# Index



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## 1. Objective

Define and quantify the risk points and acceptable quality limits associated with the use of mechanical PCR material in the manufacture of flexible tubes.

## 2. Scope

Extruded plastic tubes, IML ESTube plastic tubes, laminated tubes and their components made of mechanical PCR material.

## 3. Definitions - abbreviations

PCR = Post-Consumer Recycled

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# 4. Extruded plastic tubes made of PCR material

In cases where PCR materials are used, due to the specific characteristics of the material, several aspects have to be assessed.

## 4.1. Colour

The materials recycled as a result of the production process (in this case mechanical recycling) tend to be more or less coloured materials, which in some cases, and in high concentrations, significantly limit the colouring of the article to be manufactured.

Consequently, the variation in colour and opacity of the PCR pellet causes a variation in the colour and increases the opacity of the final tube.

| **Batch to batch opacity variability of PE PCR material** | |
|---|---|
|  |  |
| **Standard PE material** | **PE PCR Material** |

Between different batches of the same PCR material, there is a higher variability than usual in colour homogeneity, which will be transferred to the manufacture of coloured articles, in the form of a higher than usual colour-tone variability.

| **Batch to batch colour variability of PE PCR material** | | |
|---|---|---|
|  |  |  |
| **Standard PE material** | **PE PCR material Batch 1** | **PE PCR material Batch 2** |

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In the particular case of the appearance of the tube decoration, this may be affected as a result of the modification of the background of the tube. The use of the PCR material changes the colour of the sleeve, more so as the PCR % increases, which changes the perception of the decoration, its appearance, which must be taken into account and assessed.

| ASPECT DESIGNATION | SPECIFIC DETAILS |
|---|---|
| Variation of background and/or inks colour | $\Delta E \leq 6$ with respect to original sample |

→ **The result of colour variations in the tube is inherent to the PCR material, therefore COLOUR CARDS CAN NOT BE SUPPLIED.**

## 4.2. Inclusions that produce appearance defects

The PCR material randomly contains small "inclusions" (particles of coloured material, infusions, etc.). The number and location of inclusions in the tube cannot be controlled.

During the tube extrusion/co-extrusion process, the "inclusion" can create a number of externally visible defects.

Similarly, a number of surface irregularities may be created on the inner surface, which will not be considered as a defect.

The defects that can be created are as follows:

- Bumps
- Depressions
- Scratches
- Black or white dots

In schematic mode:

| DEFECT | EFFECT IN EXTRUSION / COEXTRUSION PROCESS | EFFECT IN DECORATED END TUBE |
|---|---|---|
| Bumps | Small bumps | Lack of decoration (*) |
| Depressions | Small hollow | Lack of decoration (*) |
| | Elongated hollow | Lack of decoration (*) |
| Scratches | Longitudinal scratches | Lack of decoration |
| Black or white dots | Visible black or white dots (depending on the area where they are) | Visible black or white dots (depending on the decoration) |

(*): directly visible or when performing the decoration adherence test with adhesive tape

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→ **It is important to take into account all defects present in an item for its judgment. For example:**

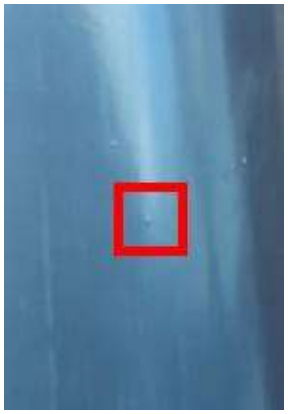
- **If the item has 2 minor defects, this item will be counted as a defective item with a minor defect.**
- **If there are 2 defects of different categories in the article, this item will be counted as a defective item with the most serious defect.**

### 4.2.1. Bumps

These are small deformations that come out from the surface of the tube, that produce quality defects compared to the usual standards with all decoration technologies (offset, flexography, silkscreen and stamping).

On tubes with adhesive labels, bumps may cause bubbles under the label (the size of the bubble may be larger than the size of the bump), in which case this shall not be considered as a defect.

