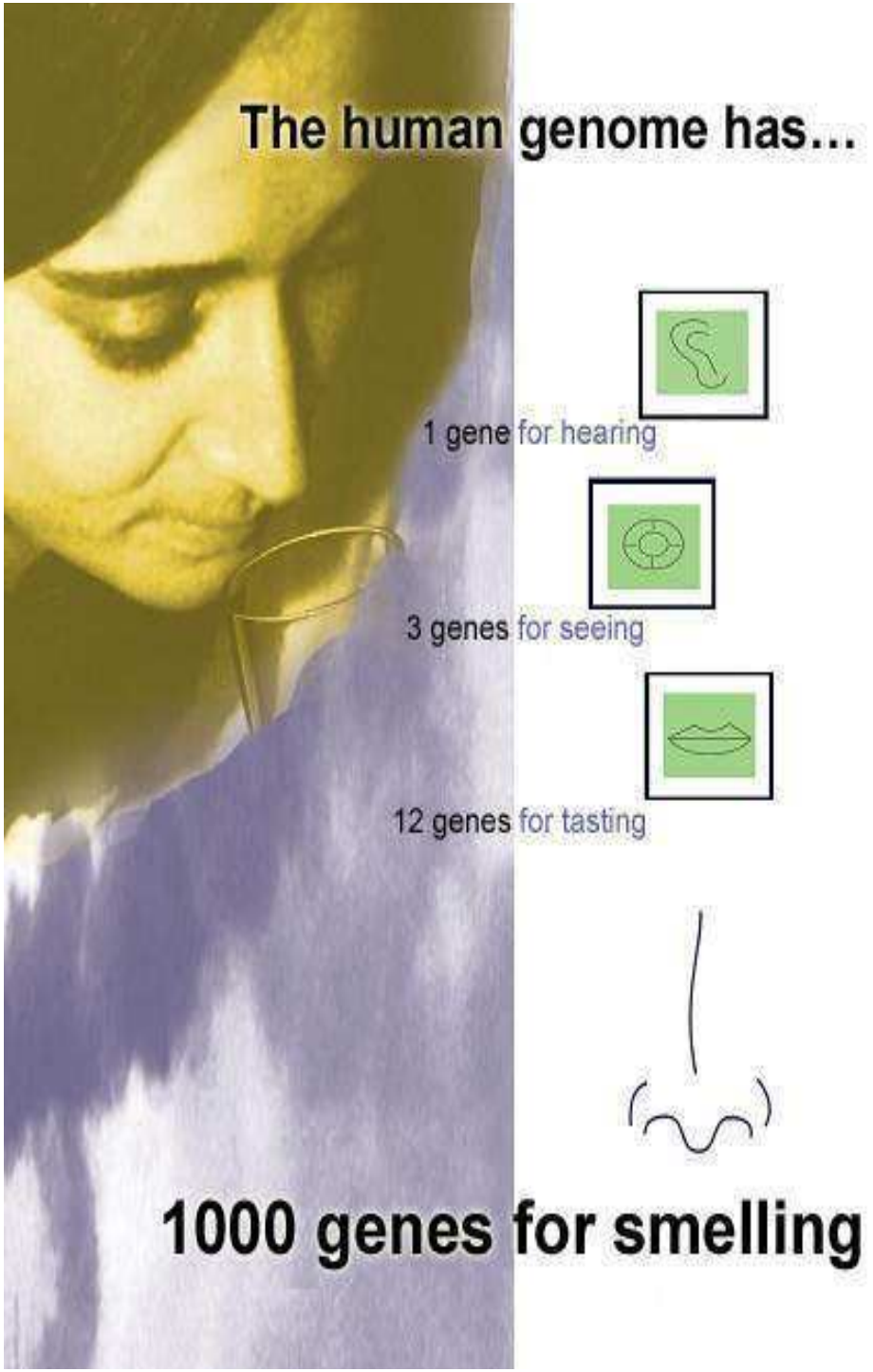

ODOUR MANAGEMENT FOR INDUSTRIAL PLANTS AND MUNICIPALITIES

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Agenda

- Introduction
- Why odours should be managed
- Odour quantification tools
- Odour Management Planning (Case study)
- Questions

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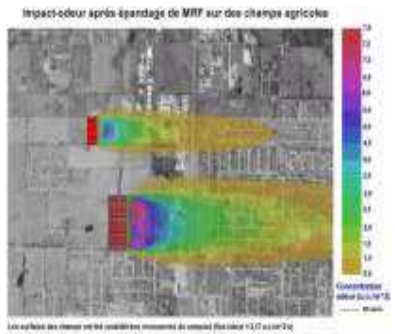
- **Provide the best tools to understand odours and to save managing environmental odours**

- In Odour management since 1998, more than 1000 interventions in all types of industries;
- 40 employees (North America, Europe and Latin America) :
  - Odour diagnostics; Performance studies; Modelling studies;
  - Liaison committees;
  - Odour mitigation plans and preventative programs;
  - Implementation of odour measurement (e-nose) and real-time modelling tools (More than 40 systems installed, nearly half on composting sites);
- Just in 2009, 35 residual waste management sites supported in Canada, France, Belgium, Switzerland (Composting, Digestion, Landfills and integrated sites).



