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


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# U.S. Waste Management Infrastructure

| Technology | Number |
|---|---|
| Source Separation Collections | 9,000 |
| Material Recovery Facilities (MRF) | 736 |
| Composting | 2,300 |
| Mixed Waste Processing Facilities (MWPF) | 51 |
| Mass Burn WTE | 65 |
| Modular WTE | 9 |
| RDF -Processing &/ or Combustion | 20 |
| Anaerobic Digestion | 19 |
| Transfer Stations | 3,350 |
| Landfills | 1,908 |

**Sources:** Most from Eileen Berenyi's Research ~ 2012-2015

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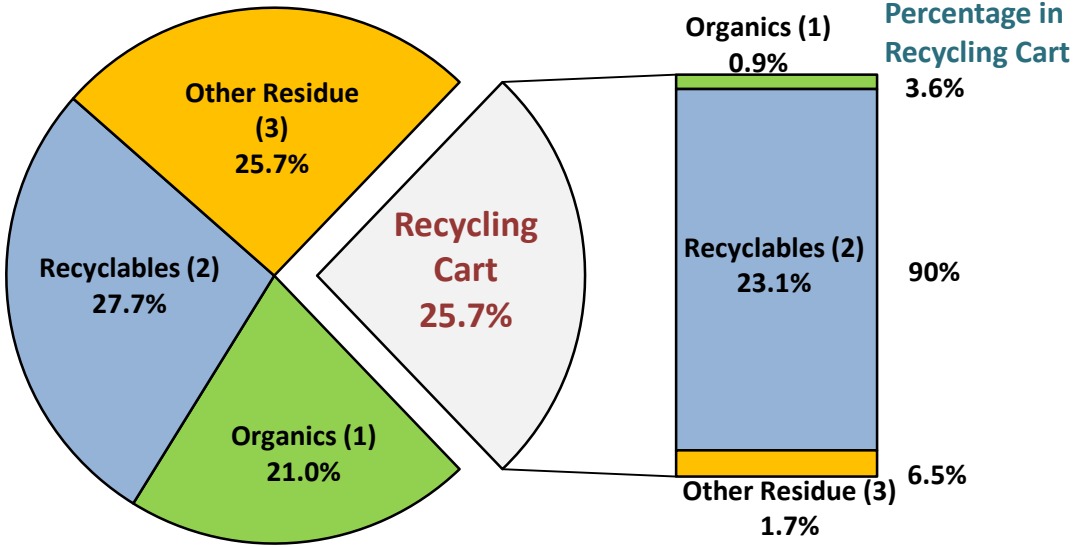
# MSW Processing

