WIRMC 2025
WISCONSIN INTEGRATED RESOURCE MANAGEMENT CONFERENCE

Maximizing the Potential of Data in Material Recovery Facilities

Wisconsin Integrated Resource Management Conference
Friday, February 28, 2025 at 10:30 am

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UW-Madison, B.S. Civil and Environmental Engineering

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Today's Agenda

Introduction

1. Circularity
2. MRF Data
3. Technologies
4. Possibilities

Wrap up

Contact Info

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Our Story

GBB is an international solid waste management consulting firm that helps public- and private-sector organizations craft practical, customized and technically sound solutions for complex solid waste management challenges.

Since 1980, GBB has been a trusted resource at the forefront of the industry, creating success stories that integrate smart planning with effective management of solid waste services. Our staff enables our clients to do more with less.

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Our Vision

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

Communities

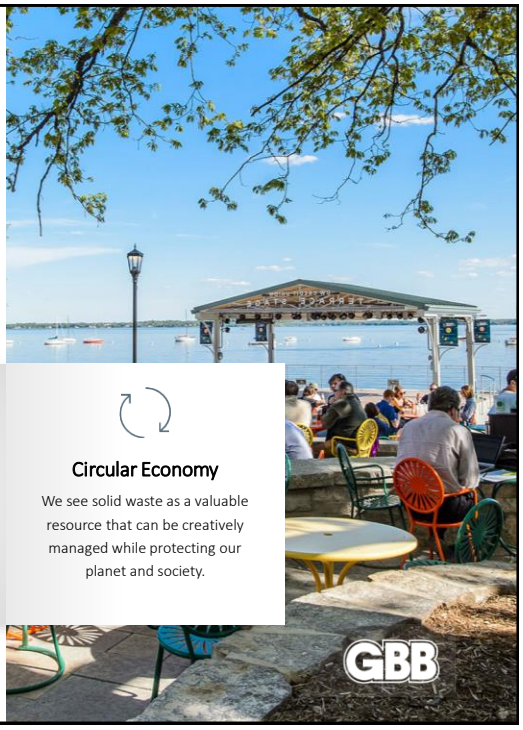
We are guided by our principles of quality, value, ethics, and results to help communities of all shapes and sizes.

Environment

We believe effective management of solid waste is an imperative that directly affects our planet- both today and far into the future.

Circular Economy

We see solid waste as a valuable resource that can be creatively managed while protecting our planet and society.



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Our Comprehensive Services

- Technical Evaluation & Planning
- Solid Waste Management Planning
- Business & Financial Planning
- Curbside Collection & Route Optimization
- System Administration & Receivership
- Sustainability, Circular Economy & Disaster Debris Planning
- Expert Witness

GBB

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Circularity and MRFs

"Like all major transitions in human history, the shift from a linear to a circular economy will be a tumultuous one. It will feature heroes and pioneers, naysayers and obstacles, and moments of victory and doubt. If we persevere, however, we will put our economy back on a path of growth and sustainability. Many years from now, people will look back on it as a revolution."
– Frans van Houten (CEO of Philips Healthcare)

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Circular Economy and Recycling

The Idealized Goal

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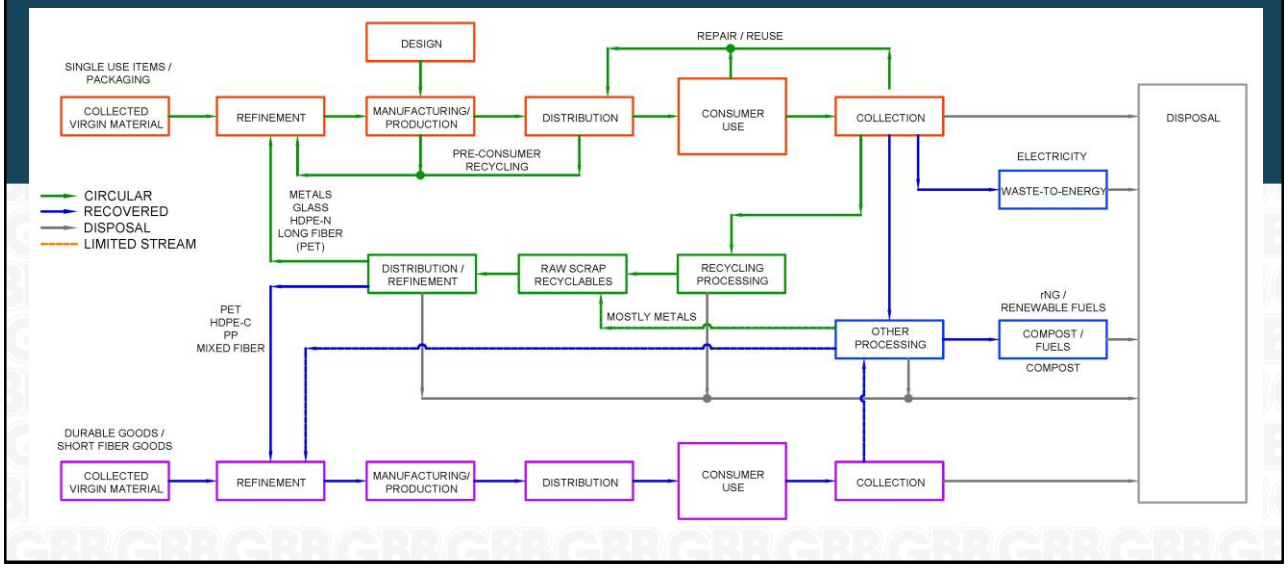
Circular Economy and Recycling
Current Infrastructure and Process