Odours from organic waste… really?

We all know it - Odours are omnipresent :

- Incoming organic waste is already odorous (just doing its job rotting…);
- At the pre-treatment steps (reception, mechanical separation, grinding and other prep processes), sometimes discontinuous but significant releases;
- Nearly continuous releases in handling and treatment systems (variable based on technology, design and throughput but never truly "eliminated");
- Also occur in the treatment and use of end products and by-products (wastewater, solids, "mature" composts)

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An environmental problem…

- **Odours:**
- Lower residents' quality of life
- Are the main perception of pollution (with dust and noise)
- 70% of air quality complaints
- Are a growing concern as cities encroach on plants
- Local intolerance due to badly managed odour emissions.

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Odours – Social and Human Impact

Direct Impact

- Interruption of activities
- Discomfort and nuisance
- Loss of quality of life
- Loss of enjoyment of premises

Concerns

- Health risks
- Loss of property value
- Fear of more odour episodes

Psychosocial Impact

- Stress
- Frustration and anger
- Growing irritation as odor continues
- Greater olfactory sensitivity
- Loss of trust in those responsible
- Feeling powerless and disenfranchised

Health

- Sleep disturbances
- Loss of appetite
- Headaches, cough, asthma, vomiting
- Interference with reading and concentration

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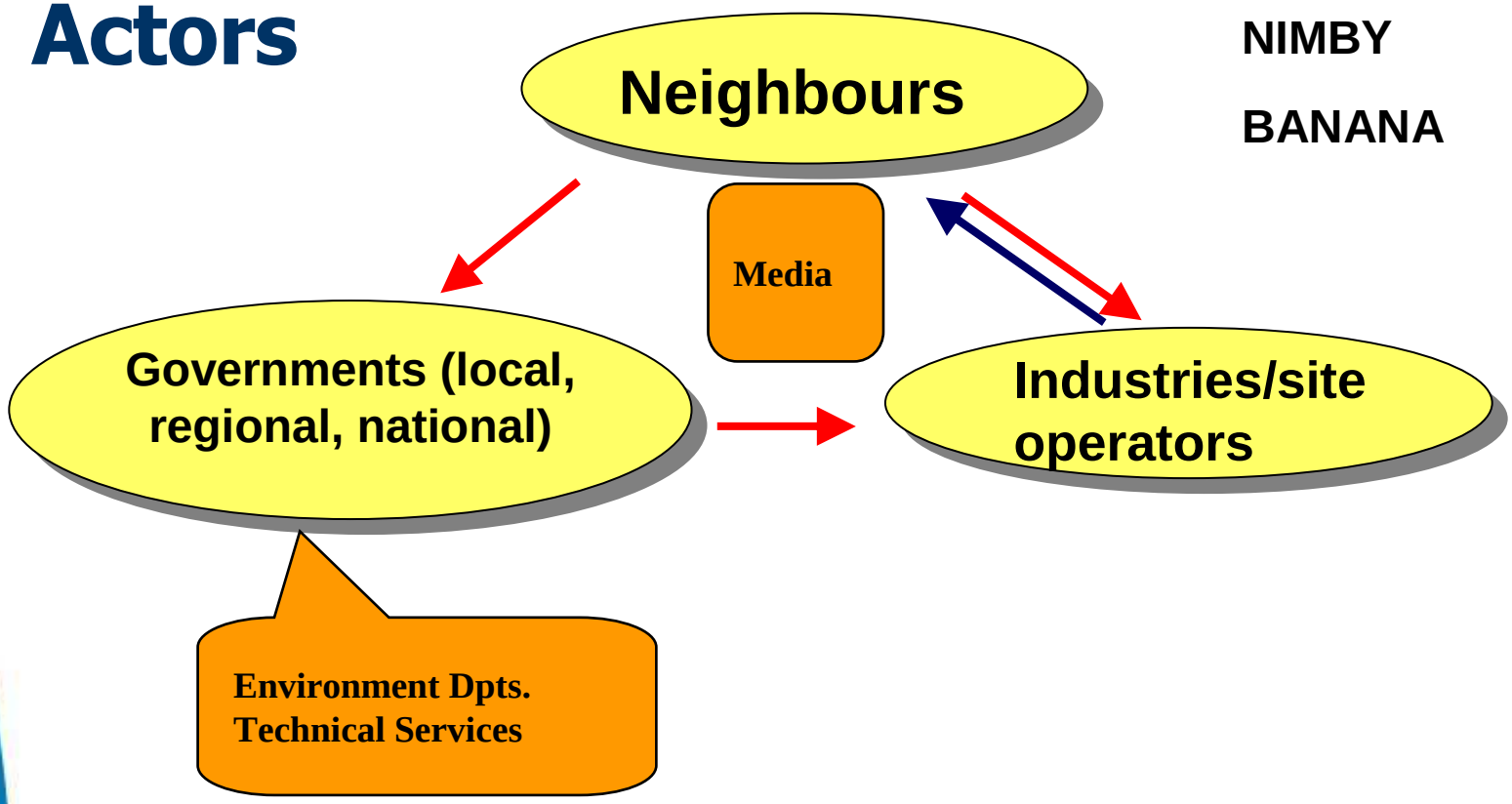
Actors