- The minimum assessable size of a bump is:
  - Ø1,25 mm in not decorated areas.
  - Ø1,5 mm in areas with decoration (offset, flexography, silkscreen and stamping).

| **Bumps** | |
|---|---|
|   |   |
| **Quantity:** ≤ 4 | **Quantity:** > 4 |
| **OK** | **minor** |

→ **After the decoration adherence test with adhesive tape, the size of the defect will not be assessed.**

→ **The use of pearly dyes increases the magnitude and quantity of defects by 25%.**

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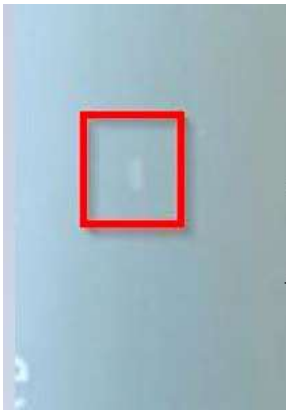
### 4.2.2. Depressions

These are small deformations that come in from the surface of the tube, that produce quality defects compared to the usual standards with all decoration technologies (offset, flexography, silkscreen and stamping).

In tubes with adhesive labels the depressions may cause bubbles under the label (the size of the bubble may be larger than the size of the depression), in which case it shall not be considered as a defect.

- The minimum assessable size of a depression is:
  - Ø1,25 mm in not decorated areas.
  - Ø1,5 mm in areas with decoration (offset, flexography, silkscreen and stamping).

| **Depressions** | |
|---|---|
|   |   |
| **Quantity:** ≤ 4 | **Quantity:** > 4 |
| **OK** | **minor** |

→ **After the decoration adherence test with adhesive tape, the size of the defect will not be assessed.**

→ **The use of pearly dyes increases the magnitude and quantity of defects by 25%.**

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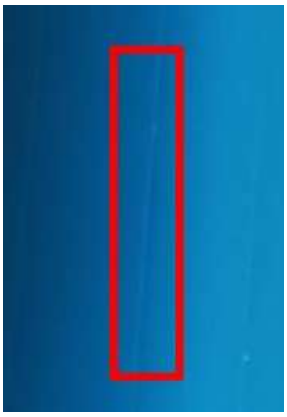
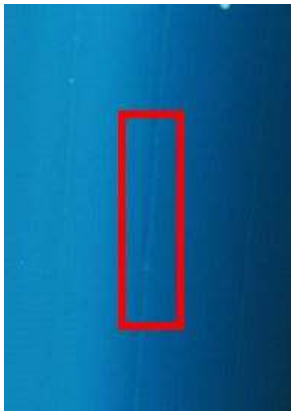
### 4.2.3. Longitudinal scratches

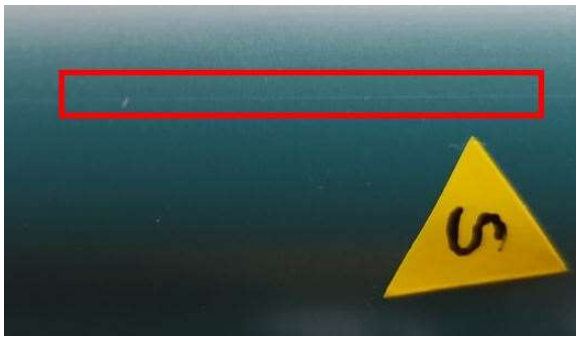
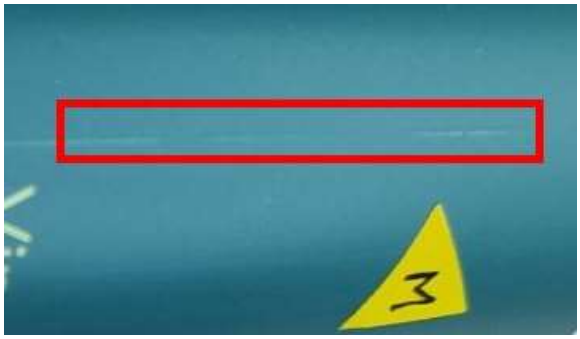
These are longitudinal scratches which appear in the extrusion/co-extrusion process due to inclusions and produce quality defects compared to the usual standards, with special incidence in mass decorations and matt varnished tubes with all decoration technologies (offset, flexography, silkscreen and stamping).

