TEST REPORT

COMPANY

TotalEnergies Corbion

MATERIAL

(Sample No.:	22304, 22343)
Material category:	Packaging
Material definition:	-
Special Application:	PLA from packaging waste

TEST DATE

2022-08-25

TEST OPERATOR

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SALES CONTACT

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Index of contents

List of figures

1. Recycling test center in Mülheim-Kärlich/Koblenz

We design recycling solutions for individual requirements

Worldwide Testing
TOMRA Recycling has seven Test Centers worldwide, with each providing different waste or metal testing possibilities.

- Mülheim-Kärlich, Germany
- Parma, Italy
- Seoul, South Korea
- Xiamen, China
- Buffalo, New York, USA (partnered with Wendt Corporation)
- Norwalk, Connecticut, USA (partnered with Van Dyk)
- Chiba, Japan (partnered with Earthtechnica Co., Ltd.)

State-of-the-Art Technology
At our flagship test center in Mülheim-Kärlich, customers can test using all TOMRA Recycling technologies, including, e.g., eddy current, screens, ballistic and wind sifter units. In cases where the results are not easily visible, laboratory equipment, e.g., hand-held XRF and NIR devices, can be used to further analyze sorting performance. With 50 metric tons warehousing capacity, the test center is a licensed laboratory with highly qualified engineers who support the analysis of results.

Tailored Industrialization
As a result of its long-standing and successful experience, TOMRA Recycling has developed hundreds of standardized and specialized applications, including packaging, paper, municipal solid waste, plastics, aluminum, e-scrap and end-of-life-vehicles. At our test centers, operators can test samples of their own material on our machines. Through its loop configuration, the test center allows several different processes to run concurrently with the waste samples being prepared through screening and a ballistic separator.

World-class Application Expertise
The test center is operated by engineers, who work with customers to develop innovative workflows during testing. These specialists ensure systems are setup to deliver optimum sorting and recycling levels for each customer’s unique requirements. The approach enables TOMRA Recycling to provide a level of test support unsurpassed in the industry.

WE LOOK FORWARD TO WORKING WITH YOU TO PROVIDE OPTIMAL PERFORMANCE!

2. Sorting system used during the test

Sorting system used during the test	
Detection unit:	**AUTOSORT®**
Working width:	1000 mm
Sensors:	[NIR1]
EM sensor:	-
Add-on:	-
Resolution:	High
Valves:	TS400
Nozzle distance:	25 mm
Belt speed:	3 m/s
Air pressure:	6 bar

Figure 1: Sorting system used during the test // AUTOSORT®

Additional information on the sorting system used during the test can be found in Chapter 5.

3. Input material and sorting task

The customer sent samples of PLA trays to the test center in Mülheim-Kärlich. Aim of the test was to determine the sortability of PLA from packaging waste. Non-treated German packaging waste was used as background packaging waste.

4. Test procedure and result

First, tray samples were recorded with Autosort to check the NIR classification of the samples. Both types of trays were classified as PLA.

Then, two sorting tests were carried out:

Test 1. Eject PLA from packaging waste (3D fraction after ballistic separation).
→ Determine if trays are sorted to PLA correctly.

Test 2. Eject PET from packaging waste (3D fraction after ballistic separation).
→ Determine if trays are falsely sorted to PET.

Both sorting tests showed correct sorting of PLA trays. Small quantities were incorrectly sorted, which can be attributed to ordinary mechanical oversorting.

The next pages show the classification result and photo documentation of the sorting tests.

