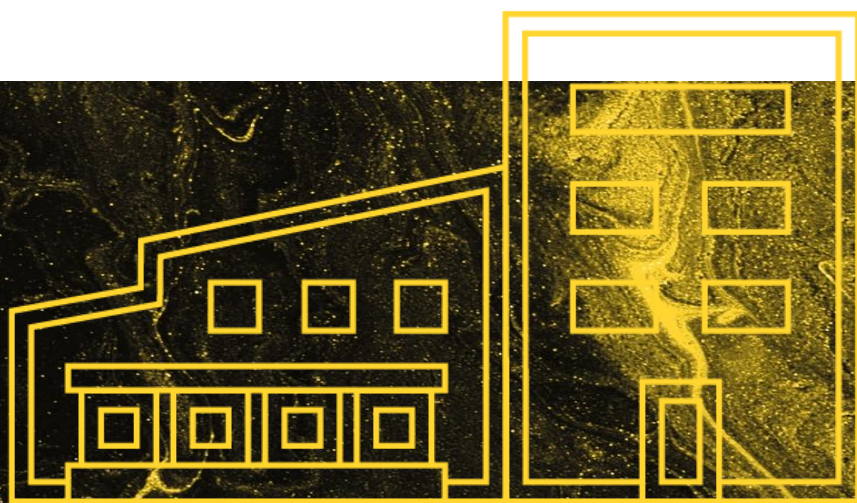


MRF test

PROTOCOL



WWW.COCET.FR/EN/

To contact us:

<https://www.cocet.fr/en/contact-us/>

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Glossary

MRF: Material Recovery facility – plant for sorting and pre-processing materials from comingled waste for resource recovery

Sample: item or unit packaging for each reference tested

Tested packaging: Packaging studied during testing at the MRF

Reference packaging: Packaging used as a reference and tested at the MRF alongside the packaging being tested, enabling analysis of the results. The reference packaging is defined by COCET.

Reference: type of packaging tested (e.g., tray with lid, cardboard box, etc.)

Synoptic: organization of the sorting system in a MRF (sequence of machines, flow paths)

Introduction

COCET

The mission of the Committee for Studying the Behaviour of Packaging in Sorting Centres (COCET) is to help designers and decision-makers develop household packaging that can be sorted in French sorting centres. The committee includes various stakeholders in the value chain for sorting household packaging (Citeo, Derichebourg Environnement, Pellenc ST, Sepur, Tomra) and works on household packaging (bottles, dispenser bottles, pots, films, cartons, bags, etc.) made of all kinds of materials (plastic, cardboard, metal), except glass. COCET's scope begins as soon as the packaging is placed in the French sorting bin by the consumer and continues until it exits the French sorting centre. The test protocols established by COCET are the result of work carried out with sorting industry stakeholders and a consensus on their representativeness.

This MRF test protocol was established by COCET. It is representative of the most used settings in France. This protocol is available to manufacturers who want to replicate the process used in French sorting centers. The sorting system separates packaging from selective collection into different streams and directs them to their respective recycling streams.

Version no.	Date	Description
I	November 2025	Initial version

I. Scope

The MRF test protocol evaluates the sorting behaviour of packaging made mainly of paper/cardboard, plastic, or metal across the entire sorting system in France.

For packaging made mainly of paper/cardboard or plastic, where only issues of detectability and material and color orientation during the optical sorting stage are important, the [COCET OS I Protocol](#) is preferable. It offers more flexible implementation (logistics, test organization) than tests in MRF.

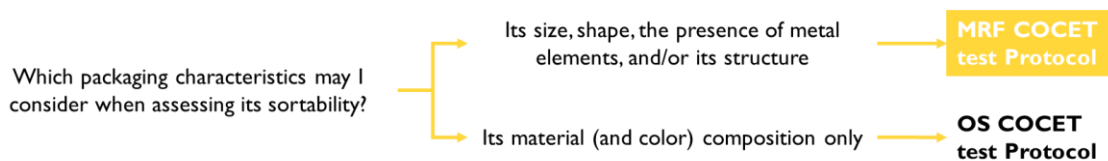


Figure 1 Determining the use of the MRF COCET Protocol

This protocol addresses the overall behaviour of packaging in the sorting centre but does not assess its recyclability during the recycling process in its designated stream.