NIMBY

BANANA

In the « old days » : controls implemented during a crisis or forced by new permit
Now: proactive operators manage odours from site's conception
However : tools needed to optimize the approaches (cost vs required abatement… varies almost every 10 seconds!).

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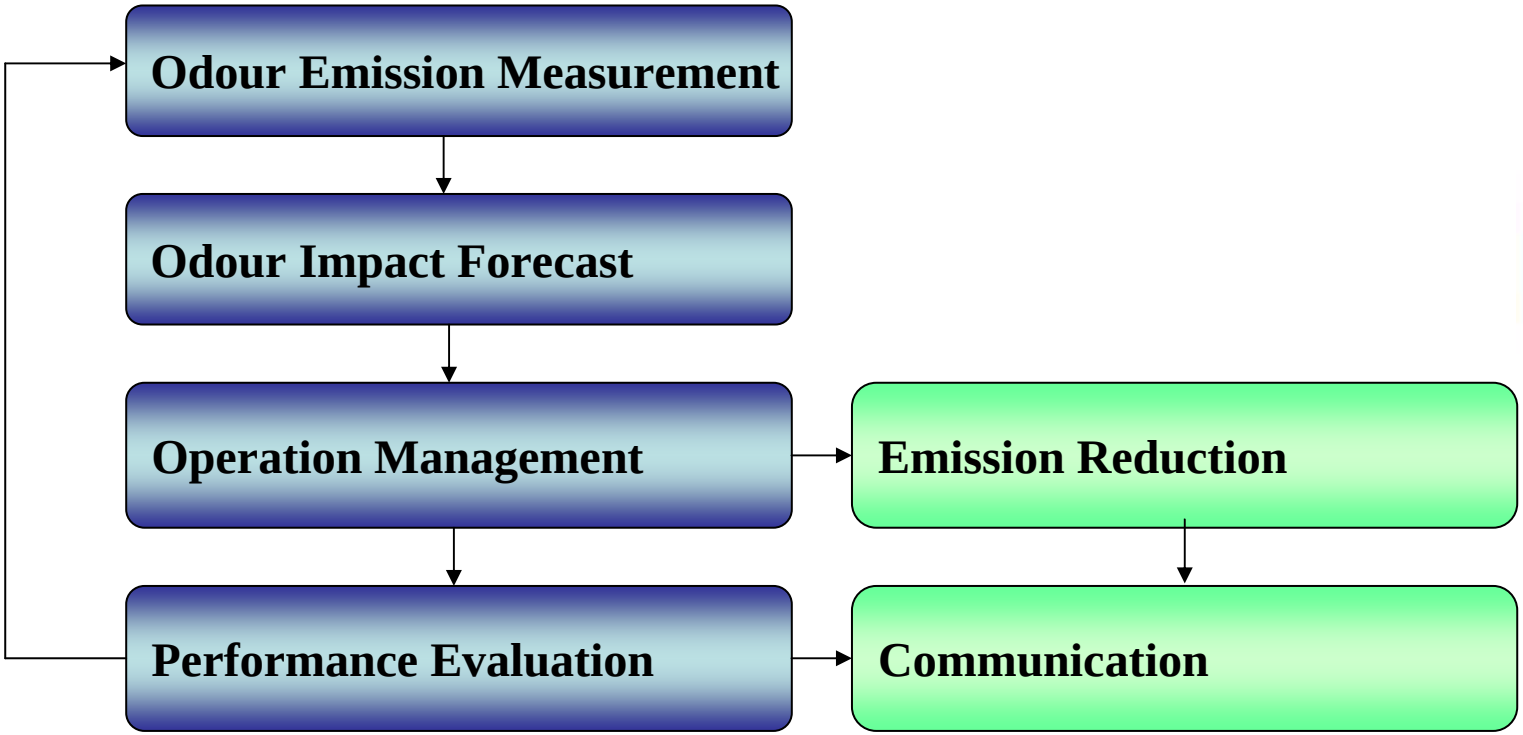
Odour management



