

Odour science and engineering

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1-week course (8 sessions) at the University of Valladolid

In this module, which will comprise 8 h of lectures, our objective is to bring industrial odour emission characterization for Chemical and Environmental Engineers at the University of Valladolid. The module is introductory but is focused on relevant topics for engineering students as objectivation of odour sensation. Concept of sensorial and subjective perception will be explained. Students will be introduced in general concepts of exposure and annoyance linked with the presence of odour.

After a brief overview of odour legislation in Europe, this module has the object to present the different methodology used to measure, objectivizing, odours coming from industrial processes.

Also general concepts of pollutants dispersion will be presented to understand odour dispersion on the territory.

LECTURE DETAILS

Lecture 1

Introduction to the module, learning objectives and outcomes.

Odour characterization:

- Odour concentration and odour threshold;
- Odour intensity;
- Hedonic tone;
- Quality.

General concepts of exposure and annoyance due to the odour.

Odour from materials and odour from industrial process.

Lecture 2

Odour regulation and policy: criteria

- Regulations based on air quality standards and limit values
- Regulations on direct exposure assessment
- Regulations based on no-annoyance
- Regulations based on Best Practice

Overview of odour legislation in Europe.

Lecture 3

Odour sampling. Techniques and strategies for the estimation of Odour Emission Rate from:

- Point sources (chimneys)
- Active area sources (biofilters)
- Solid passive area sources (heaps)
- Liquid passive area sources (quiescent tanks)
- Semi passive area sources (landfill areas)

Lecture 4

Chemical analysis. Techniques and strategies for the chemical compounds quality and quantification:

- GC-FID
- GC-MS
- GC-O
- Field analysis

Lecture 5

Olfactometric analysis: sensorial analysis using dynamic olfactometry according to EN 13725:2003.

- Olfactometer and olfactometric chamber
- Panel choice/selection
- Determination of odour concentration: example of test

Lecture 6

Artificial electronic systems

- Electronic nose concept
- Detection system (sensors)
- Data processing
- Feature extraction
- PCA
- Pattern recognition

Lecture 7

Dispersion modelling for odour.

- Atmospheric dispersion/transport of pollutants
- Turbulence (mechanical, thermal)
- Pasquill Gifford stability classes
- Types of Model (aeromod- calpuff)
- Input data (emission, meteorological, orographic)

Lecture 8

Field inspection.

Olfactometric survey.

Grid method

Plume method (static and dynamic)

LEARNING OUTCOMES

1. Explain the basis for odour characterization
2. Identify methods for sampling of complex odorous sources
3. Explain measurements suitable for odour industrial objectivation
4. Describe models used for dispersion odour identification,

5. Explain field measurements to evaluate odour phenomena on field