

Materials - Environment - Process intensification

Evaluation of an innovative coating for VOC/odour reduction in indoor environment

Atmos'Fair
16 & 17 October 2018



1. Introduction

2. Odour and emissions from materials

3. Case study : paints reducing undesirable odour/VOC

- Methodology
- Results

4. Conclusion

Indoor Air Quality (IAQ) context :

- Consumers awareness has increased :
 - more stringent demands regarding quality of life, e.g. comfort, safety
 - information by public authorities, consumers organisations and health professionals
 - media coverage
- Impact of environmental issues :
 - compliance with legal requirements
- Compliance with customer requirements (pressure from end-users)
 - labels and producers awareness
- Marketing issues (odourless and low VOC grades)



Home office

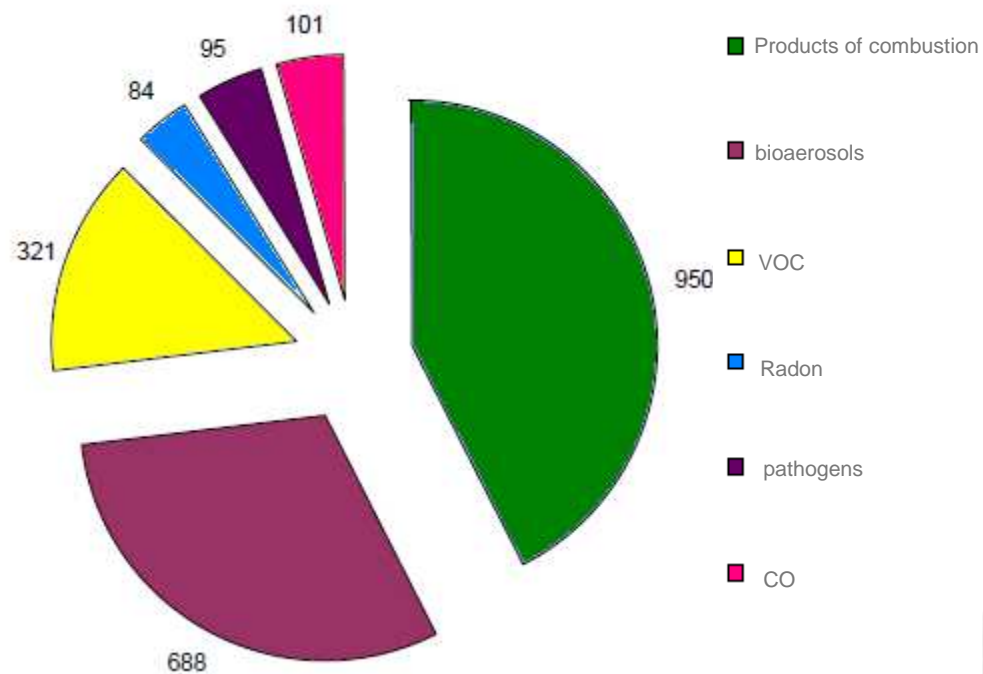


Transport



Manufacturing site

Indoor air quality: a public health issue



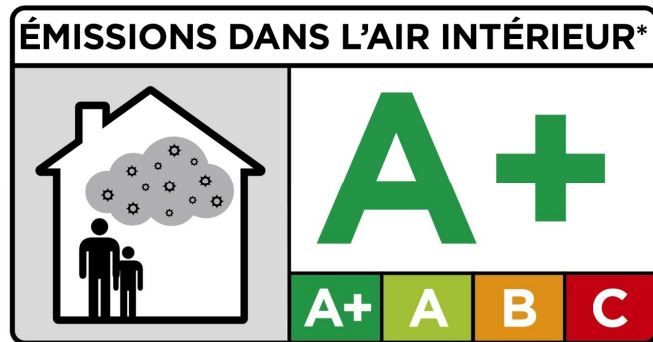
Contribution of indoor air exposure to the disability rate in Europe, DALY / year. Excluding passive smoking.