Olfactometry: Definitions

- **Odour unit: by definition, 1 o.u./m³ when the odour is perceived by 50% of a panel (1 o.u./m³ corresponds to the detection threshold)**
- **Odour concentration (c) (number of odour units): Number of dilutions (with odorless air) of the gas mixture required to obtain 1 o.u./m³.**
- Ex.: c = 10 000 o.u./m³ means that it takes 10 thousand dilutions to reach the detection threshold for this gas sample

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Odour quantification: Dynamic dilution olfactometry

- **Odour quantification using a human panel**

Standards:

- EN 13 725
- ASTM: E 679 – 91

- **Odour sniffing station**

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Odour Sampling of point sources

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Surface area source sampling

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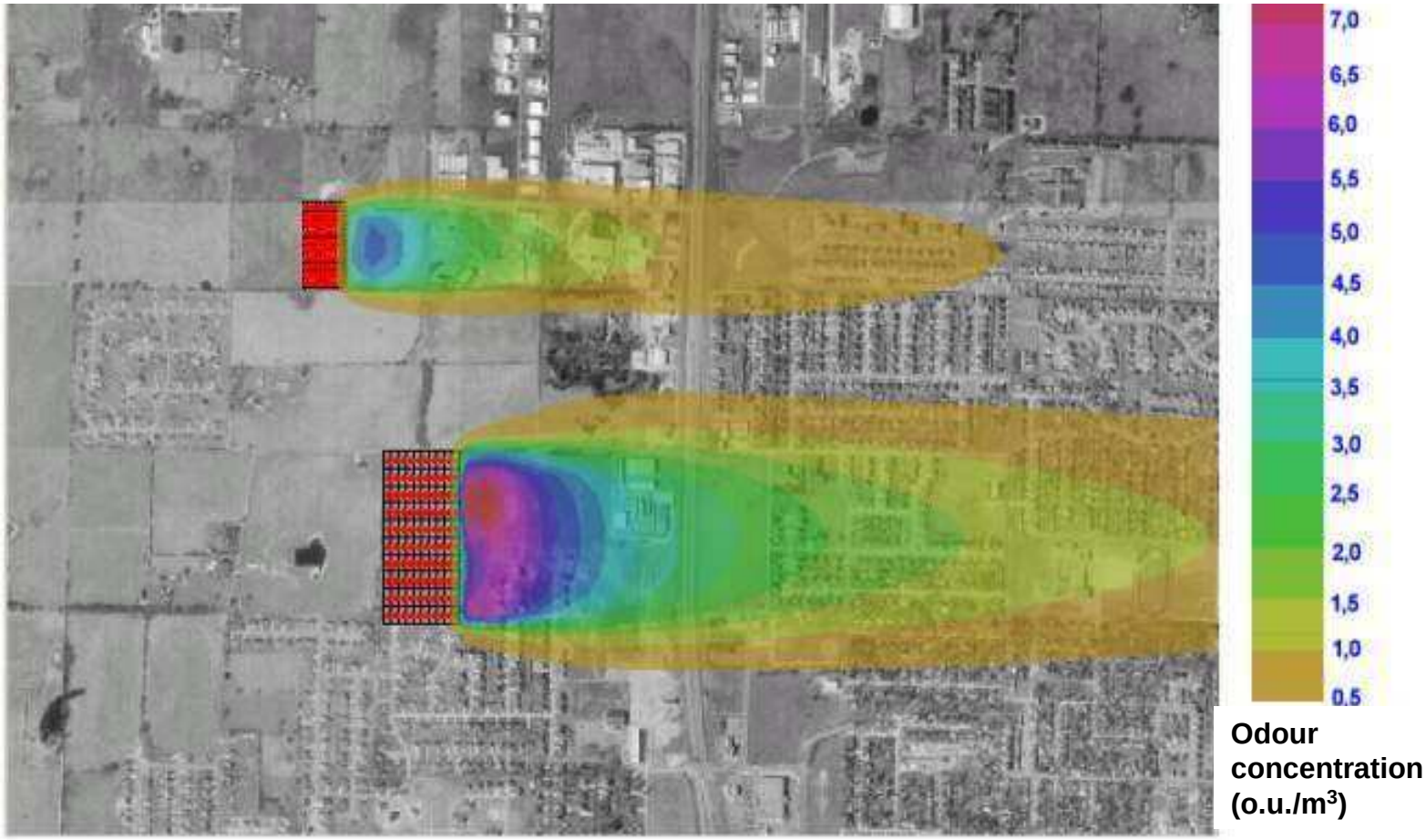
Example: Odour Plumes