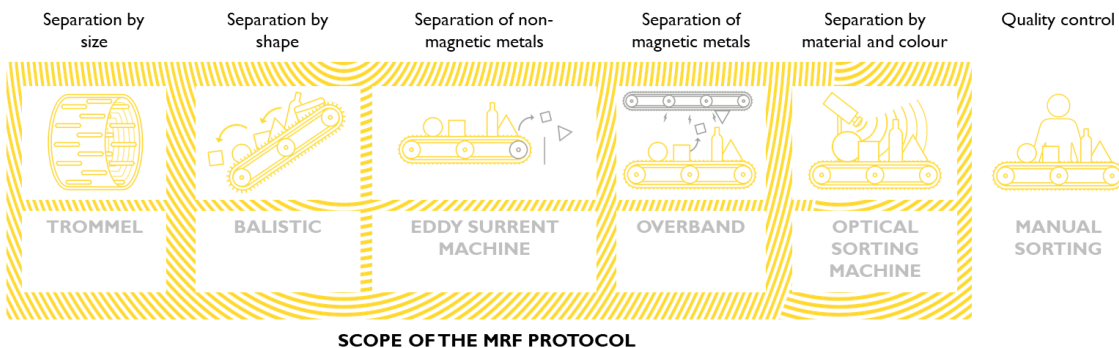


Figure 2 Scope of the MRF COCET Protocol

II. Aims

This protocol assesses whether packaging can be sorted at MRFs and directed to its recycling stream. It does not assess packaging recyclability. It is available to manufacturers wishing to independently assess whether their packaging can be correctly sorted. Tests conducted by a manufacturer in accordance with this protocol cannot be the subject of a specific COCET Notice. If desired, the Requester may share the results with COCET, which may, where appropriate, consider whether the sorting issue warrants further assessment through a General Notice.

The tests should be conducted in three different French MRFs to ensure that they are suitably representative.

COCET relies on the materials committees (COTREP, CEREC, ALUTREC, COTREM) to determine the target streams of each packaging tested.

III. Terms of reference

Any company (packaging manufacturer, marketer, producer, resin manufacturer, distributor, etc.) looking for determining whether its packaging can be correctly sorted at a French MRF can use this protocol to perform testing.

Companies wishing to perform tests will hereafter be referred to as the « **Requesters** ».

French Material Recovery Facility will hereafter be referred to as the « **MRF** ».

IV. Packaging eligible for testing

To ensure the tests reflect the operational conditions of French MRF, the packaging should comply with the parameters listed below. If not, COCET reserves the right to review the analysis and interpretation of the results.

Eligibility criteria for the packaging to be tested

1. The packaging should be household packaging as sorted by the consumer, consisting of all elements that may remain attached at the time of sorting after the product has been consumed, as defined in Citeo's recyclability methodology¹.
The packaging to be tested consists of a main element specifically sorted by the consumer and any associated elements. A definition of "main" and "associated" elements, and an illustrative list of elements generally considered as main or associated elements are provided in the recyclability methodology¹.
2. All types of packaging mostly consisting of (>50% by weight) plastic, paper/cardboard, or metal, of all types (bottles, flasks, trays, jars, cartons, bags, film, pouches, cardboard, etc.) are eligible.
3. Packaging may be new or used but should be emptied of its contents.
4. Packaging should be shaped to resemble packaging waste, meaning at least compacted and/or crumpled to replicate the compaction stage during collection by truck.

Note: The protocol does not apply:

- To packaging that does not have a majority material or does not belong to one of the material families listed in **Annex 3**
- To small packaging

If the Requester wishes to evaluate the sorting behavior of such packaging, they must contact COCET.