Source: Envie project



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Building regulations



Ausschuss zur
gesundheitlichen
Bewertung von
Bauprodukten



-Harmonised testing for building products
(Construction Products Regulation)

-Harmonisation framework using the EU-LCI
concept (ECA report 29, 2013)

-Belgian Royal Decree with limit values

-French Decree

-German Ü-Mark

-Different labels



Research & Development Partner for Industries

Services

Analytical support
Problem solving
Quality control
Regulatory assessment

Industrial projects

Product/process development
Product/process improvement

Collaborative projects

Competence development
Product development
Process development



- Certech has expertise in odour and air sampling for 35+ years

- Knowledge of different applications such as:
 - food packaging (off-flavour problem solving)
 - cosmetic and medical packaging
 - consumer products
 - transport
 - building products
 - indoor air quality



- Automotive and ISO 17025 accreditations



N° 400 TEST



PSA PEUGEOT CITROËN

Questions from
industry, national
laboratories,
universities ...



Analytical support



Problem solving



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- 2nd set of experiments

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Key steps of action

Tools

1 - Characterisation of emissions



Chemical and odour analysis,
correlation odour/off-flavour

2 - Identification of the causes
Diagnosis



Knowledge of polymer formulation,
degradation and migration phenomena

3 - Remediation



Impact of process, formulation,
treatments,... (synergy of core skills :
materials, environment, process
intensification)