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Case study: Composting facility - North of France

- Construction: 1998
- 110 000 t/yr (open windrow composting site), one of the largest composting plants in Europe
- Closest receptor: 550 metres
- Problems faced:
  - Repeated complaints from neighbours
  - Relationship with elected officials and regulatory agencies degrading
  - Facing a requirement to cover all operations
  - Action plan required (with priorities)
  - Facing potential permit loss
  - Imposed a limit of 5 u.o./m^3 at receptors
- Implemented a 2 year abatement plan to minimize odour impacts with the Odowatch system

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Aerial view of the site

Source: Google Earth

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Actions initiated at the facility

- 0 - 6 months:
  - Communication of the action plan with stakeholders
  - Continuous Monitoring of Odour emissions
  - Source ranking (based on rates, impacts, peaks, etc.)
  - Identification of abatement solutions

- 7 - 12 months:
  - Solution integration to existing operations (i.e. Aeration cycle optimization, Windrow cover trials)
  - Continuous Monitoring of Odours
  - Monitoring of abatement efficiency
  - Communication of results to stakeholders

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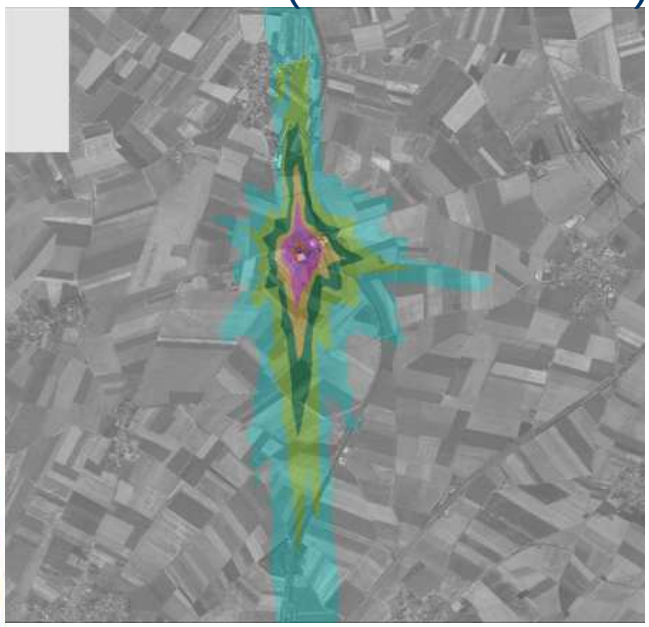
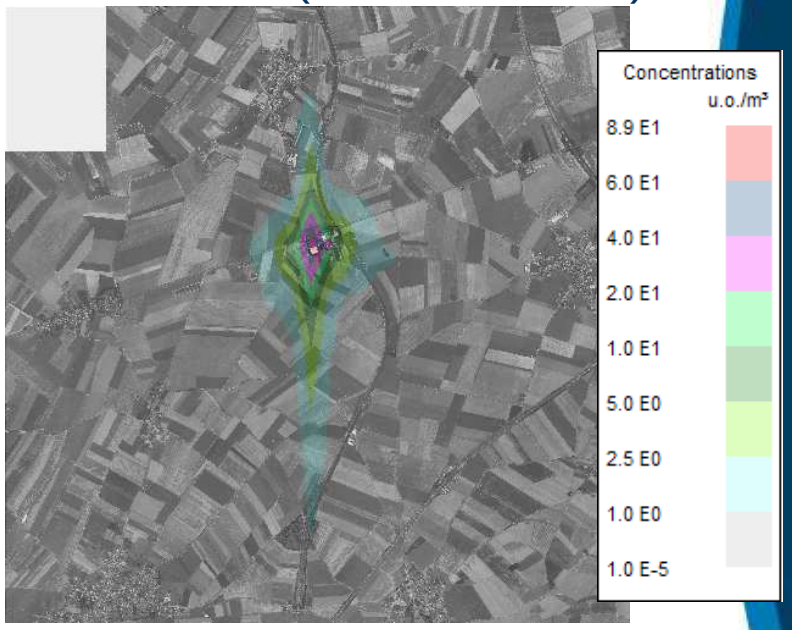
Results