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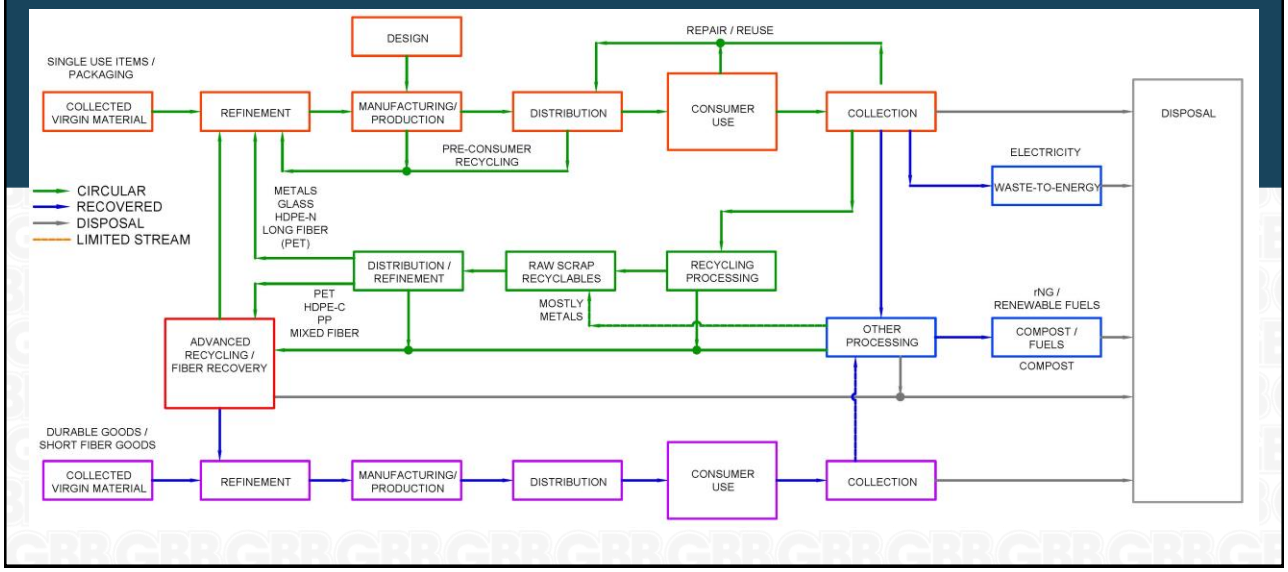
Circular Economy and Recycling
Future Infrastructure and Process



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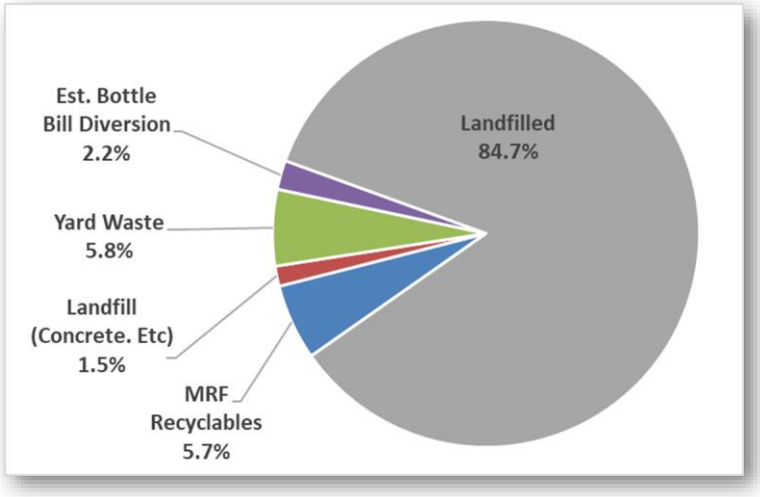
Current Collection and Processing



Source: GBB – Kent County, MI 2021

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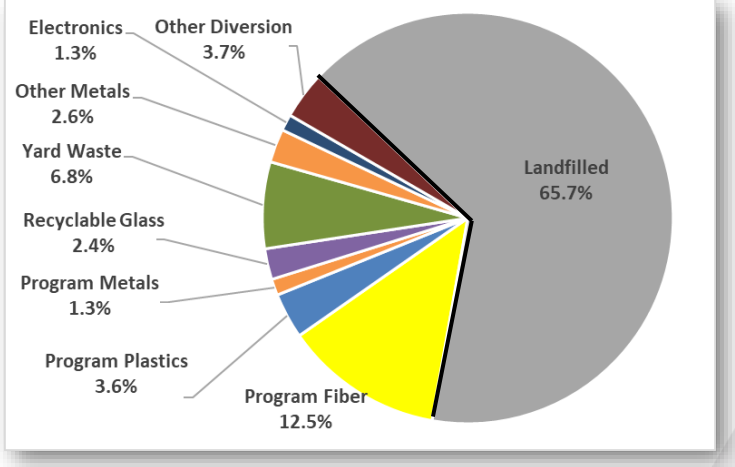
Ideal Collection and Processing

What is All Program Materials (MRF) Were Recovered

34.3%



Source: GBB – Kent County, MI 2021

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MRF Data

"We are drowning in information but starved for knowledge."
- John Naisbitt (Autor of Megatrends)