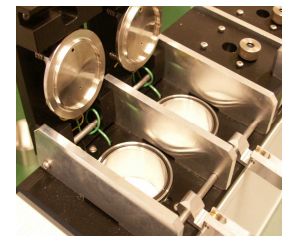
4 - Evaluation



Labels, schemes, standards but also
“quick” and “cost effective” pretest



A : Conditioning



B : Sampling



C : Analysis

Chemistry

Odour

Odour quantitative analyses

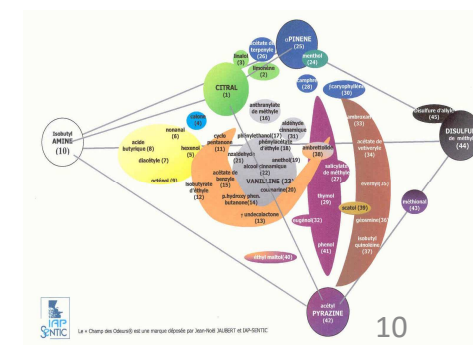
Odour qualitative analyses



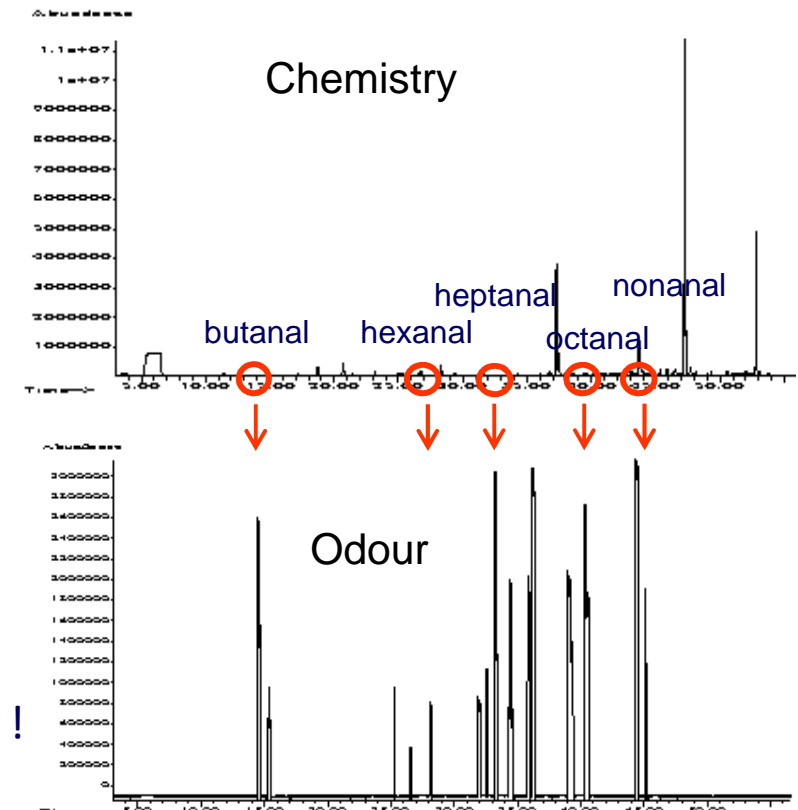
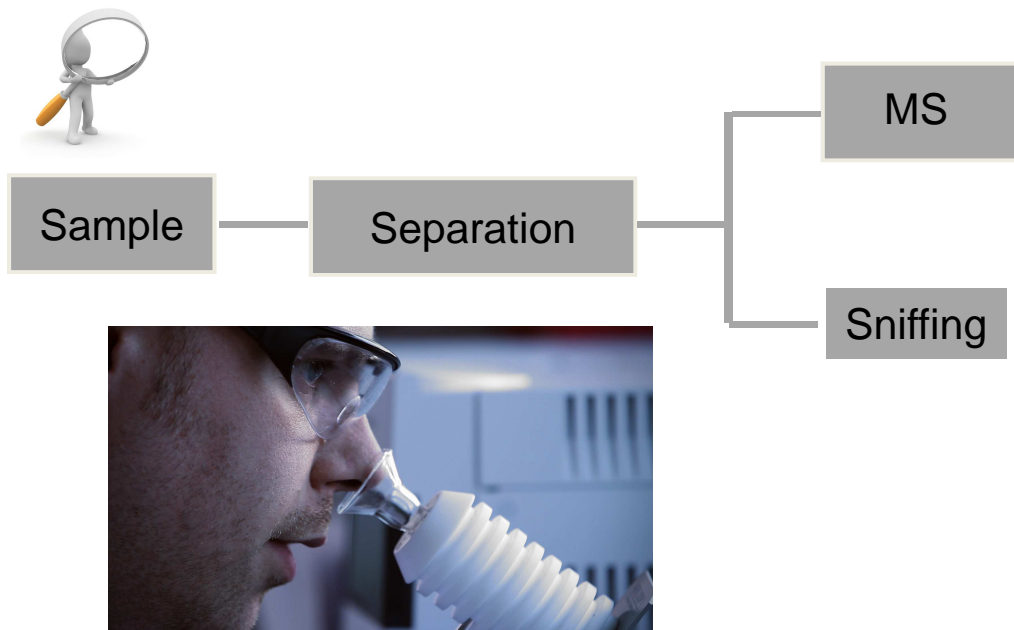
Measurement after
dilution of the air sample
EN 13725

Direct measurement
Intensity scale

ISO 5496
« Field of odours »



- 2 sensory rooms complying with standards
- Different panels (representative of the population, calibrated, trained)
- Accredited according to EN 13725 for dynamic olfactometry measurements and intensity scale
- Identification of odorant substances and correlation with chemistry by GC-MS-Sniffing analysis with expert panels



Minor compounds could be responsible of odour !

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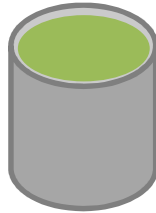
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Our methodology to study the efficiency of additivated coatings

Odorous mixture

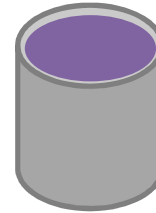


Paint A with additive



Paints with additives

Paint B with additive

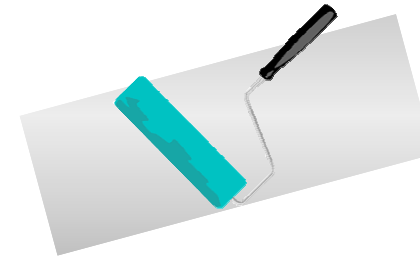


Paint C with additive



A) Samples preparation :

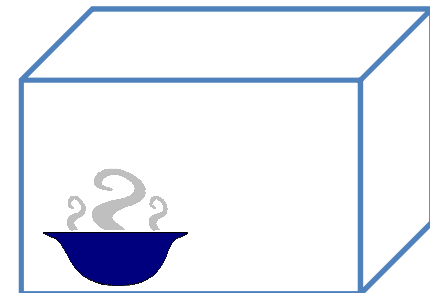
two layers were applied on aluminum plates
drying before the test



