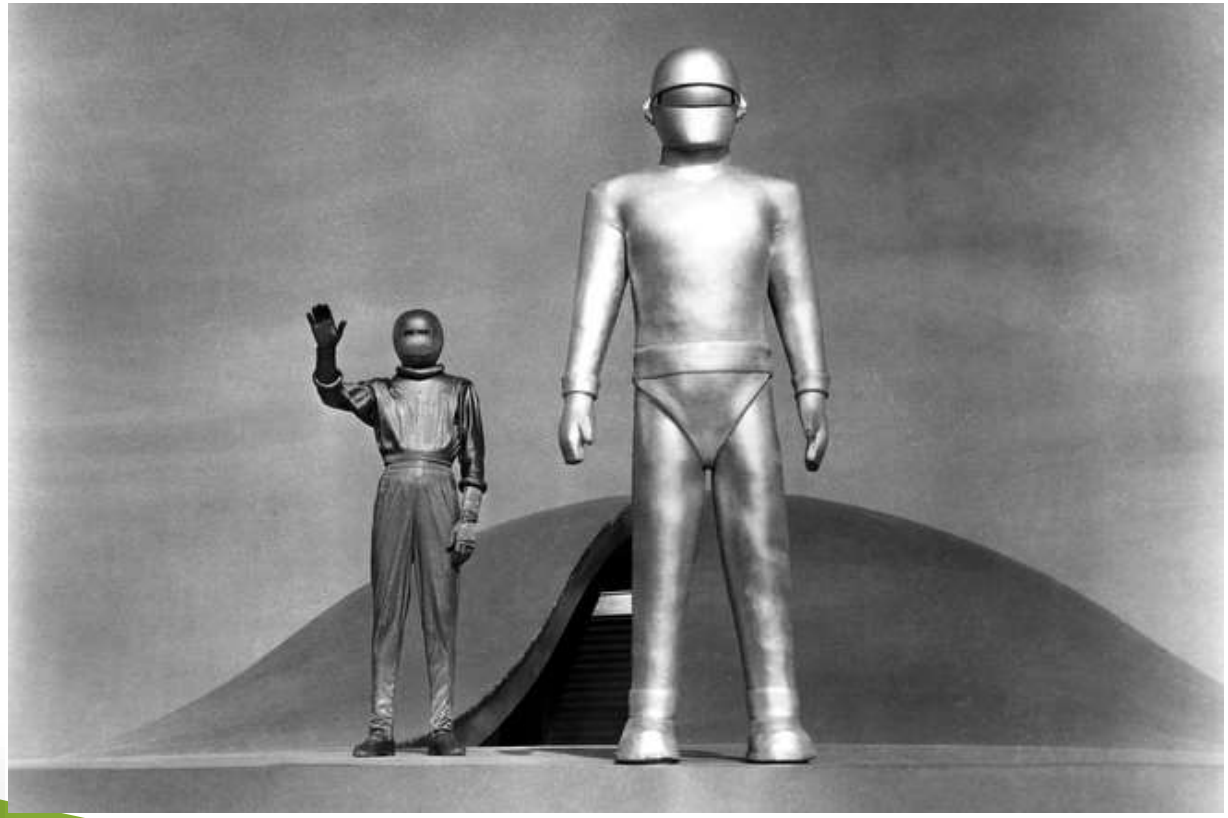
Processing Systems of the Future

The Rise of the Robots



Source: "The Day the Earth Stood Still" 1951

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

Processing Systems of the Future

- The Future of Processing Facilities: 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 prior to optical units (instead of by shape)
  - **Robotic Sorters**
    - Both for QC and for Pre-Sort – can positively pic multiple materials

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

Processing Systems of the Future

Combined Systems

Source: MRWMD – Monterey, CA

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

Processing Systems of the Future

Improved Optical Units

- Improvements in algorithms, shape recognition and attention to air flow characteristics, optical units can now better recover:
  - **Fiber**
  - **Clean Wood**
  - **Film**
  - **Flexible Packaging**
  - **Cartons**
  - **Other potential target materials**

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

Processing Systems of the Future

CIRRUS® FiberMax™

Source: CP Group

GBB SOLID WASTE MANAGEMENT CONSULTANTS

Processing Systems of the Future

Outputs from CIRRUS® FiberMax™

Negative Sort Fiber

Positive Sort Ejects

- 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

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

Processing Systems of the Future

Video of CIRRUS® FiberMax™

FiberMAX Video.....

Source: CP Group

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

GBB SOLID WASTE MANAGEMENT CONSULTANTS

Processing Systems of the Future

Pre-Sort Robotic Sorters – C&D

Source: ZenRobotics

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

Processing Systems of the Future

Video of Pre-Sort Robotic Sorters – C&D

ZenRobotics Video.....

Source: ZenRobotics

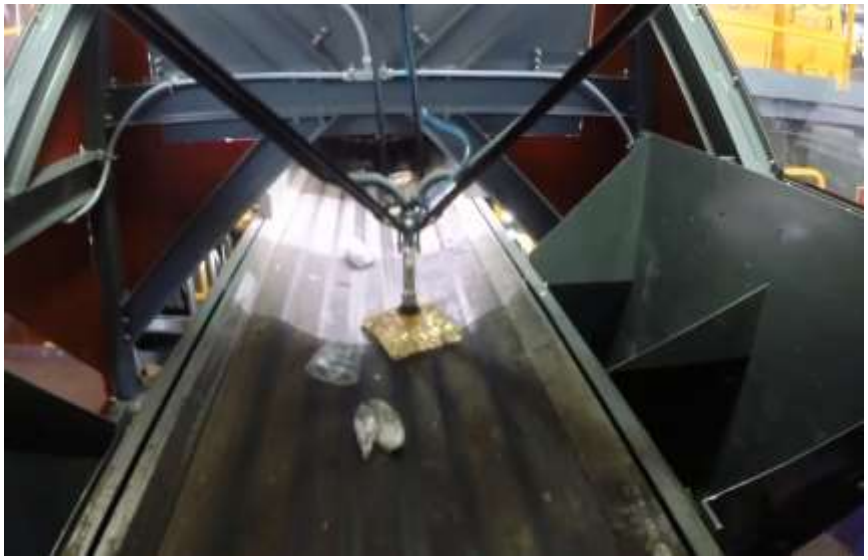
http://zenrobotics.com/

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

Processing Systems of the Future

QC Robotic Sorters – Utilizes shape and material recognition computer vision

AMP Cortex



Max-AI™

Source: AMP / BHS

GBB SOLID WASTE MANAGEMENT CONSULTANTS

QC Robotic Sorter – Max-AI™

MaxAI Video.....

Source: BHS

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

GBB
SOLID WASTE
MANAGEMENT
CONSULTANTS

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
- The very nature of the processing systems will create new commodity streams that without a market will become residue
- The processing facilities would need to be part of a larger recovery system to be successful

GBB
SOLID WASTE MANAGEMENT CONSULTANTS