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Basic MRF Operating Data

Daily Operating Report

i. Throughput (Daily Deliveries)
ii. Commodity Production (tonnage, bale counts)
iii. Residual (tonnage, disposal or rerun)
iv. Uptime/Downtime (reasons for downtime)
v. Labor Utilization (number and location)
vi. Maintenance (regular, unscheduled, lock-out/tag-out)
vii. Pictures (feedstock, residual, bales, maintenance)

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Technologies

"Any sufficiently advanced technology is indistinguishable from magic."
- Arthur C. Clarke (Author)

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What we do

Greyparrot Analyzer is an AI waste analytics system that tracks and reports insights on waste flows in recovery facilities

Camera unit AI Integration Dashboard

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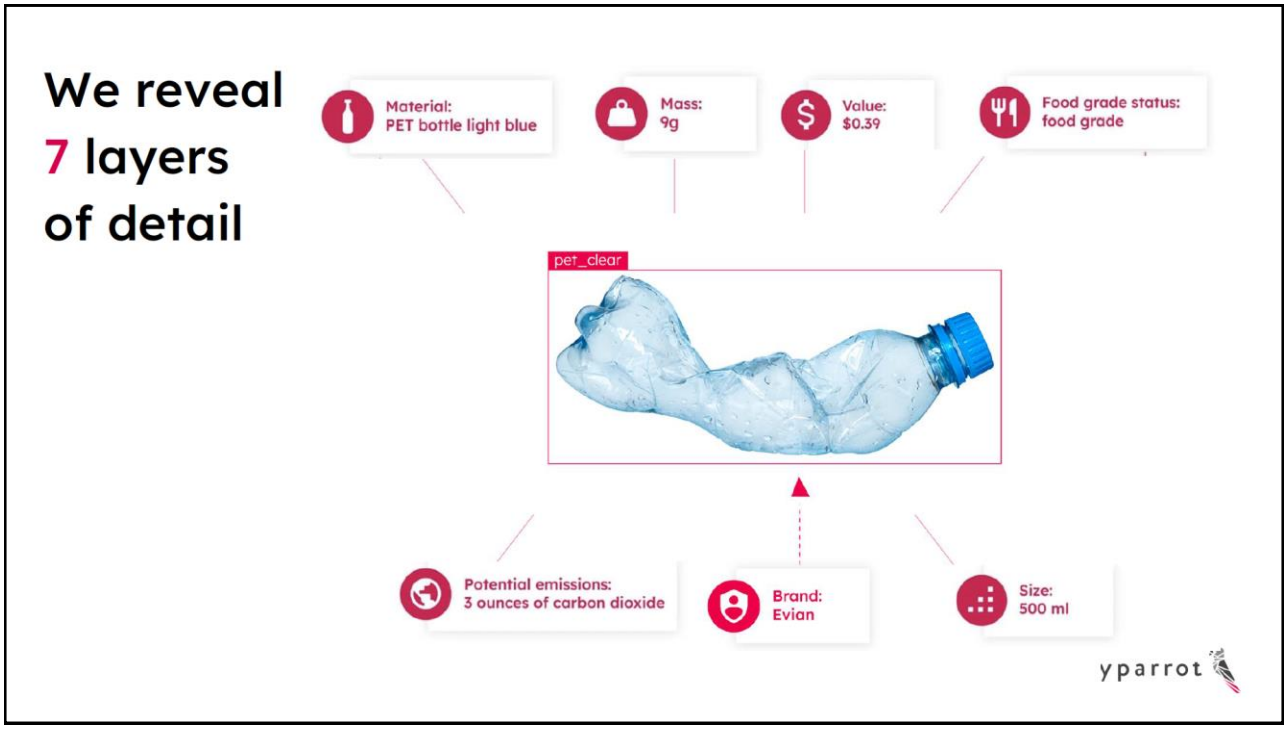
We reveal
7 layers
of detail
Material:
PET bottle light blue
Mass:
9g
Value:
$0.39
Food grade status:
food grade
pet_clear
Potential emissions:
3 ounces of carbon dioxide
Brand:
Evian
Size:
500 ml
yparrot

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Summary report
greyparrot
Customer name Demo
Generated by Gaspard Duthilleul
Analyzer Infeed (17DCD8)
Scenario High Granularity
Mode Mass
Generated on 19/03/2024 15:38
Time start 31/01/2024 23:01
Time end 29/02/2024 22:55
Total mass 532.51 t
Duration 28d 25h 54m 18s
Throughput while belt moving 1.23 t/h
Throughput for duration 0.77 t/h
Material composition
Belt status
Belt Running Full
17d 23h 17m 36s (61.3%)
Belt Running Empty
1h 2m 24s (0.1%)
Belt Stopped
10d 23h 19m 10s (37.4%)
Analyzer offline
8h 15m 8s (1.2%)
Mass
Mass (t)
02/03 02/05 02/07 02/09 02/11 02/13 02/15 02/17 02/19 02/21 02/23 02/25 02/27 02/29
Stopped
Running Full
© 2024 Greyparrot AI
Waste Intelligence