B) Generation of odorous atmosphere in an emission chamber : odorous mixture placed in a 1,2 m³ chamber static mode

evaluation of adsorption effects of the
chamber itself (blank test procedure)

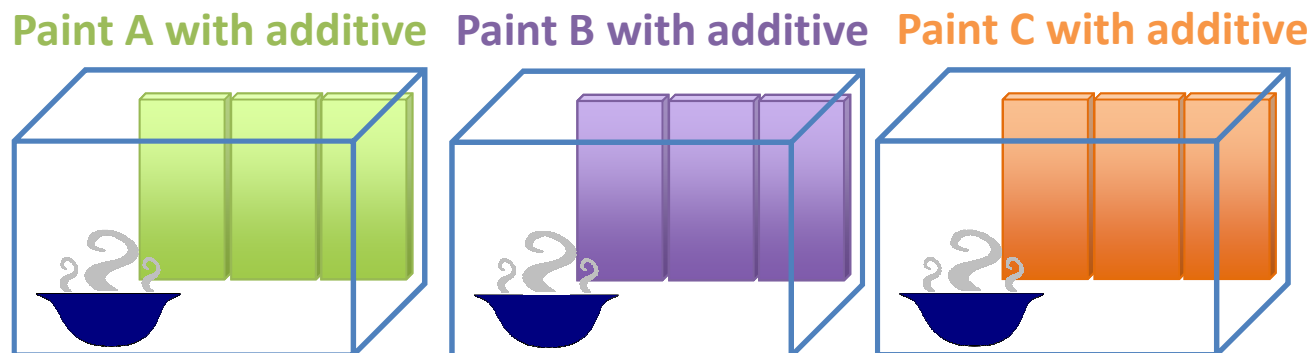
Purge of the chamber (dynamic mode)



C) Samples conditioning

coated plates placed
vertically along the walls of
the chamber

Introduction of the
odorous mixture



D) Static ageing 3h at room temperature

E) Sampling the gas phase after 1h and 3h on specific cartridge (Tenax®) or in Tedlar® bag

F) Analyses

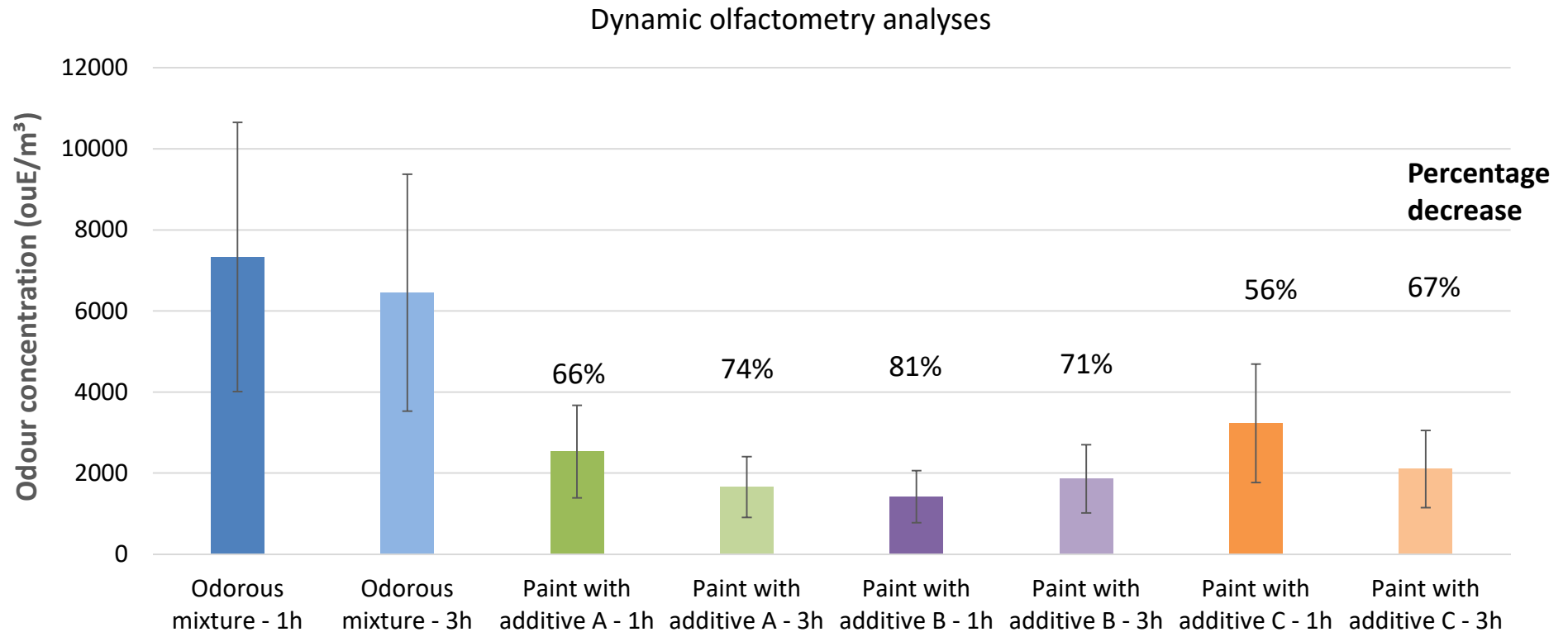
Quantitative analyses of odour :