¹Recyclability methodology: <https://tree.citeo.com/en/>

V. Procedure for Requesters

Stage 1: Contact COCET

The Requester contacts COCET via the [contact page](#) on COCET's website, describing its request with the help of the document in **Annexe I**. If the Requester wishes to test the detectability of several packaging types (different materials, plastic resins, dimensions, thicknesses, shapes, etc.), it should inform COCET of this, specifying all the types of packaging it wishes to test. After reviewing the request, COCET will respond to the Requester indicating the number of tests that need to be performed.

Stage 2: Contact the MRFs

Once the test request has been validated and **Annexe I** has been submitted, COCET can help the Requester to identify three MRFs in order to discuss the financial and logistical arrangements. The budget and schedule for carrying out the tests will be provided by the MRFs.

Before testing, the Requester must review the observation and counting procedure for each reference tested at each SC. This is used to define:

- The location for injecting the samples
- The observation stations (in the cabin, in the process)
- The number of observers required

The report will be documented with synoptic (details of the sorting system) for each MRF.

Stage 3: Selection of a third party to perform the tests

To run the MRF tests (sample injection, counting), the Requester will pick a trusted third party with no interest in these tests and will document its identity.

Stage 4: Prepare the test samples

100 samples per reference, empty or emptied, are required to perform the test within each MRF. As the tests are to be run in 3 different MRFs, 300 samples (at least) per reference tested will be required.

	MRF 1	MRF 2	MRF 3	TOTAL
Test packaging	100 identical packaging	100 identical packaging	100 identical packaging	300 identical packaging
Reference packaging	100 identical packaging	100 identical packaging	100 identical packaging	300 identical packaging

Table 1 Number of samples to submit to test the packaging

The samples will be identified using paint (with an acrylic spray paint). If the packaging consists of several associated elements, each component will be identified and associated with the main body of the packaging.

The report will be documented with a photo of the 100 samples prepared by reference for each MRF.

The samples will be sent separately to the 3 MRFs. **Annex 2** will be completed and applied to each parcel and sent in advance of shipment by email to the MRFs. The deadline for sending samples prior to testing will be defined with the MRFs (minimum recommended deadline: 7 days before testing).

VI. Performance of tests

A. Set up in the MRF

Injected samples may emerge at any sorting table and in the material storage area. Nevertheless, depending on the packaging composition, it is possible to predict the tables at which most samples should emerge. The relevant output streams are listed for guidance in **Annex 3**.

Good practice: Inform the sorting operators in the sorting cabin that a test is underway so that they can set aside any bulging samples that arrive on their sorting table. For output streams where samples are expected, position an observer alongside the sorting operator at the relevant tables to optimize sample recovery.

B. Starting the test

Once the observers are in place, the samples can be injected one by one into the sorting process. This injection is carried out at the conveyor after the feeding hopper.

Good practice: if a storage area is provided at the feed point, samples may be injected immediately after it, directly onto the conveyor feeding the sorting system. This avoids excessive waiting time in the sorting cabin and does not affect the test results. If several references are scheduled for the test day, they may be introduced consecutively at the feed point, always one sample at a time.

C. Counting samples

Samples are collected from each sorting table and output streams. Counting is done at each collection point to determine the number of samples found in each output stream. This count is recorded in a table, which is attached to the report (see **Annex 4**).

The report will be documented with photos of the samples collected at each collection point.

VII. Results et Analysis

A. Calcul method

The counts are used to calculate the **Gross sorting performance** (*Gross perf.*) of the reference packaging and the test packaging. The target stream must first be identified (see **Annex 3**).

Gross sorting performance reflects the MRF's ability to direct a given packaging item to its target stream among the other packaging waste present, taking account of the system's actual operating conditions (MRF process, equipment models, stream composition, etc.). To obtain a representative view of the French market, the protocol requires testing at three different MRFs.

As this protocol is intended to assess the influence of design choices on packaging behaviour in a MRF, the analysis is based primarily on **Relative sorting performance** (*Relative perf.*).