## Household Outputs




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

(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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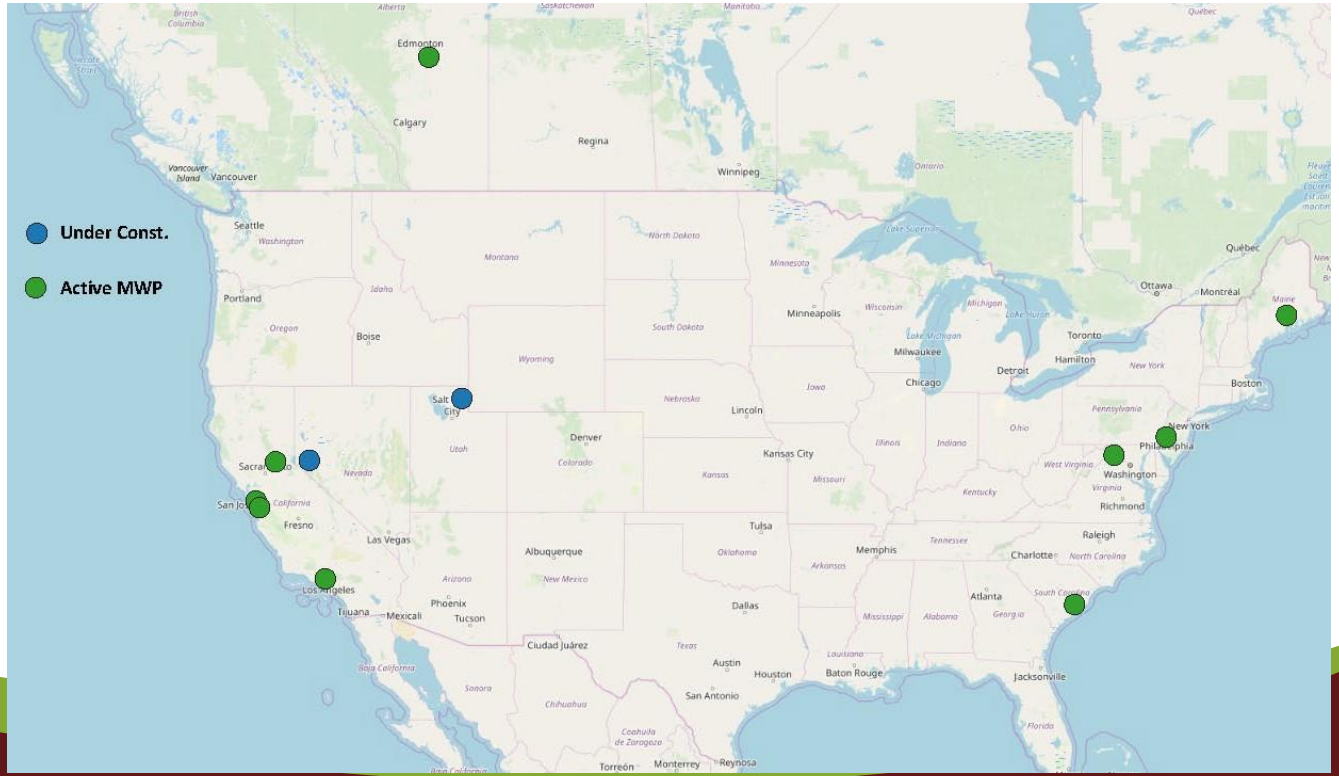
# MSW Processing

## Map of Modern MWPF Locations

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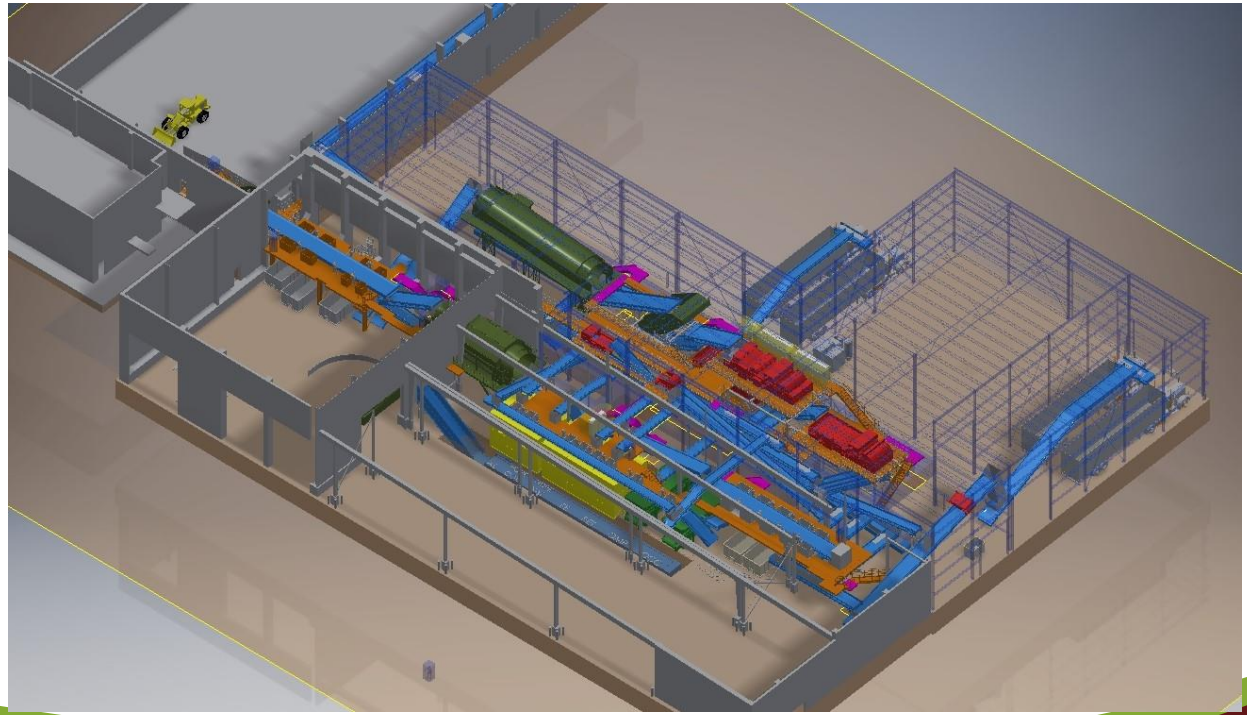
# MSW Processing