-measurement after dilution of the air sample : **dynamic olfactometry (EN 13725)**

Qualitative analyses of odour : evaluation according to « **Field of odours** » with an expert panel

Qualitative analyses of VOC : **TDS-GC-MS**

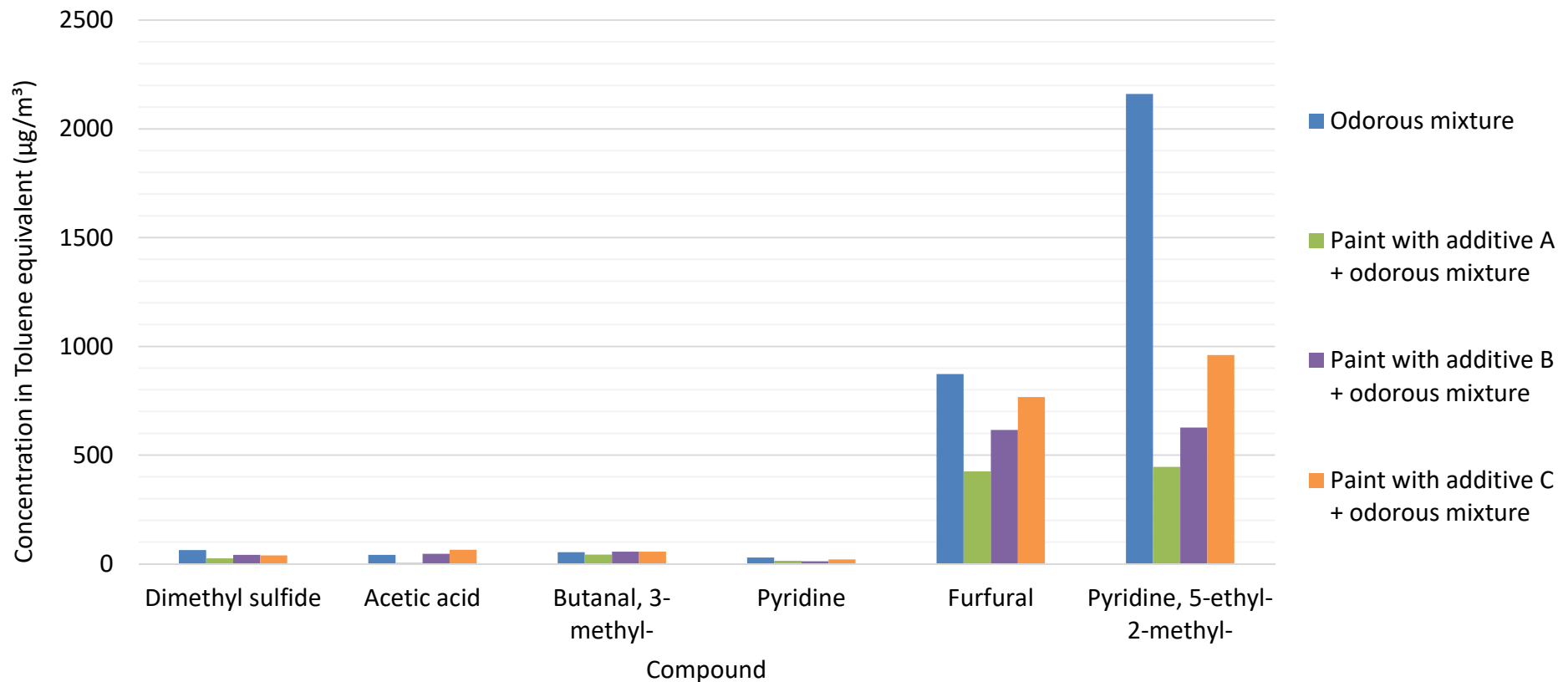
Quantitative analyses of odour by measurement after dilution (Dynamic Olfactometry)