Relative sorting performance is calculated from the Gross sorting performance results for the Test packaging and the Reference packaging. The latter provides a comparison point that neutralizes the influence of factors specific to the sorting system. **Relative sorting performance** therefore isolates the effects of the packaging design and assesses its ability to be directed to its target stream.

Calculation of Gross Sorting Performance

The **Gross sorting performance** is calculated for each Reference packaging and Test packaging introduced into the MRF.

$$\text{Gross perf test (\%)} = \frac{\text{No. test target stream}}{\text{No. test recovered}} \times 100$$

$$\text{Gross perf ref (\%)} = \frac{\text{No. ref target stream}}{\text{No. ref recovered}} \times 100$$

Where:

- *No. test target stream*: number of test packaging items found in the target stream
- *No. ref target stream*: number of reference packaging items found in the target stream
- *No. test recovered*: total number of test packaging items recovered overall
- *No. ref recovered*: total number of reference packaging items recovered overall

Please note: During testing in a sorting centre, some injected samples may not be recovered. They may recirculate through the system for longer than the test duration or be missed by the people recovering samples at the sorting tables. These are referred to as "lost" samples. Gross sorting performance is calculated using the samples recovered during counting, rather than lost samples whose routing could not be observed.

For the following calculations, the **Average** Gross sorting performance of the Test packaging at the three MRFs is used:

$$\text{Average Gross perf test (\%)} = \frac{\text{Gross perf test MFR1} + \text{Gross perf test MFR2} + \text{Gross perf test MFR3}}{3}$$

$$\text{Average Gross perf ref (\%)} = \frac{\text{Gross perf ref MFR1} + \text{Gross perf ref MFR2} + \text{Gross ref test MFR3}}{3}$$

Where:

- *Gross perf. test MRF1 (and respectively 2 and 3)*: gross sorting performance of the Test packaging at MRF 1 (and respectively 2 and 3)
- *Gross perf. ref. MRF1 (and respectively 2 and 3)*: gross sorting performance of the Reference packaging at MRF 1 (and respectively 2 and 3)

Calculation of Relative Sorting Performance

The **Relative sorting performance** of the test packaging is calculated by dividing the Average Gross sorting performance of that Test packaging by the Average Gross sorting performance of the Reference packaging.

$$\text{Relative perf test (\%)} = \frac{\text{Average Gross perf test}}{\text{Average Gross perf ref}} \times 100$$

Where:

- *Average Gross perf test*: Average Gross sorting performance obtained across the three MRFs for the Test packaging
- *Average Gross perf ref*: Average Gross sorting performance obtained across the three MRFs for the Reference packaging