On tubes with adhesive labels, longitudinal scratches may cause the label to lift at the edges, in which case this shall not be considered a defect.

| **Longitudinal scratches** | |
|---|---|
|   |   |
| **Quantity:** any quantity<br>**Size:** not visible at 30 cm | **Quantity:** > 2<br>**Size:** clearly visible at 30 cm |
| **OK** | **minor** |

→ **The use of gloss and satin varnishes is recommended.**

→ **The use of matt varnishes increases the magnitude of the longitudinal scratches, compared to satin varnishes, hence in cases where matt varnish is used, the defects will not be assessed.**

| | |
|---|---|
|  |  |
| **Effect with satin varnishes** | **Effect with matt varnishes** |

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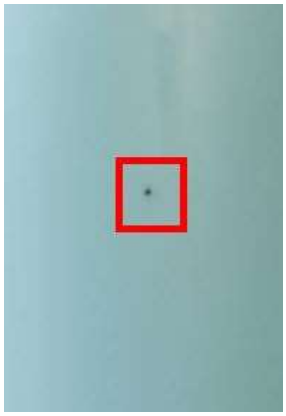
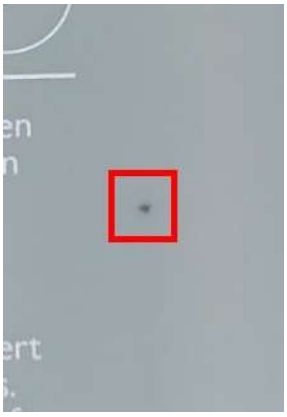
### 4.2.4. Black or white dots

These are unavoidable dos that can appear on either internal or external surfaces of the tube, that produce quality defects compared to the usual standards in those areas not covered by the decoration.

#### *4.2.4.1. Black or white dots on sleeves made of PCR material*

- Black or white dots shall be assessable at a distance of 30 cm.
- The minimum assessable size of a black or white dot is 1,25 $mm^2$.

| **Black or white dots on sleeves made of PCR material** | |
|---|---|
|   |   |
| **Quantity:** ≤ 4 | **Quantity:** > 4 |
| **OK** | **minor** |

→ **For natural or transparent tubes, where all defects are visible, the acceptable quality limit will be ≤ 5 points.**

#### *4.2.4.2. Black or coloured dots and/or bursts in caps made of PP PCR material*

- Applies to the visible surfaces of the assembled closure, that is, defects on the inside of the closure will not be assessed.
- Points and/or bursts shall be assessable at a distance of 30 cm.
- The minimum assessable dot and/or burst size is 1,25 $mm^2$.

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| Black or coloured dots and/or bursts in caps made of PP PCR material | |
|---|---|
|   |     |
| **Quantity:** ≤ 4 | **Quantity:** > 4 |
| **OK** | **minor** |

#### *4.2.4.3. Black dots on heads made of PE PCR material*

- Black dots that may be on the head shall not be considered as a defect with the cap assembled, as in most cases the head is hidden under the cap.

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# 5. IML ESTube plastic tubes made of PCR material

In cases where PCR materials are used, due to the specific characteristics of the material, several aspects have to be assessed.

## 5.1. Colour

The materials recycled as a result of the production process (in this case mechanical recycling) tend to be more or less coloured materials, which in some cases and in high concentrations significantly limit the colouring of the articles to be manufactured. PP PCR materials tend to be more greyish than PE PCR materials.

Consequently, the variation in the colour and opacity of the PCR pellet causes a variation in the colour and opacity of the final tube which in some cases may be hidden by the opacity of the label, as far as the sleeve is concerned. However, this difference in colouring will be noticeable in the head and inside the tube.

Between different batches of the same PCR material, there is a higher variability than usual in colour homogeneity, which will be transferred to the manufacture of coloured articles, in the form of a higher than usual colour-tone variability.

| **Batch to batch colour variability of PP PCR material** | | |
|---|---|---|
|  |  |  |
| **Standard PP material** | **PP PCR material Batch 1** | **PP PCR material Batch 2** |

In the particular case of the appearance of the tube decoration, this may be affected as a result of the modification of the background of the tube. The use of the PCR material changes the colour of the sleeve, more so as the PCR % increases, which changes the perception of the decoration, its appearance, which must be taken into account and assessed.

| ASPECT DESIGNATION | SPECIFIC DETAILS |
|---|---|
| Variation of background and/or inks colour | $\Delta E \leq 6$ with respect to original sample |

→ **The result of colour variations in the tube is inherent to the PCR material, therefore COLOUR CARDS CAN NOT BE SUPPLIED.**

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## 5.2. Inclusions that produce appearance defects

The PCR material randomly contains small "inclusions" (particles of coloured material, infusions, etc.). The number and location of inclusions in the tube cannot be controlled.