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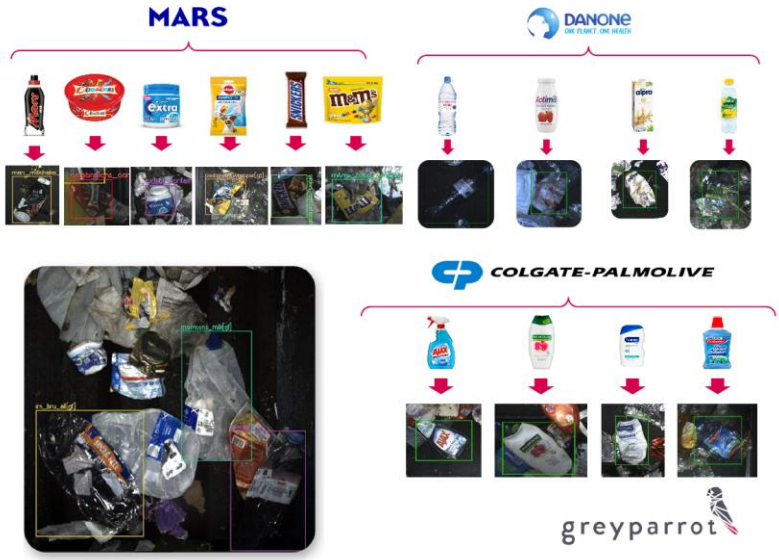
Introduce transparency: Tracking waste packaging

Brand and SKU data are automatically detected with AI

- 1800+ SKUs, around 3m items
  - From international and local brands
  - Up to 30+ SKUs for one single brand
- Flexibility to expand by:
  - Brands
  - Waste streams
  - Geographies



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Possibilities

"We are drowning in information but starved for knowledge."
- John Naisbitt (Autor of Megatrends)

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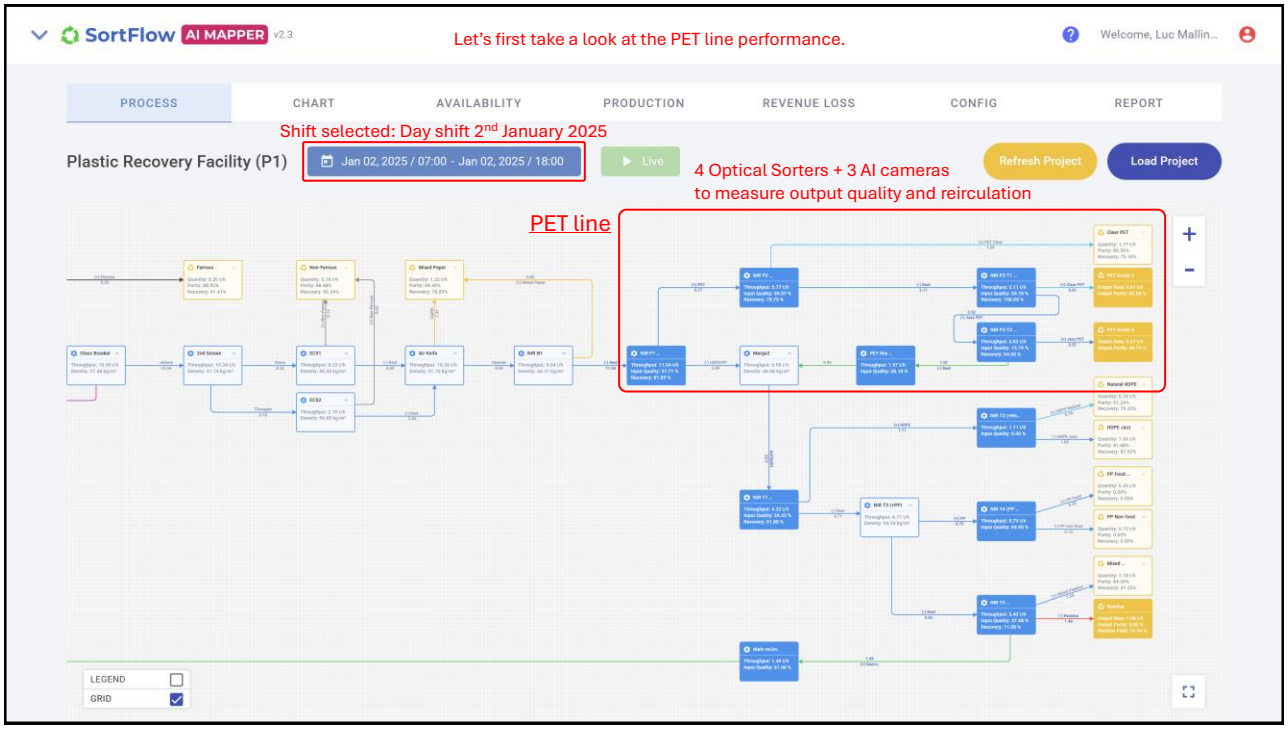
SortFlow AI MAPPER v2.3
Let's first take a look at the PET line performance.
Welcome, Luc Mallin...
PROCESS
CHART
AVAILABILITY
PRODUCTION
REVENUE LOSS
CONFIG
REPORT
Shift selected: Day shift 2nd January 2025
Plastic Recovery Facility (P1)
Jan 02, 2025 / 07:00 - Jan 02, 2025 / 18:00
Live
4 Optical Sorters + 3 AI cameras
to measure output quality and reirculation
Refresh Project
Load Project
PET line
LEGEND
GRID