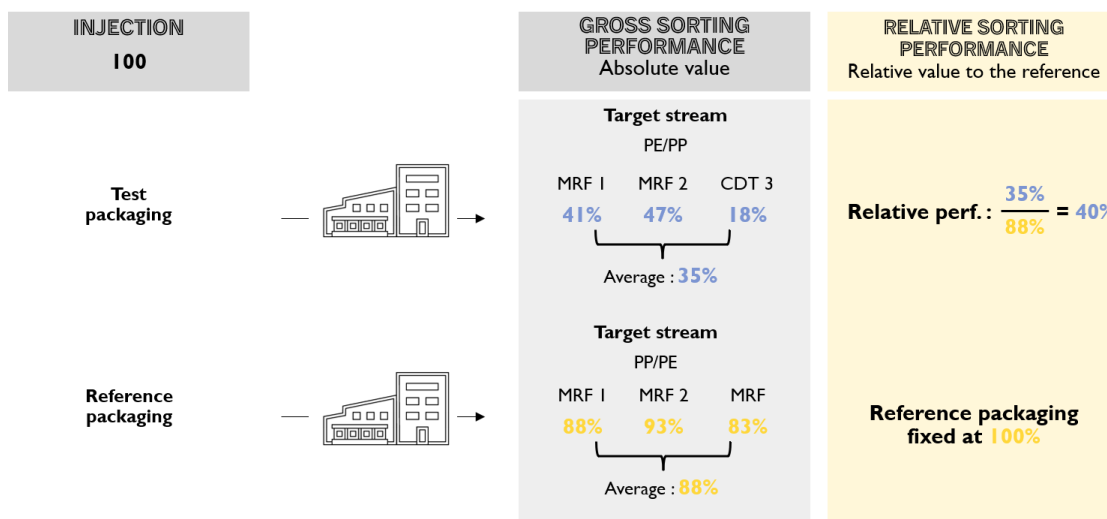


Figure 1 Example of calculating gross and relative sorting performance

Calculation of the Loss Rate

During a MRF test, some injected samples may not be recovered when the packaging is counted. For instance, some samples may recirculate through the MRF system for longer than the test duration or be missed by the operators recovering them from the sorting tables. These are referred to as “lost” samples.

The **loss rate** is calculated for each reference by dividing the number of samples not recovered by the number of samples injected.

- Number of samples injected: No. samples injected
- Number of samples found: No. samples recovered
- Number of samples not found, lost: No. of samples lost

$$\text{Loss rate (\%)} = \frac{\text{No. samples lost}}{\text{No. samples injected}} \times 100$$

The **Loss Rate** is an indicator of result reliability. Gross Sorting Performance is calculated from the packaging items recovered and identified within the different output streams. As the proportion of lost items increases, confidence in the result decreases, since the destination of a significant share of the injected packaging remains unknown.

A low Loss Rate increases confidence in the Gross Sorting Performance result, whereas a high Loss Rate may reduce confidence in its reliability and representativeness.

If the **Loss Rate** is $\geq 20\%$ for a given reference in one or more sorting facilities, the Gross Sorting Performance result should be interpreted with caution.

In such cases, COCET should be consulted to assess the reliability of the results and determine whether additional testing is required.

Please note: For example, a Gross Sorting Performance of 90% associated with a Loss Rate of 2% provides a much more robust result than the same performance obtained with a Loss Rate of 25%, where the destination of a substantial proportion of the injected packaging remains unknown.

B. Success criteria

For the packaging to be classified as well sorted, the following success criterion must be met:

The orientation of packaging in MRF is **Acceptable** if **Relative Perf. > 90%**

Otherwise, the orientation of the packaging during the optical sorting stage is **Not Acceptable**.

VIII. Test report

The Requester will provide COCET with a complete report containing the following information:

- A description of the samples tested, including photos, particularly after preparation (painting)
- For each MRF:
 - o The date of the test
 - o MRFs name and location
 - o MRF's synopsis (process flow diagram)
- A table containing the following information for each reference:
 - o The number of samples injected
 - o The counts of samples found for each sorting table (output stream), including photos for illustration
- For each reference, the calculation of the Raw Sorting Performance, the Relative Sorting Performance, and the Loss Rate
- The report must include the following sentences:
 - o "Tests have been conducted in accordance with the COCET test protocol – Assessment of packaging detectability in optical sorting processes – VI".
 - o "This report does not constitute a COCET Notice or an opinion regarding the recyclability of the packaging under study. It may be shared with COCET for the purpose of communicating the results. COCET will assess whether the sorting issue should be examined through a General Notice."

Annexe I : COCET MRF test request form

Company		IMAGE OF THE PACKAGING
First name, last name		
Position		
Email		
Telephone number		

DESCRIPTION OF THE PACKAGING TO BE TESTED

Packaging type	
Trade name/Reference number	
Targeted sorting issue	
Thickness	
Packaging dimensions	
Materials (exact composition of each material)	
Volume marketed	

REQUESTER'S UNDERTAKINGS

- ☐ **I HEREBY CONFIRM THE FOLLOWING:**
- I wish to conduct tests in accordance with the standard protocol set out by COCET.
 - I confirm that tests will be conducted within MRF, as approved by COCET.
 - **I agree to bear the entire cost of testing, which I will arrange directly with the MRFs.**
 - **I agree that the results will be sent to COCET for information.**

COMPANY STAMP

Date:

Last name, first name and
signature:

Annexe 2 : Document to be completed and attached to each package of samples

Purpose of testing COCET MRF protocol

Requester

Company

First name, last name

**Contact
MRF**

Test date ... / ... /

**Reference number of
the sample and
target material**

**What should be
done with the
samples after
testing?**

- ☐ Please do not return samples.
 - ☐ Please return samples after testing. The return address is:
 - Surname:
 - Street:
 - Postcode/city:
 - Country:
-

Annexe 3 Determining the target stream

The **target stream** is defined in coordination with technical committees (COTREP, CEREC, ALUTREC, etc.). We refer to “packaging compatible with its target stream,” meaning that its composition is compatible with the material recycling process and does not pollute or disrupt this stream.