After 1 hour → the odour concentration is only decreased with additive **A, B**

After 3 hours → the odour decrease is significant with the additives **A, B** and **C**

Identification of VOCs by TDS-GC-MS analysis



All paints reduce the concentration levels of the compounds from the odorous mixture

There is a selective aspect of the chemical abatement

The best abatements are observed for the paints with the additives **A** and **B**

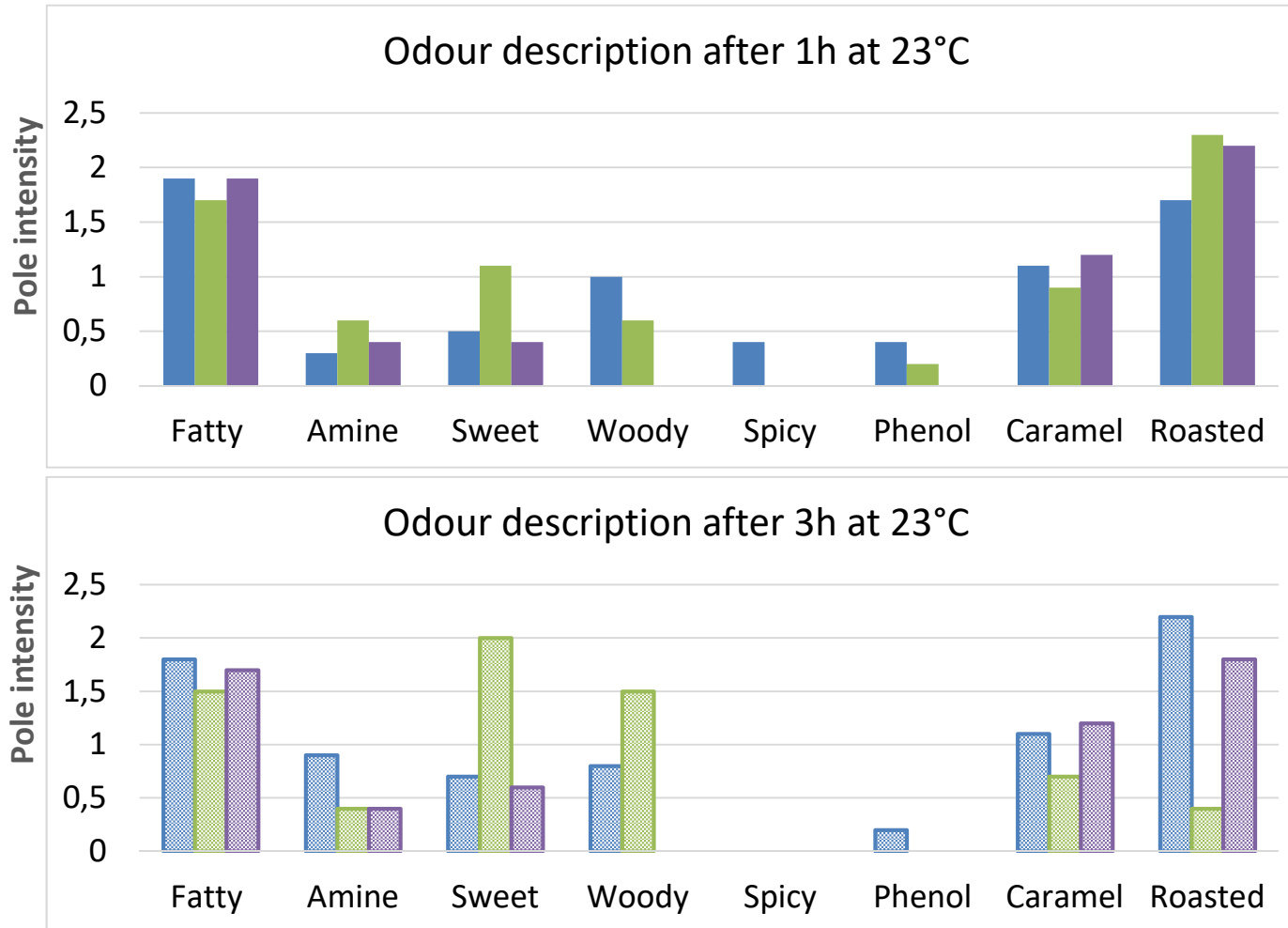
Identification of VOCs by TDS-GC-MS analysis