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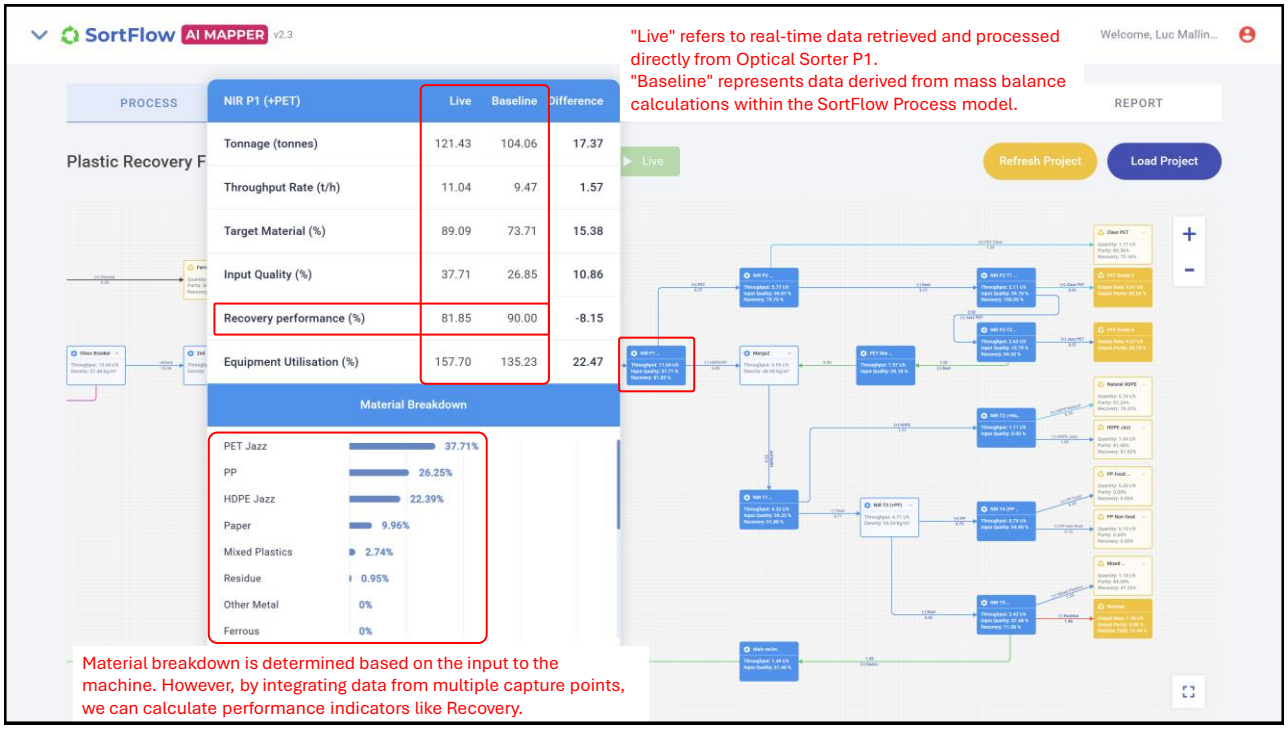
SortFlow AI MAPPER v2.3
"Live" refers to real-time data retrieved and processed directly from Optical Sorter P1.
"Baseline" represents data derived from mass balance calculations within the SortFlow Process model.
Welcome, Luc Mallin...
PROCESS
REPORT
Plastic Recovery F
Live
Refresh Project
Load Project
NIR P1 (+PET)
Live
Baseline
Difference
Tonnage (tonnes) 121.43 104.06 17.37
Throughput Rate (t/h) 11.04 9.47 1.57
Target Material (%) 89.09 73.71 15.38
Input Quality (%) 37.71 26.85 10.86
Recovery performance (%) 81.85 90.00 -8.15
Equipment Utilisation (%) 157.70 135.23 22.47
Material Breakdown
PET Jazz 37.71%
PP 26.25%
HDPE Jazz 22.39%
Paper 9.96%
Mixed Plastics 2.74%
Residue 0.95%
Other Metal 0%
Ferrous 0%
Material breakdown is determined based on the input to the machine. However, by integrating data from multiple capture points, we can calculate performance indicators like Recovery.