To identify the target stream for packaging to be tested, its packaging family and therefore its majority material (material >50% by weight) must be determined.

Note: The protocol does not apply to packaging that does not have a main material or does not belong to one of the material families listed below.

Packaging family	Details	Target stream
Fibrous		
Composite paper-cardboard packaging	Packaging that contains more than 50% paperboard by weight and has another material (including surface coatings and varnishes) on at least one entire side of the paperboard material applied in a tightly bonded or cohesive manner. Example: Liquid packaging carton	Cardboard/Paper and Composite cardboard ²
Paper-Cardboard packaging	Paper-cardboard packaging that does not meet the Composite paper-cardboard definition and contains more than 50% paper-cardboard is therefore classified as Paper-Cardboard Packaging ⁵ Examples: cardboard box, paper bag	Cardboard/Paper and Composite cardboard ²

² Depending on MRFs and their vocabulary, several names can be used for these streams.

Packaging family	Details	Target stream
Graphic paper	Graphic paper is defined as any paper weighing less than 224 g/m². Examples: flyers, magazines, newspapers, envelopes, posters, instruction manuals, decorative paper, receipts, tickets, etc.	JRM
Plastic		
Clear and Blue PET Bottle	Bottle made of more than 50% clear or blue PET by weight	Clear PET bottle
Coloured, transparent, and opaque PET bottles (except blue)	Bottle made of more than 50% by weight of coloured or opaque PET	Coloured PET bottle
Rigid PE packaging	Packaging made of more than 50% by weight rigid PE	Rigid PE et PP
Rigid PP packaging	Packaging made of more than 50% by weight rigid PP	Rigid PE et PP
Rigid PS packaging	Packaging made of more than 50% by weight rigid PS	Rigid PS
Clear PET rigid packaging, single-layer and multi-layer	Packaging (other than bottles) composed of more than 50% rigid PET by weight	Clear PET tray
Flexible PE packaging	Flexible packaging composed of more than 50% LDPE, HDPE, BOPE, or OPE resin, etc., and which may deform when filled with product.	« Flux développement souple »
Flexible PP packaging	Flexible packaging composed of more than 50% PP, BOPP, or OPP resin, etc., which can deform when filled with product.	
Complex Flexible PE/PP packaging	Flexible packaging composed of more than 50% PP resin combined with PE.	

Packaging family	Details	Target stream
Metal		
Rigid steel packaging	Rigid packaging composed of more than 50% steel by weight. Examples: cans, tins	Steel
Large rigid aluminium packaging	Large rigid packaging made of more than 50% aluminium by weight. Examples: cans	Large aluminium
Small rigid aluminium packaging	Small rigid packaging made of more than 50% aluminium by weight. Examples: coffee pods, lipstick	Small aluminium
Flexible aluminium packaging	Flexible packaging made of more than 50% aluminium that can deform when filled with product.	Small aluminium

Annexe 4 Sample counting table

Note: Output streams from sorting cabins may vary from one MRF to another. Be sure to follow the sorting center names. The table below is provided for informational only.

	Reference 1	Reference 2	...
Fibrous			
PCC, ELA			
PCNC, EMR			
JRM			
GDM			
Gros carton			
Plastic			
Clear PET Bottle			
« Flux développement rigide »			
Rigid PE/PP			
Flexible PE/PP			
Metal			
Alu (Large)			
Alu (Small)			
« Fines » (small packaging)			
« Residue » (Process)			