During the tube extrusion/co-extrusion process, the "inclusion" can create a number of externally visible defects, such as:

- Black or coloured dots
- Bursts of coloured material

In schematic mode:

| DEFECT | EFFECT IN EXTRUSION / COEXTRUSION PROCESS | EFFECT IN DECORATED END TUBE |
|---|---|---|
| Black or coloured dots | Visible black or coloured dots (depending on the area where they are) | Visible black or coloured dots (depending on the type and decoration of label) |
| Bursts of coloured material | Visible bursts of coloured material (depending on the area in which they are) | Visible bursts of coloured material (depending on the type and decoration of label) |

→ **It is important to take into account all defects present in an item for its judgment. For example:**

- **If the item has 2 minor defects, this item will be counted as a defective item with a minor defect.**
- **If there are 2 defects of different categories in the article, this item will be counted as a defective item with the most serious defect.**

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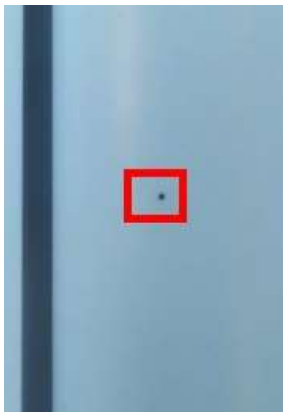
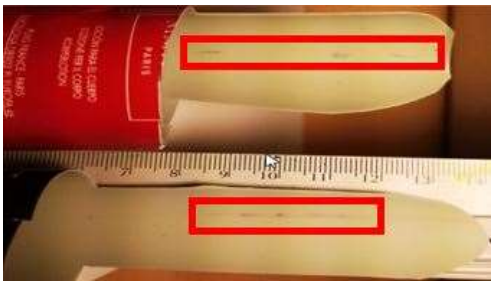
### 5.2.1. Black or coloured dots and/or bursts

These are unavoidable dots and/or bursts that can appear on either internal or external surfaces of the tube, that produce quality defects compared to the usual standards.

#### *5.2.1.1. Black or coloured dots and/or bursts on sleeves made of PP PCR material*

- Dots and/or bursts on the inner surface of the sleeve: dots and/or bursts that can be seen on the inside of the sleeve shall not be considered as non-conformities, as they are the result of inherent inclusions in the PCR material.
- Dots and/or bursts on the outer surface of the sleeve: for sleeves made from labels which are not natural or transparent, the dots and/or bursts are not noticeable as they are covered by the label itself. For natural or transparent labels:
    - Points and/or bursts shall be assessable at a distance of 30 cm.
    - The minimum assessable size of a dot and/or burst is 1,25 $mm^2$.

| **Black or coloured dots and/or bursts on sleeves made of PP PCR material** | |
|---|---|
|    |   |
| **Quantity:** ≤ 4 | **Quantity:** > 4 |
| **OK** | **minor** |

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### *5.2.1.2. Black or coloured dots and/or bursts in caps made of PP PCR material*

- Applies to the visible surfaces of the assembled closure, that is, defects on the inside of the closure will not be assessed.
- Points and/or bursts shall be assessable at a distance of 30 cm.
- The minimum assessable dot and/or burst size is 1,25 $mm^2$.

| **Black or coloured dots and/or bursts in caps made of PP PCR material** | |
|---|---|
|   |     |
| **Quantity:** ≤ 4 | **Quantity:** > 4 |
| **OK** | **minor** |

### *5.2.1.3. Black or coloured dots and/or bursts on heads made of PP PCR material*

- Black dots that may be on the head shall not be considered as a defect with the cap assembled, as in most cases the head is hidden under the cap.

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# 6. Laminated tubes made of PCR material

In cases where PCR materials are used in the heads and caps, due to the specific characteristics of the material, several aspects have to be assessed.