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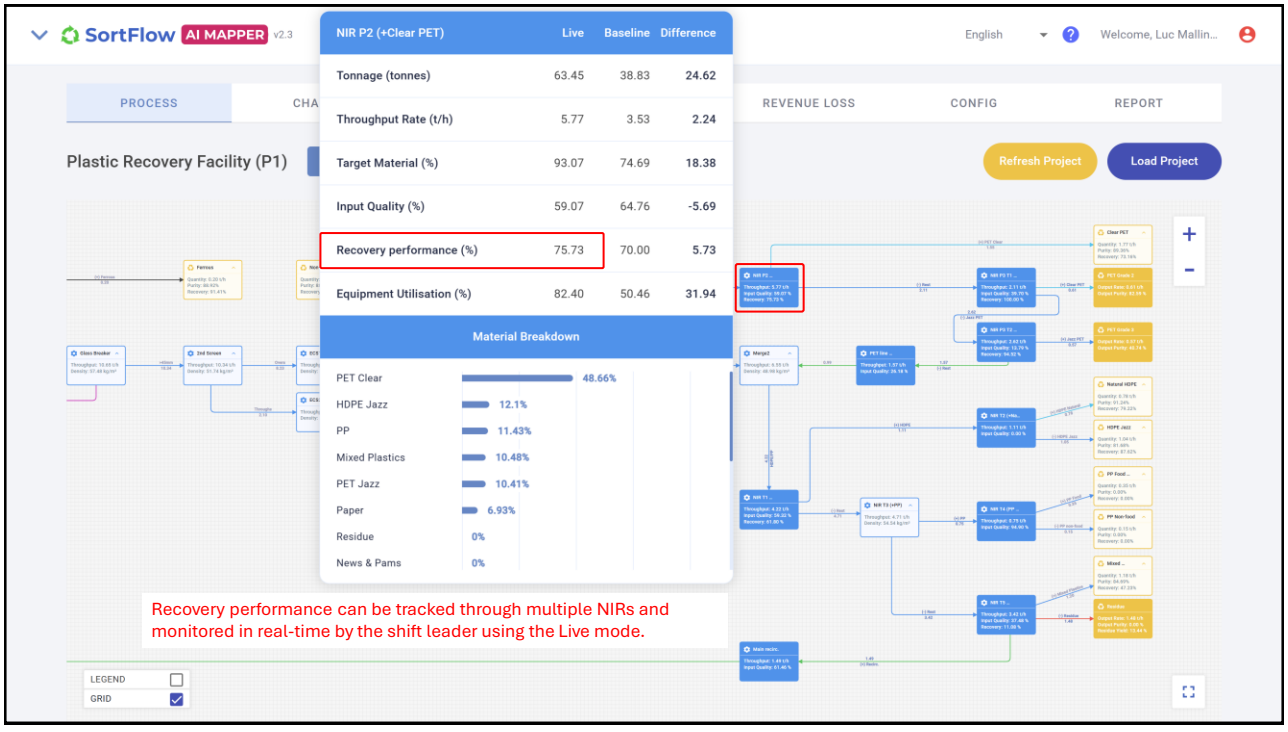
SortFlow AI MAPPER v2.3
English
Welcome, Luc Mallin...
PROCESS
REVENUE LOSS
CONFIG
REPORT
Plastic Recovery Facility (P1)
Refresh Project
Load Project
NIR P2 (+Clear PET) Live Baseline Difference
Tonnage (tonnes) 63.45 38.83 24.62
Throughput Rate (t/h) 5.77 3.53 2.24
Target Material (%) 93.07 74.69 18.38
Input Quality (%) 59.07 64.76 -5.69
Recovery performance (%) 75.73 70.00 5.73
Equipment Utilisation (%) 82.40 50.46 31.94
Material Breakdown
PET Clear 48.66%
HDPE Jazz 12.1%
PP 11.43%
Mixed Plastics 10.48%
PET Jazz 10.41%
Paper 6.93%
Residue 0%
News & Pams 0%
Recovery performance can be tracked through multiple NIRs and monitored in real-time by the shift leader using the Live mode.
LEGEND
GRID

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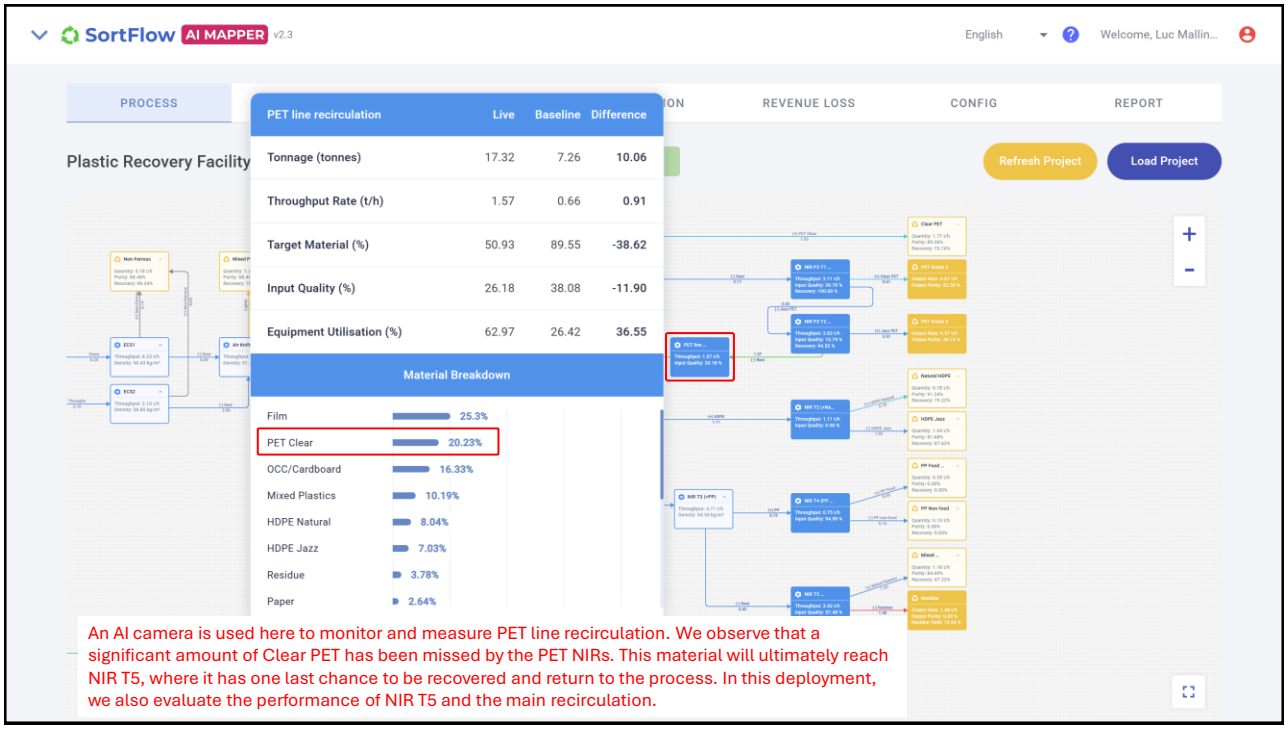
SortFlow AI MAPPER v2.3
English
Welcome, Luc Mallin...
PROCESS
REVENUE LOSS
CONFIG
REPORT
Plastic Recovery Facility
Refresh Project
Load Project
PET line recirculation Live Baseline Difference
Tonnage (tonnes) 17.32 7.26 10.06
Throughput Rate (t/h) 1.57 0.66 0.91
Target Material (%) 50.93 89.55 -38.62
Input Quality (%) 26.18 38.08 -11.90
Equipment Utilisation (%) 62.97 26.42 36.55
Material Breakdown
Film 25.3%
PET Clear 20.23%
OCC/Cardboard 16.33%
Mixed Plastics 10.19%
HDPE Natural 8.04%
HDPE Jazz 7.03%
Residue 3.78%
Paper 2.64%
An AI camera is used here to monitor and measure PET line recirculation. We observe that a significant amount of Clear PET has been missed by the PET NIRs. This material will ultimately reach NIR T5, where it has one last chance to be recovered and return to the process. In this deployment, we also evaluate the performance of NIR T5 and the main recirculation.