## Modern MWPF Facility Layout



**Source:** CP Group – WIWMD

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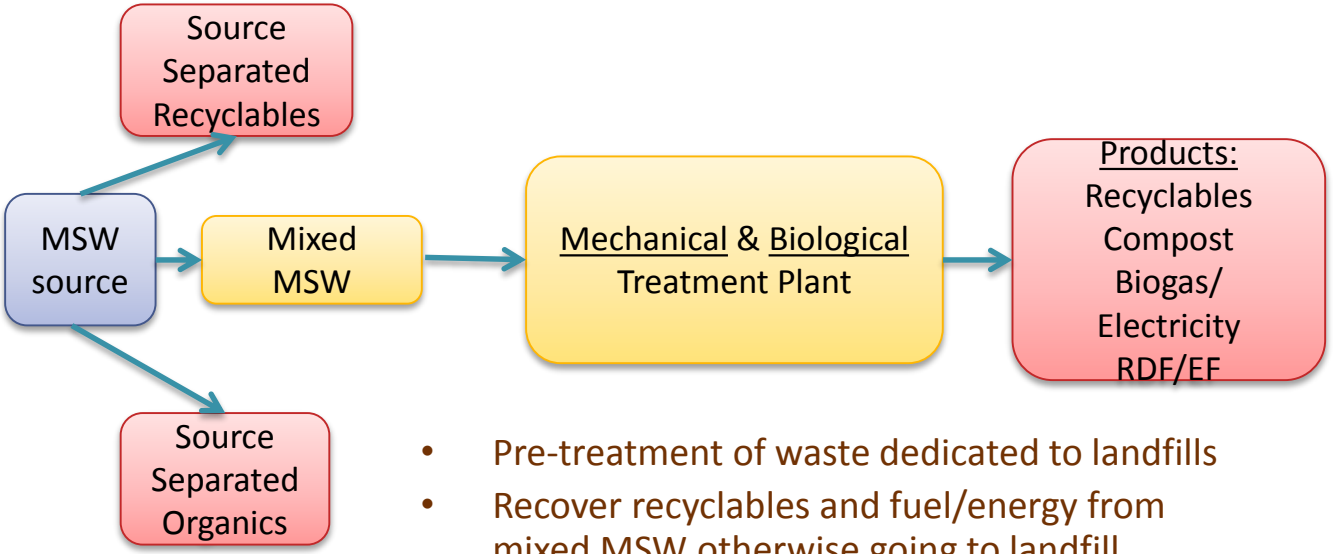
# MSW Processing

## MBT Processing




- Pre-treatment of waste dedicated to landfills
- Recover recyclables and fuel/energy from mixed MSW otherwise going to landfill
- Stabilizing organics fraction

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# MSW Processing

## MBT Processing

**Source:** GBB – Entsorga

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# Processing Systems of the Future

- The Future of Material Recovery Facilities (MRF):
  *New Processing Systems will Consist 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