R.T. (min.)	Compound	N° CAS	Known odour mixture	Paint A with additive		Paint B with additive	
			Concentration in Toluene equivalent ($\mu\text{g}/\text{m}^3$)	Concentration in Toluene equivalent ($\mu\text{g}/\text{m}^3$)	% decrease	Concentration in Toluene equivalent ($\mu\text{g}/\text{m}^3$)	% decrease
5,76	Acetic acid	64-19-7	37,3	ND	100	ND	100
7,02	Butanal, 3-methyl-	590-86-3	71,1	60,2	15	46,7	34
8,95	Propanoic acid	79-09-4	69,9	ND	100	ND	100
14,22	Furfural	98-01-1	936,0	371,3	60	260,3	72
20,78	Not identified compound		34,4	ND	100	ND	100
22,61	Glycol ether		146,3	ND	100	13,0	91
22,78	Pyridine, 2-ethyl- 5-methyl-	18113-81-0	2812,1	1015,6	64	1127,5	60
23,63	Glycol ether		56,2	ND	100	ND	100
23,83	Glycol ether		44,9	ND	100	17,4	61

ND : Not detected ($< 2 \mu\text{g}/\text{m}^3$)

Significant reduction of VOC for the two
additivated paints

Qualitative analyses of odorous compounds by evaluation according to « Field of odours »



Odorous mixture

Paint A with additive

Paint B with additive

After 1 hour :
Selectivity in the
reduction of typical
notes :

↘ Woody

After 3 hours : For
Paint A ↘ Fatty,
Amine, Roasted

For **Paint B** ↘ Fatty,
Amine, Woody,
Roasted

A selective abatement is observed for the notes constituting the odorous mixture.

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- A specific methodology was developed in order to simulate a polluted atmosphere and to demonstrate the efficiency of different additivated paints
- Dynamic olfactometry allows a better discrimination of the samples
- Kinetic of odour abatement and VOC reductions depend of the nature of the additive

From the case study, the demonstration that the two additives of **paint A and B** act positively to reduce the odour as well as the VOC emissions.

The efficiency is selective (not the same abatement observed on specific VOC & odorous notes).

Certech offers its expertise for the development of low odour and VOC materials as well as for odour and VOC abatement systems.

Methodology could be adapted in function of end-use applications.

Value added expertise : from atmospheres generation, odour and VOC analyses, additives selection and process...

Support to sustainable industrial innovation

Product and process improvement

High value added services

Synergistic aggregation of core skills

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Thank you!

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