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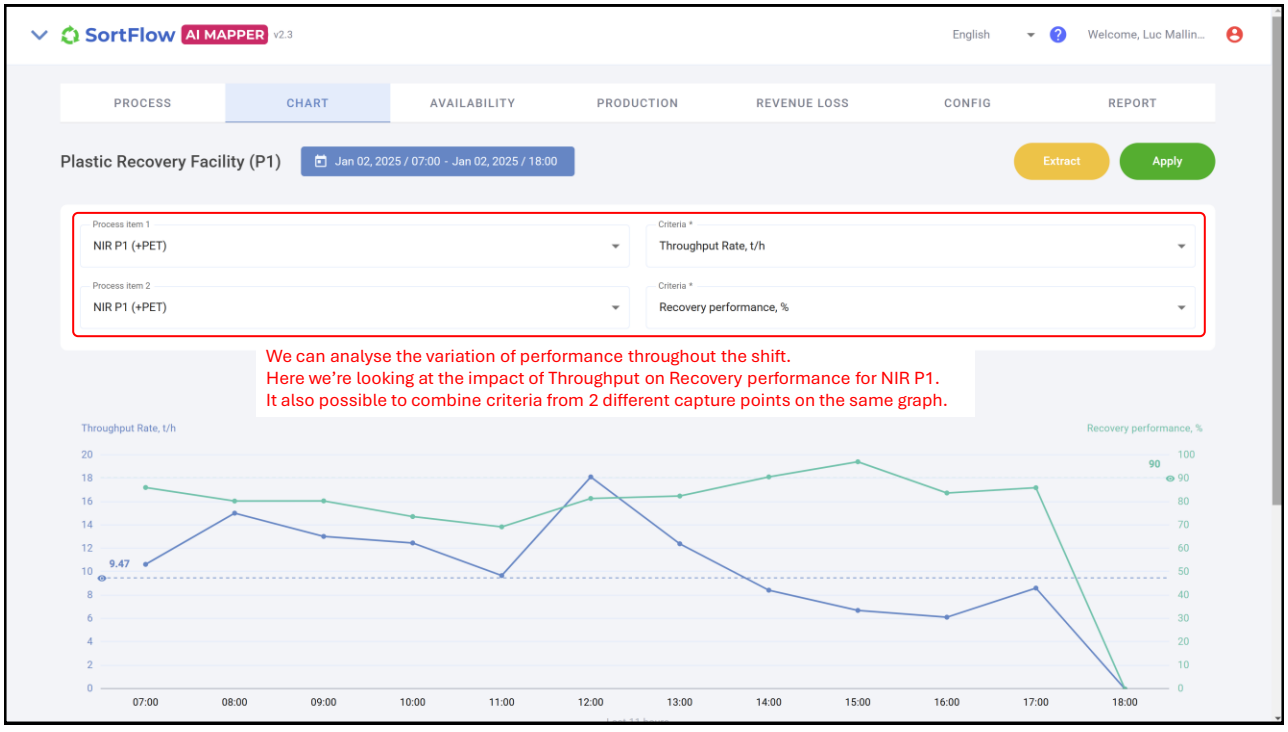
SortFlow AI MAPPER v2.3
English
Welcome, Luc Mallin...
PROCESS
CHART
AVAILABILITY
PRODUCTION
REVENUE LOSS
CONFIG
REPORT
Plastic Recovery Facility (P1)
Jan 02, 2025 / 07:00 - Jan 02, 2025 / 18:00
Extract
Apply
Process item 1
NIR P1 (+PET)
Criteria *
Throughput Rate, t/h
Process item 2
NIR P1 (+PET)
Criteria *
Recovery performance, %
We can analyse the variation of performance throughout the shift.
Here we're looking at the impact of Throughput on Recovery performance for NIR P1.
It also possible to combine criteria from 2 different capture points on the same graph.
Throughput Rate, t/h
Recovery performance, %
9.47
90
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00

33


SortFlow AI MAPPER v2.3
English
Welcome, Luc Mallin...
PROCESS
CHART
AVAILABILITY
PRODUCTION
REVENUE LOSS
CONFIG
REPORT
Plastic Recovery Facility (P1)
Jan 02, 2025 / 07:00 - Jan 02, 2025 / 18:00
Extract
Apply
Process item 1
NIR P1 (+PET)
Criteria *
Throughput Rate, t/h
Process item 2
NIR P1 (+PET)
Criteria *
Recovery performance, %
During the first half of the shift, we observed that the throughput exceeded the maximum recommended level, negatively impacting PET recovery performance, which dropped to the 70% range.
Throughput Rate, t/h
Recovery performance, %
Throughput Rate: 12.49 t/h
Recovery performance: 73.74 %
15
73
9.47
90
07:00
08:00
09:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00