## 6.1. Colour

The materials recycled as a result of the production process (in this case mechanical recycling) are usually more or less coloured materials, which in some cases, and in high concentrations, significantly limit the colouring of the article to be manufactured.

Consequently, the variation in colour and opacity of the PCR pellet causes a variation in the colour and increases the opacity of the final tube.

Between different batches of the same PCR material, there is a higher variability than usual in colour homogeneity, which will be transferred to the manufacture of coloured articles, in the form of a higher than usual colour-tone variability.

| **Batch to batch colour variability of PCR material** | | |
|---|---|---|
|  |  |  |
| **Standard material** | **PCR material Batch 1** | **PCR material Batch 2** |

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## 6.2. Inclusions that produce appearance defects

The PCR material randomly contains small "inclusions" (particles of coloured material, infusions, etc.). The number and location of inclusions in the tube cannot be controlled.

During the tube extrusion/co-extrusion process, the "inclusion" can create a number of externally visible defects, such as:

- Black or coloured dots
- Bursts of coloured material

→ **It is important to take into account all defects present in an item for its judgment. For example:**

- **If the item has 2 minor defects, this item will be counted as a defective item with a minor defect.**
- **If there are 2 defects of different categories in the article, this item will be counted as a defective item with the most serious defect.**

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### 6.2.1. Black dots

These are unavoidable dots that can occur on either internal or external surfaces of the heads and caps that produce quality defects compared to the usual standards.

#### *6.2.1.1. Black or coloured dots and/or bursts in caps made of PP PCR material*

- Applies to the visible surfaces of the assembled closure, that is, defects on the inside of the closure will not be assessed.
- Points and/or bursts shall be assessable at a distance of 30 cm.
- The minimum assessable dot and/or burst size is 1,25 $mm^2$.

| **Black or coloured dots and/or bursts in caps made of PP PCR material** | |
|---|---|
|   |     |
| **Quantity:** ≤ 4 | **Quantity:** > 4 |
| **OK** | **minor** |

#### *6.2.1.2. Black dots on heads made of PE PCR material*

- Black dots that may be on the head shall not be considered as a defect with the cap assembled, as in most cases the head is hidden under the cap.

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## 7. Organoleptic characteristics

The organoleptic properties of the recycled material are not comparable with the usual virgin PE or PP materials, so articles made of PCR materials may be affected in this respect, more or less noticeably depending on the composition of the PCR material.

The odour of PCR material may vary from batch to batch.

Currently PE PCR suppliers inform us in their analysis bulletins about the limits of volatile substances and organoleptic measurements, guaranteeing that they are within their pre-set values. Work is being done for the cases of PP PCR suppliers to obtain the same guarantee for their products.

To the best of our knowledge, and with the current experience of our customers, no impact on the fragrance of the product in the bulk has been found.

This characteristic cannot be assessable to define the conformity of the product.

## 8. Influence of PCR material on other aspects

PCR materials are recycled materials which, while maintaining a certain degree of performance, cannot achieve 100% of the performance of a first-class virgin material. As a result, certain aspects may be changed.

The customer must be aware of the above aspects, and packaging containing PCR material in its composition must be strictly validated by the customer, especially with regard to compatibility/stability tests, in order to assess aspects related to migrations, etc.

## 9. Environment, Health & Safety, CSR and others

Food contact:

Currently approved materials have different certifications for food contact compliance.

The customer must assess in particular the suitability of the use of these raw materials from a regulatory point of view.

Regulatory information on PCR materials may be provided upon signature of a confidentiality agreement.

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## 10. Associated documents

| Denomination | Document code |
|---|---|
| Technical Specifications - Extruded plastic tubes and plastic caps | E.00.00000 |
| Technical Specifications - Laminated tubes and plastic caps | E.00.00001 |
| Technical Specifications - IML ESTube plastic tubes and plastic caps | E.00.00002 |

## 11. Approvals and changes

| | | |
|---|---|---|
| Owner | QMS Resp. CTL-TH Engineering<br>Ezkurra Jorge | SIGNATURE |
| Reviewed | Technical Director CTL-TH Engineering<br>Valpuesta Juan Ignacio | SIGNATURE |
| Approved | Technology Group Director<br>Fdz. de Mendiola Javier | SIGNATURE |

| | |
|---|---|
| Summary Modification | Creation |
| Supersedes | Initial version |


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