Good Practice for Testing Odour and Taint in the Flexible Packaging Industry

Presented by Member Companies of Flexible Packaging Europe at a Workshop on Sensory Science in Ispra on 29th November 2011
Introduction

- Flexible Packaging Europe (FPE) represents the larger converters of flexible packaging in Europe
  - Some 60 member companies
  - Also national flexible packaging associations are associate members
  - Represents some 75% of European converted flexible packaging production
- Participants
  - Aline Ditche from Amcor Flexibles, Sarrebourg, France
  - Barbara Hochecker from Constantia Teich, Weinburg, Austria
  - Maurizio Rossi from Giflex, the association of Italian converters, and Sealed Air, Milano, Italy
Flexible Packaging Production Process

- Some companies extrude plastic films from resin
- Most buy in rolls of paper, plastic and aluminium foil
- They also buy in “wets” – inks, solvents, adhesives, coatings
- They combine these materials by printing, laminating and coating processes to make large “mother” rolls
- These are slit into shorter, narrower reels
  - Sometimes they are made into pre-made pouches and bags
- Despatched to food packer, normally for use on automated packaging machinery
Flexible Packaging Industry Structure

- Typical production facility employs 50 – 500 people
- More than 1,000 products (different structures, thicknesses, print designs etc)
- Typically 2,000 to 5,000 production orders p.a.
- Little production for stock; most is made to satisfy a particular customer demand
- Time from production to despatch – normally 1 to 7 days, at most 10 days.
- Production personnel are usually not suitable for doing taint and odour testing due to their exposure to solvents
- From a practical viewpoint, it is impossible to test each order
Definitions

• Odour Test. Evaluation of the odour of the material itself
  – Since all materials have some odour, aims to detect anything that is stronger than normal, unusual or unpleasant
• Taint Test. Evaluation of the taste of a food or model foodstuff following its contact with the material in question.
• Triangular Test. Where the tester is presented with three samples, two control and one test. He or she must identify which is different from the other two. The scores are evaluated on a statistical basis. An example is the Robinson test
• Scoring Test. Where a panel of testers give samples a score according to a pre-defined numerical system
• Ruckle Test. A subjective test where one ruckles/ wrinkles/ scrunches the material and then and sniffs it.
As producers of Flexible Packaging, we have to control the risk of odour on our material and the risk of the food product being tainted.

The Robinson Test cannot be a routine test.

That’s why we have developed odour test methods that can be practised on our sites and aligned with customers’ methods.

These tests are carried out at the last step of production and are used to take a decision about the acceptability of a run.
Sensory Room
Testing Location

• Ideally, this should be a dedicated room
  – Calm and away from production, solvents and other odorous substances
  – Temperature = 20°C +/- 2°C
  – Uniform and controlled lighting
  – No aggressive colours on walls and ground no distraction by pictures
  – Separate area for storage and preparation
  – The testers are sitting in individual cabins so that they can’t see each other and influence them
• Even if many smaller companies cannot afford the money or space for such a dedicated room, they should still try to keep to the above principles as much as possible
Panel

• Ideally, 15 to 20 persons trained. The session should be done with at least 6 panellists.
• The panel could represent the whole population as much as possible:
  – Administration, technical, lab, persons who worked before in the production but who have now a new job

  *The production workers have a big experience of the material but could be saturated by the odours and be influenced in their assessment.*

• The persons have to be available on regular basis.
Selection of the Panel

• These persons have to be motivated by this activity and interested in receiving new knowledge.

• They have to fill the questionnaire so that we be sure that they do not have specific problems that could affect their senses: diabetic, asthmatic, allergic, smokers …

• They have to be conscious of the rules (no perfume, no coffee, no foods before testing), they have to inform when they are absent and they have to be available in case of urgent tests.
• Family Name:
• First Name:
• Sex:
• Date of birth :
• Department :
• Occupations:
• Normal days and hours of work :
• Office telephone :
Sensory Analysis Questionnaire

( 2 )

• Questions about health:
  – Are you diabetic, asthmatic, allergic?
  – Do you have frequent colds or sinus problems, problems with teeth, high blood pressure?
  – Do you regularly take any medication which affects your senses of taste and smell?

• Questions about habits:
  – What are your favourite foods?
  – What foods do you dislike?
  – What food can you not eat at all?
  – Do you diet on a regular basis?
  – Do you know if you lack the ability to taste or smell one or more substances?
• Other questions:
  – How were you informed about this new activity?
  – Do you think sensory analysis is useful? In what way?
  – Have you ever done tasting tests before?
  – Do you smoke?
  – If not, have you stopped smoking in the last six months?

*it’s not proved that smokers perform less well but we know that people who have recently stopped may have different perceptions.*
PANEL TRAINING
Sensorial Analysis Presentation

- A theoretical presentation could be organised for the future testers by an Expert (e.g. from University).

- The aim is to explain them how our senses are running and to make them conscious how this activity is important.

- A first training could be organised:
  - test of the 5 fundamental savours
  - test with familiar aroma
• Test with different concentrations of a well known molecule (e.g. from solvent used in production).
• Triangulation test.
• Test to check the capability of the panellists to describe their perceptions.
• We have to select the panellists for their interest, for their sensitivity and skill in evaluating odours from packaging materials.