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SortFlow AI MAPPER v2.3
Another approach to evaluating shift performance, enabled by leveraging live data, is tracking unproductive runtime occurrences. These occur when only some machines are supplied with material, potentially signaling infeed or performance issues. Additionally, this method can be used to detect jams when operating the application in Live mode.
PROCESS
CHART
Plastic Recovery Facility (P1)
Jan 02, 2025 / 07:00 - Jan 02, 2025 / 18:00
Plant Downtime: 6.81% / 0.75 hr
Unproductive Runtime: 10.64% / 1.17 hr
Productive Runtime: 82.55% / 9.08 hr
Plant Downtime
Unproductive Runtime
Productive Runtime
Number of occurrences 2 10 10
Total 0.75 hr 1.17 hr 9.08 hr
Shortest 0.33 hr 0.08 hr 0.08 hr
Longest 0.42 hr 0.33 hr 2.00 hr
Plant Availability Timeline
08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00
Unproductive Time (hours)
1.1

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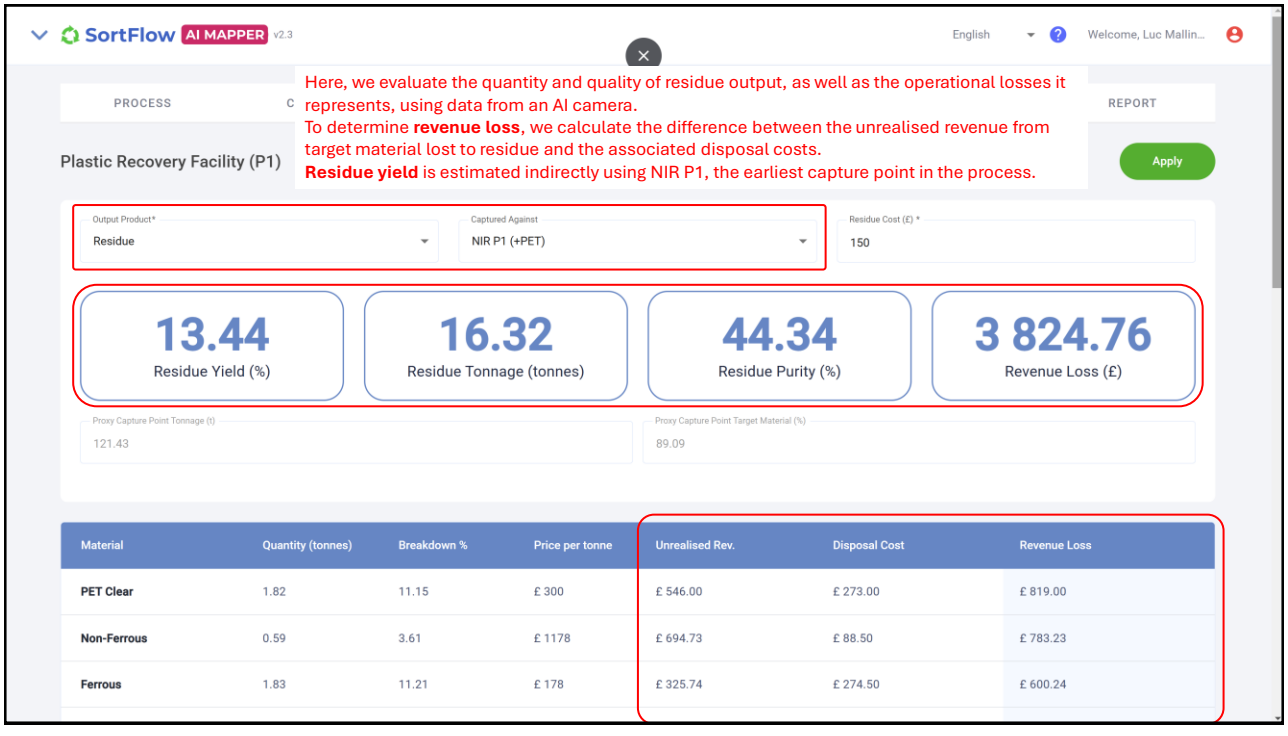
SortFlow AI MAPPER v2.3
English
Welcome, Luc Mallin...
Here, we evaluate the quantity and quality of residue output, as well as the operational losses it represents, using data from an AI camera.
To determine revenue loss, we calculate the difference between the unrealised revenue from target material lost to residue and the associated disposal costs.
Residue yield is estimated indirectly using NIR P1, the earliest capture point in the process.
PROCESS
REPORT
Plastic Recovery Facility (P1)
Apply
Output Product* Residue
Captured Against NIR P1 (+PET)
Residue Cost (£) * 150
13.44 Residue Yield (%)
16.32 Residue Tonnage (tonnes)
44.34 Residue Purity (%)
3 824.76 Revenue Loss (£)
Proxy Capture Point Tonnage (t) 121.43
Proxy Capture Point Target Material (%) 89.09
Material Quantity (tonnes) Breakdown % Price per tonne Unrealised Rev. Disposal Cost Revenue Loss
PET Clear 1.82 11.15 £ 300 £ 546.00 £ 273.00 £ 819.00
Non-Ferrous 0.59 3.61 £ 1178 £ 694.73 £ 88.50 £ 783.23
Ferrous 1.83 11.21 £ 178 £ 325.74 £ 274.50 £ 600.24

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Thank You!

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"The multidisciplinary elements of the materials management industry inspire me with the possibility to create far-reaching change toward more sustainable, resilient, and socially just communities."

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