**Source:** MRWMD/BHS – Monterey, CA


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# Optical Units

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



**Source:** CP Group / BHS

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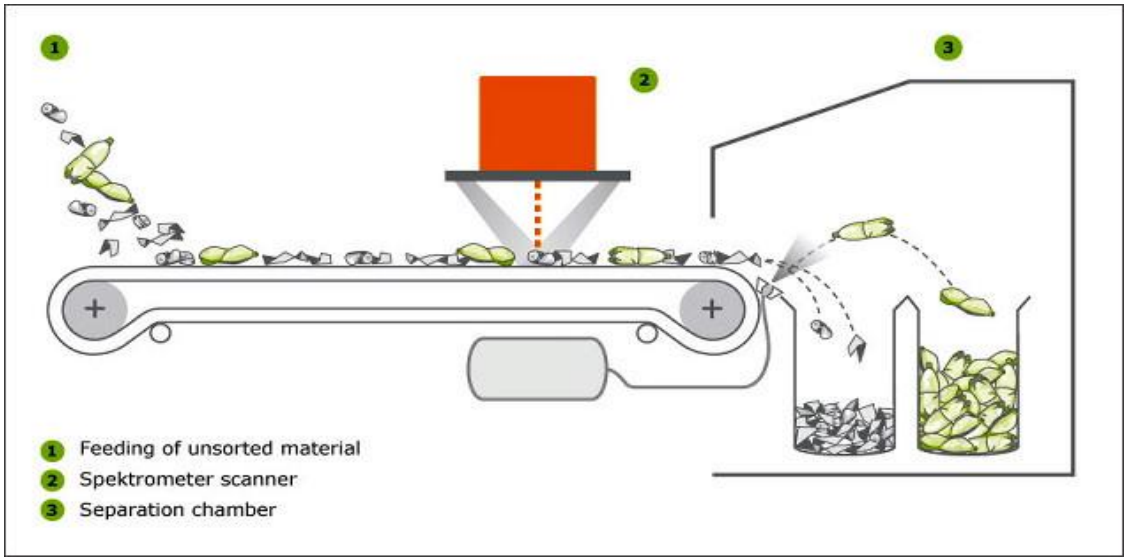
# Optical Units




**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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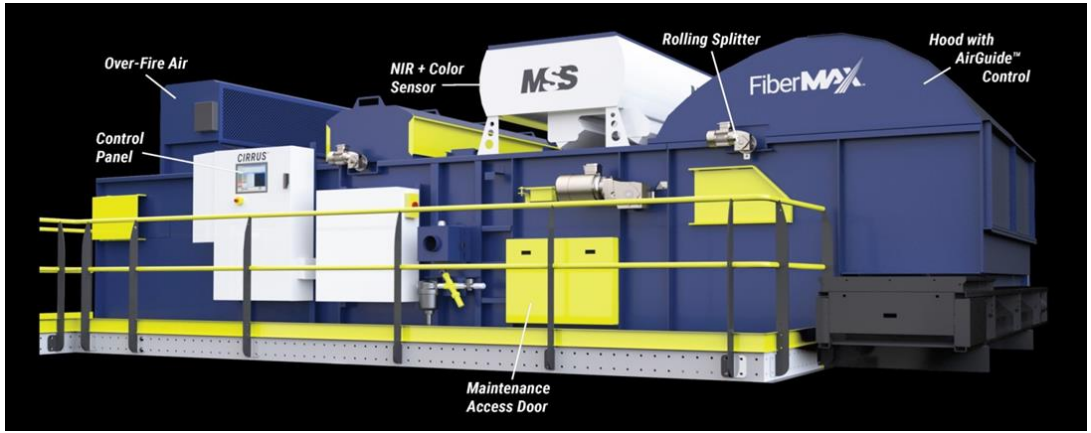
# Smart Technologies for MRFs

## 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™

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

**Source:** CP Group

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# Smart Technologies for MRFs