*Their first evaluation could be an opportunity to eliminate poor performers.*
Regular Training

• Regular controls should be organised to train new testers and to monitor the performance of the panel.

• Tests to check the ability of the panellists to range different concentrations of a substance.

• Tests to check the reproducibility and repeatability of the answers.

• The procedure of monitoring should involve a qualitative test with reference samples which release typical odours (solvents, films, adhesive, cold seal, inks …).
  But due to the evolution of the odours inside the materials, this control is the most difficult to apply.
Evaluation of the Panel

- The results of each panellist are recorded.
- The % of good answers is used to conclude if the panellist has succeed or not.
- If the test has failed, a second chance is given to the panellist in the next months.
- If the test failed a second time, the panellist could be excluded.
Testing in Practice
Good Practice in Odour/ Taint Testing in Flexible Packaging

- Testing of odour & taste transfer from the package to the foodstuff poses a number of issues related to:
  - Nature of the detected undesired sensory defect
  - Conditions of usage
  - Subjective judgement
- Testing may be needed at three points
  - During the development of the packaging material
    - e.g. new structure, new process, new food packed
  - During the routine production of structures intended for high risk foods and/ or using high risk materials or processes
  - In case of queries from the food packer or the market
Industrial Tests

- These must be quick and practical:
  - For development work, there is time for both odour and taint
    - Food packer should be involved – knows the food better
  - For routine testing of production, effectively means odour tests only.
- These tests should be aligned with customer test methods and scoring. It’s more important than a theoretically « perfect » test method.
- Usually, the most important customer may in a practical way determine the exact test method used.
Issues

• Definition of what/how is the “foreign” odour/taste
• Food/Package contact mode
• Frame
  • Package Development
  • Commercial Product
• Hypothesis about origin
  • Defective product
  • Spoilage
  • Environment
  • Package
Typical Problem Cases

- Printed Materials in Rollstock Form
- Materials with specific additives (antifog, waxes etc)
- Material with barrier on the “out-side” and printing/lamination on the “in-side”
- Materials containing:
  - Styrenics
  - Elastomers
  - Mineral oils

-And a sensitive food!
Approach

• Identify a sensitive, reproducible, representative model foodstuff to cope with most applications

• Utilise/Adapt a recognised method

• Method has to be flexible so as to match with many possible tainting agents

• Reproduce packaging material utilisation conditions
Practical Tests – Example 1

- Taint test using triangular method
- Follow indications of UNI 10192
  - a) model foodstuff – mild sliced melted cheese
  - b) contact with the packaging material under test with the model foodstuff for 1 week at refrigerated temperature
  - c) evaluate detectability of taste transfer with a group of selected panellists (usually 16) using a triangle test
- Using the relevant statistical table it can be determined whether the test sample show detectable foreign taste or not (with 16 panellists the minimum of correct identification is 9 for a 95% level).
- Quantify the extent and possibly define the features of the foreign taste is also tried
### Triangle Test with Score

Panelist: ____________________________  Placement: ____________________________  Date: ____________________________

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<td>320</td>
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Three samples are shown, 2 samples are equal to each other and the other one is different. Indicate what is the odd sample and score it:

1. Foreign taste hardly detectable and difficult to be defined
2. Weak but definable foreign taste
3. Evident foreign taste
4. Very evident foreign taste

If a score equal or above 2 has been given, describe the type of foreign taste: ____________________________

ANY COMMENT: ____________________________________________

Panelist signature: ____________________________

A Division of EAFA
## Panel Result Working Out

### Triangle Test Results

<table>
<thead>
<tr>
<th>Panelist</th>
<th>Order</th>
<th>Correct Answer</th>
<th>Given Answer</th>
<th>Answer Is</th>
<th>Yes</th>
<th>No</th>
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<tr>
<td>3</td>
<td>AAB</td>
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<tr>
<td>4</td>
<td>BAA</td>
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<tr>
<td>5</td>
<td>ABA</td>
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<tr>
<td>8</td>
<td>ABA</td>
<td></td>
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</tr>
</tbody>
</table>

**N° total panelists:**

**N° total correct answers:**

**Result:**

**Comments:**
How to proceed

- Following panel test indications:
  - a) Verify hypothesis about origin of sensory defects by changing some potential causative factors and verifying the effect
  - b) Address possible analytical technique – such as GC - to quantify undesired compounds. Possible only in a limited number of cases
Practical Tests – Example 2

• Odour test on routine production
  – The actual level of routine test will depend on the range of products.

• Method
  – The sample should be wrapped in aluminium before being tested.
  – Glass is recommended for sample containers.
  – All equipments used shall be free from odour and only use for sensory analysis.
  – The test should be carried out with at least 6 panellists.
Practical Tests – Example 2

- No more than 6 samples should be tested within the same session to prevent saturation of the olfactory organs of the panellists.
- Due to the difficulties in keeping a standard reference sample over time, the reference is usually an empty jar.
- We examine the distribution of the scores and calculate the median score within the panel.
- When the median is equal or greater than the limit given by the customer, the packaging material is considered as unacceptable.
Practical Tests – Example 3

- "Ruckle" test
  - Does not aim to be scientific
  - However, quick and easy
  - Especially useful to alert to possible contamination of raw materials or breakdown in process
- Method
  - Material is gently ruckled using both hands and smelled
  - Relies on experience of tester to pick anything that is not normal
- Suspect material should be re-tested using more precise methods