4.1 NIR classification result

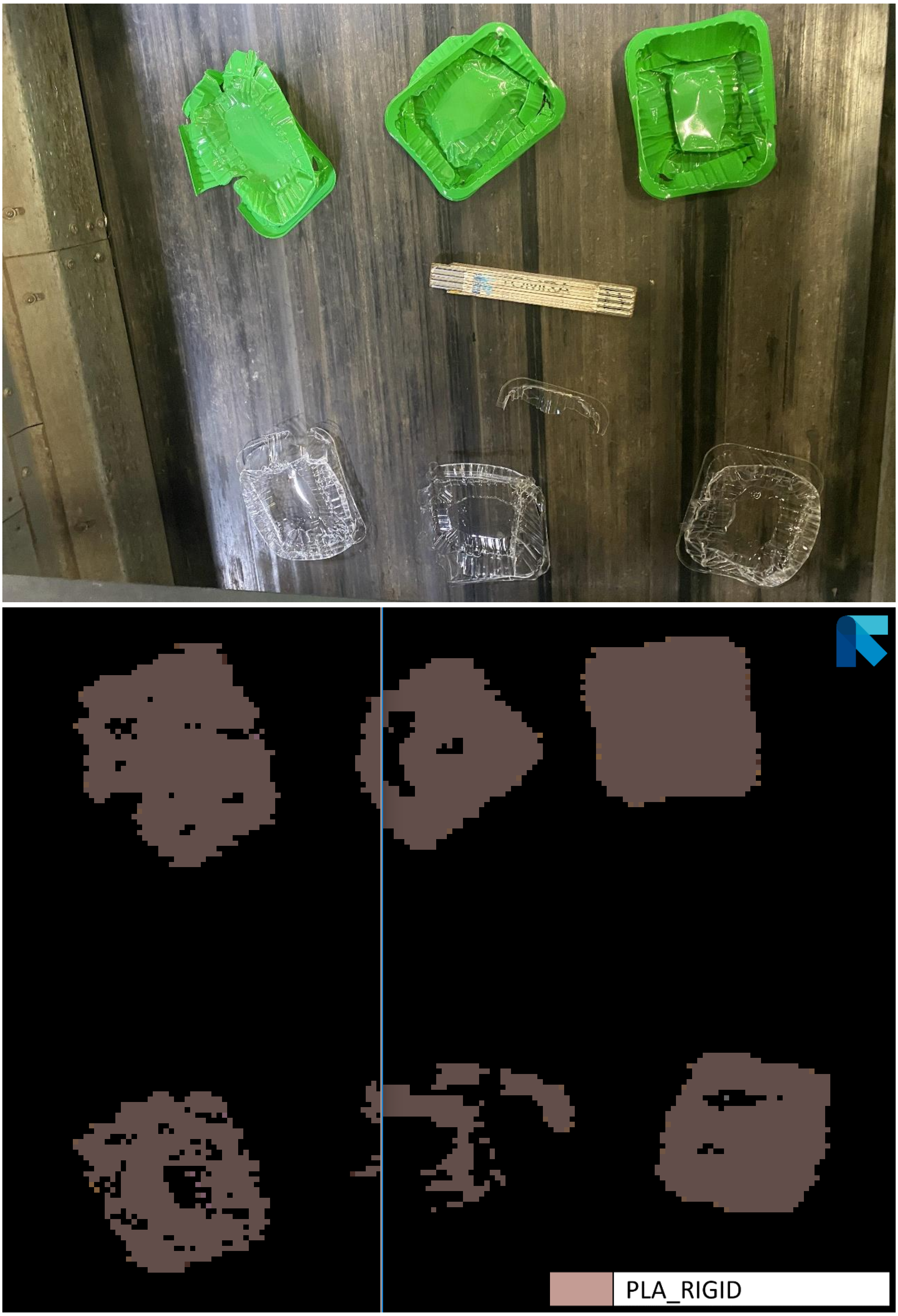


Figure 2: NIR classification of PLA trays.

Both tray types are classified as PLA.

4.2 Test 1: Eject PLA from packaging waste

Figure 3: Test 1, Run 1: Sorting fractions.
Top: Ejected *PLA* fraction.
Bottom: Dropped *others* fraction.

In the first run of Test 1, a random number of (partly crushed) trays was mixed into the background material. After the sorting, one part of one tray was found in the dropped *others* fraction. All other trays were ejected, as it was intended.

Figure 4: Test 1, Run 2: Sorting fractions.
Top: Ejected *PLA* fraction.
Bottom: Dropped *others* fraction.

In the second run of Test 2, 15 samples of each tray type were mixed into the background material (i.e. 30 samples in total). The same sorting program as in the first run was used. All trays were successfully ejected into the PLA fraction. One PET bottle was mechanically oversorted into the PLA fraction (the bottle was not classified as PLA by Autosort, but carried away by an ejected PLA tray).

4.3 Test 2: Eject PET from PLA waste

Figure 5: Test 2: Sorting fractions.
Top: Ejected *PET* fraction.
Bottom: Dropped *others* fraction.

In Test 2, again 15 samples of each tray type were mixed into the background material. Autosort was set to eject PET. One PLA tray was mechanically oversorted into the PET fraction (the tray was not classified as PET by Autosort but carried away by an ejected PET object). All other PLA trays dropped into the *others* fraction as intended.

5. Additional information on the sorting system

AUTOSORT®

The AUTOSORT® is a multifunctional sorting system to recover a wide range of valuable material from different waste streams such as single stream, packaging, municipal solid waste and other. The new generation AUTOSORT® with TOMRA's patented FLYING BEAM® technology makes a significant simplification to the system as a whole. This way the AUTOSORT® sorts extremely reliable and can be easily maintained. The use of the point scanning principle offers a wide range of online calibration possibilities which increases the sorting stability over time and leads to a higher overall performance.

Sophisticated near-infrared (NIR) and visible light (VIS) spectrometer-based sensors detect the characteristic spectra with a very high optical resolution. Equipped with the innovative FLYING BEAM® lighting technology the focus lies entirely on the area of the conveyor belt that is being scanned. This in turn results in energy savings of up to 70%

There are two detectors available for the AUTOSORT®:

(1) The advanced NIR spectrometer-based detector recognizes materials based on their specific and unique spectral properties of the reflected light. There are multiple detectors available for different spectral ranges.
(2) The VIS spectrometer-based detector recognizes materials based on their specific color properties.

These detectors can be used in combination and depend on the application.

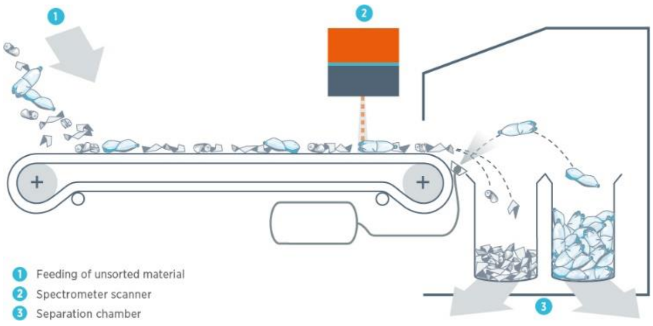
(3) DEEP LAISER for 3D object recognition and sorting tasks solved with Artificial Intelligence.

In addition, the AUTOSORT® technology covers a broader temperature range. Passive heat sinks replace active cooling equipment for temperature of up to 50°C.

The system can be quickly optimized for the required sorting tasks by the selection of sorting programs.

AUTOSORT® – Sorting Principle

Input material (1) is evenly fed onto a conveyor belt, where it is detected by the NIR and/or VIS spectrometer-based detector (2). If the sensors detect material to be sorted out, it commands the control unit to blow the appropriate valves of the ejection module at the end of the conveyor belt. The detected materials are separated from the material flow by jets of compressed air. The sorted material is divided into two or three fractions in the separation chamber (3).



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