0-6 months (98th Percentile)



7-12 months (98th Percentile)



- levels down 40 %
- complaints down to 4 for a 6 month period

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Return on investment

- **Requirement to cover all processes lifted**
  - Capital savings : about 8 m€
  - Value of capital savings (rate of 5 %) : **400 K€ / yr**
- **Increased production capacity**
  - Revenues : 30 € * 10 000 t = **300 K€ / yr**
  - Capital savings : about 500 K€
  - Value of capital savings (rate of 5 %) : **25 K€ / yr**
- **Energy savings (aeration optimization)**
  - Cost savings of : **11 k€ / an**
- **Stakeholder management**
  - Human resources (redirected to other activities): **6 k€ / yr**

NET GAIN OF : 742 K€ / yr

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Other gains

- Improved relationship with stakeholders
  - Reduced complaints
  - Reduced risk of shutdown or scale-back of activities
  - Improved corporate image
- Co-benefits
  - Optimized production
  - Increased production capacity (with existing infrastructures)
  - Minimized abatement costs

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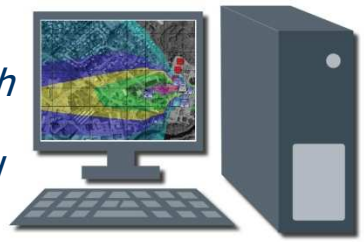
Real-time odour modelling at the facility