## Other Optical Advancements – Additional Spectrum and Lasers

**Steinert Unisort Black**


**Source:** Steinert

**Tomra LOD**


**Source:** Tomra

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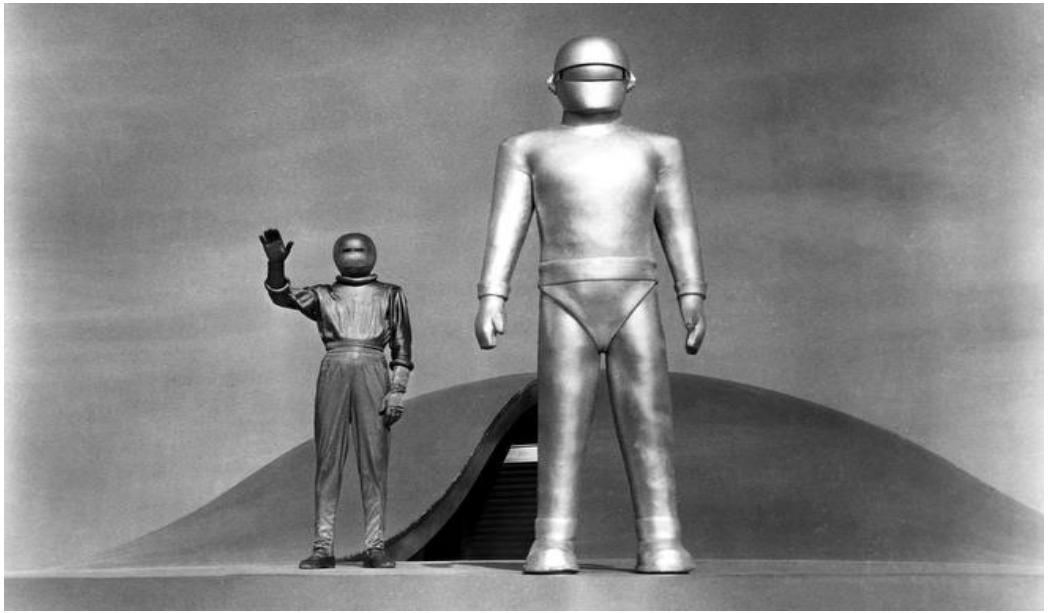
# Processing Systems of the Future

## The Rise of the Robots



**Source:** "The Day the Earth Stood Still" 1951

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# Smart Technologies for MRFs

## Robot Sorters SamurAI™ and Max-AI®



**Source:** Machinex / BHS

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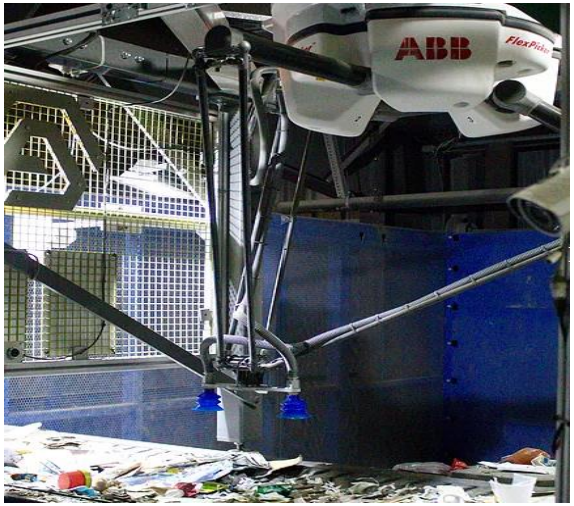
# Smart Technologies for MRFs

## Robotic Sorters




AMP Cortex

RoBB-AQC

**Source:** AMP / Van Dyk

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# Smart Technologies for MRFs

## Video of QC Robotic Sorter – Max AI®

http://www.max-ai.com/

**Source:** BHS

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# Smart Technologies for MRFs