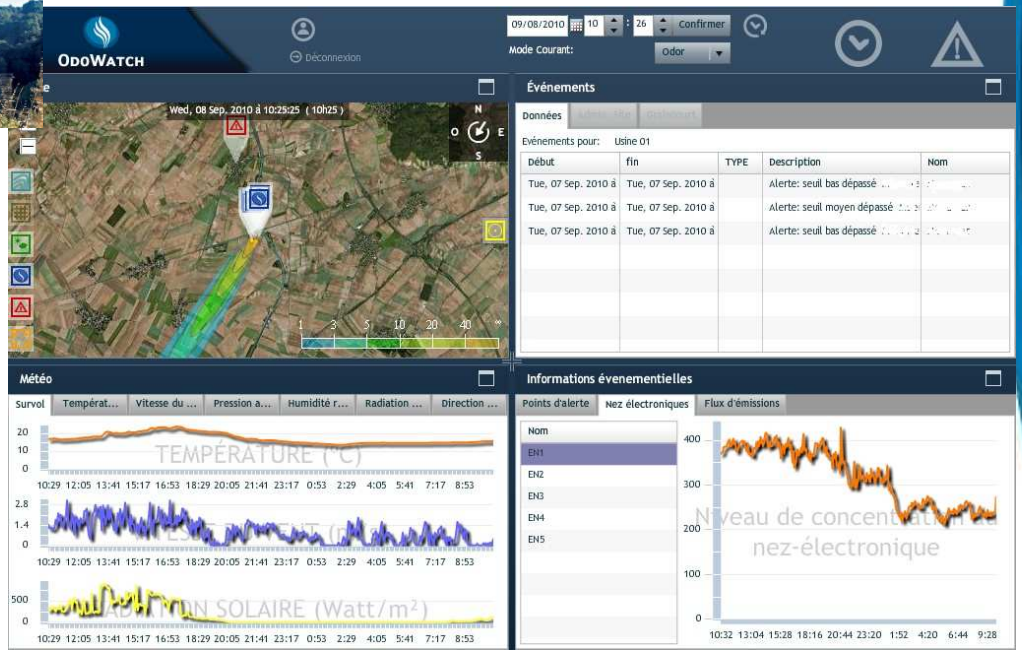
5 Electronic noses

Met tower

Computer with modelling software and database



Real time impact assessment and archiving



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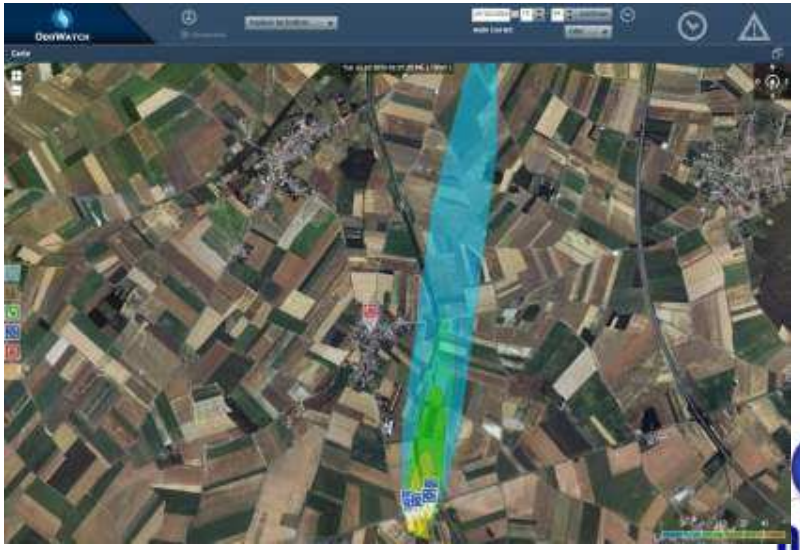

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Why install a real time system?

1. Emission rates are extremely variable for some sources (a large number of distinct samples would be needed to have a clear picture of the variations), an e-Nose can:
   - Provide a tool to track fluctuations and trends;
   - Allow for immediate reaction and pro-active actions;
   - Improve understanding;
   - Focused efforts towards the real issues… reduced odour management costs.

"Allowed us to rank odour sources and to set up corrective actions"

"Good correlation between the complaints and the system's data"

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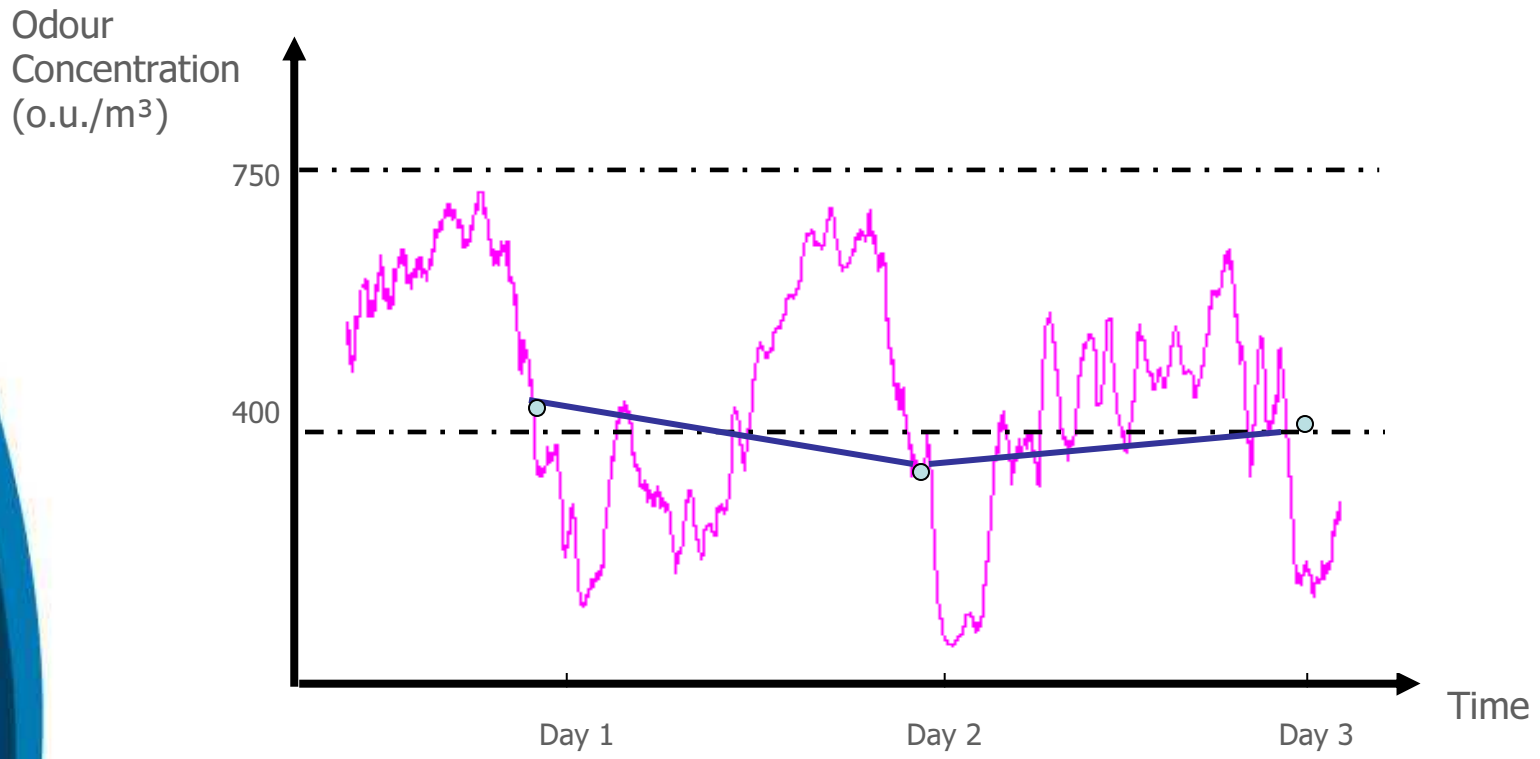
Tracking Real-time Odours



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Why (continued)?