## 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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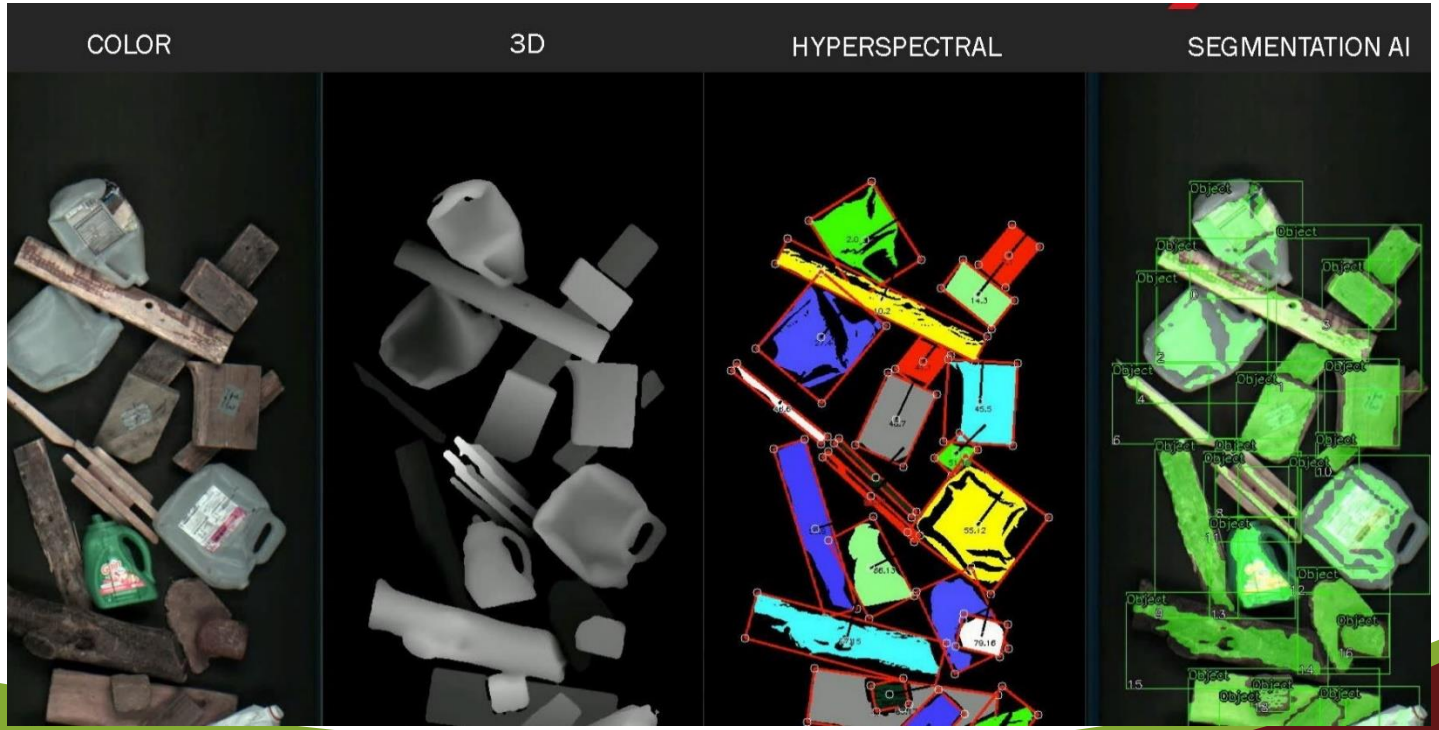
# Smart Technologies for MRFs

## Robotic Sensors with AI

**Source: Waste Robotics**

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# Processing Conclusions

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

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

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# Additional Info

## Technology and Equipment Guide

**Supplemental Report:** *The Evolution of Mixed Waste Processing Facilities* – Technology and Equipment Guide (2015)

- Prepared for the American Chemistry Council

- https://plastics.americanchemistry.com/Education-Resources/Publications/The-Evolution-of-Mixed-Waste-Processing-Facilities-Technology-and-Equipment-Guide.pdf

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# *Thank you!*

## Questions and Comments?

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