2. Real time modelling will present the current situation:
   - Which periods and conditions are putting the facility at risk;
   - Enables activity planning (i.e. first phase windrow turning, screening…);
   - Ensure odour events are minimized ;
   - Allows for production increases in optimal periods.

"The real time plume allows for visualisation of our odour impact at all times, more useful and relevant than met tower info"

"My monthly survey can be correlated with the Odowatch information"

"Odour events are avoided by planning around unfavourable conditions"

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Why (continued)?

3. System can be programmed with alert points:
   - Monitoring of odour concentration at a nose/source or modelled off site odours at specific points;
   - Operator is actively informed (alert);
   - Neutralizers could be activated, additional aeration (or closure of a fan), startup of a treatment system, etc.;
   - Leads to reduced operational cost and rapid response.

" The alert points allow compilation of statistics at specific sensitive points"

"Agreement reached with authorities to cease recurrent odour studies. Replaced by an annual report extracted from the monitoring system demonstrating limits are met"

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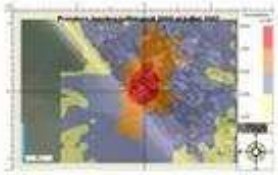
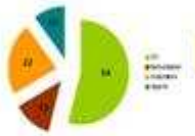
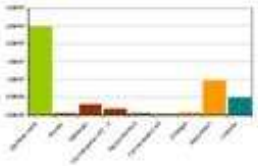
Odotech's Odour Management Plan (OMP)



Preliminary odour impact assessment (based on Odotech's database)

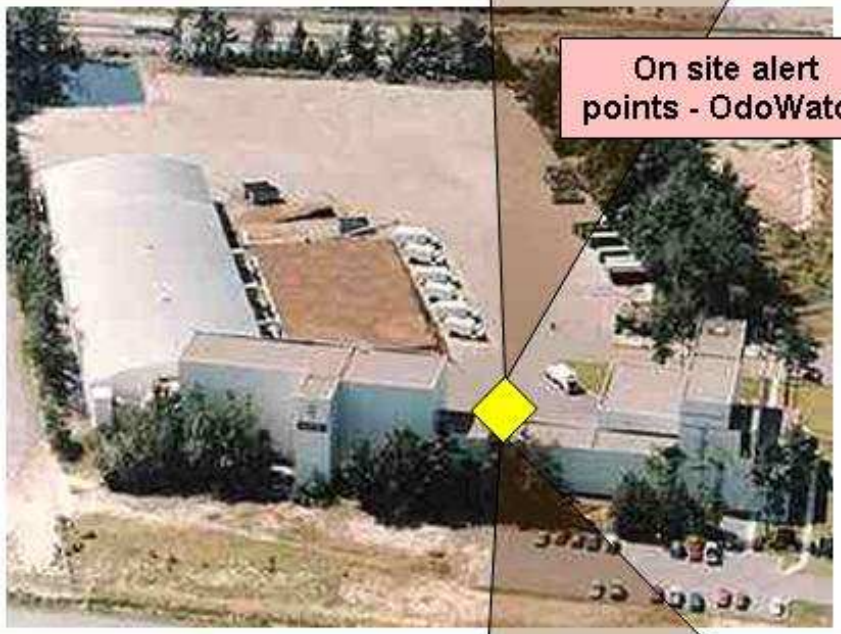




Operational strategy for off-site odour impact minimization

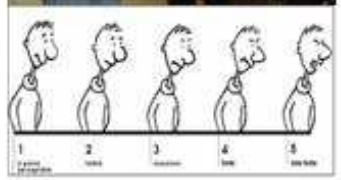
Meteorological station

OdoWatch (Real time odour monitoring)



On site alert points - OdoWatch

Off site alert points - OdoWatch



Citizen comittee, training, communication

Performance reports

Preventative | On - site (operations and equipment) | Off - site

Thank you!

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Additional information available at: www.odotech.com

Also, some interesting odour management facts on our blog:
The Odour Management Blog: blog.odotech.com