Optimizing Process and Cost Reductions Using Continuous Odour Monitoring at a Composting Facility

Optimisation des procédés et réduction des coûts grâce à la surveillance continue des odeurs dans un site de compostage

Yoann Vanel
Odotech France

Faites un cadeau à la terre ... compostez !
Give Back to the Earth ... Compost!

22e Conférence nationale annuelle sur le compost
Du 19 au 21 septembre, 2012

22nd Annual National Compost Conference
September 19-21, 2012

www.compost.org

While simultaneous translation of the audio presentation was provided at the conference, the presentation document is available only as provided. Tant que la traduction audio simultanée de la présentation a été fourni lors de la conférence, le document de présentation est disponible uniquement tel que fourni.
Using the Monitoring of Odors from a Biosolids Composting Site to Optimize the Process and Reduce the Costs

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A Typical Situation
The Issue

• Repeated complaints from neighbors
• Relationship with elected officials and regulatory agencies degrading
  – 2 counties
  – 5 villages
• Facing a requirement to cover all operations: 8 millions Euros
• Legislation:
  – Imposes a limit of 5 u.o./m³ 98 % of the time at receptors
• Facing potential permit loss
• No possibility of accepting more waste

• Action plan required
The composting site

• In operation since 1998
• Treats 50 000 tons of WWTP sludge and 70 000 tons of Green Waste per year
• Once the biggest composting site in France
• Totally open-air
• Processes:
  – Sludge composting: ventilated windrow composting
  – Green Waste composting: static piles
Odor Sources

- Elements of the processes

- Green Waste Composting
- Curing
- Leachate Tanks
- Fresh WwTP sludge
- Fermentation 0-3 weeks
- Fermentation 0-6 weeks
- Green Waste Composting
Odor Management Plan

Objective evaluation of the problem

Communication with the community

Identification of the nuisance sources

Nuisances minimization solutions
Proposed Action Plan

1. Installation of a real-time odor monitoring system
2. Diagnosis of the situation
3. Identification of possible odor reduction solutions
   1. Operations
   2. Technologies
4. Implantation of the solutions adopted
5. Monitoring and continuous improvement
6. Evaluation of the improvement
Client’s Constraints

• Minimize investments
• Minimize footprint
  – Gain space, production increase possibility
• Minimize energy/consumables costs
• Find solutions that can be reproduced elsewhere (23 other composting sites)

• Ensure that regulatory agencies and elected officials accept the plan
Odor Monitoring system

E-Nose → Central Command Unit ← Weather station

Management Software
E-Nose positionning
## First results

<table>
<thead>
<tr>
<th>First Year</th>
<th>Odour Conc. [u.o./m³]</th>
<th>EN 1</th>
<th>EN 2</th>
<th>EN 3</th>
<th>EN 4</th>
<th>EN 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum</td>
<td>83</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
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<tr>
<td>Average</td>
<td>918</td>
<td>269</td>
<td>183</td>
<td>154</td>
<td>770</td>
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<tr>
<td>Maximum</td>
<td>1444</td>
<td>736</td>
<td>5039</td>
<td>300</td>
<td>3047</td>
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First results

• Percentile 98
First Results

<table>
<thead>
<tr>
<th>Rank</th>
<th>Sources</th>
<th>Percentage of total emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ferm. 0-3 weeks</td>
<td>87%</td>
</tr>
<tr>
<td>2</td>
<td>Curing</td>
<td>7%</td>
</tr>
<tr>
<td>3</td>
<td>Ferm. 3-6 weeks</td>
<td>3%</td>
</tr>
<tr>
<td>4</td>
<td>Tanks</td>
<td>1%</td>
</tr>
<tr>
<td>5</td>
<td>GW Composting</td>
<td>1%</td>
</tr>
<tr>
<td>6</td>
<td>Screening</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>7</td>
<td>Mixing</td>
<td>&lt;1%</td>
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<tr>
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Possible Solutions

• Ferm 0-3 weeks:
  – Complete covering (building) with deodorization process
  – Gore-tex covering of the windrow
  – Mature compost covering of the windrow
  – Neutralizing/masking products
  – Reduction/modification of the ventilation

• Screening and mixing
  – Use of the odour monitoring system to determine best operation moments
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• 6 months of trial and error, and tuning…
• 2 years of optimization
After 1 year

- ↓ nuisances by 40 %
- ↓ complaints (6/12 mois)
After 3 years

<table>
<thead>
<tr>
<th>Concentration [o.u./m³]</th>
<th>EN1 Ferm. 0-3</th>
<th>EN2 Ferm. 3-6</th>
<th>EN3 Screening</th>
<th>EN4 GW</th>
<th>EN5 Tanks</th>
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<tr>
<td><strong>2007-2008</strong></td>
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<tr>
<td>Minimum</td>
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<tr>
<td><strong>2008-2009</strong></td>
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<tr>
<td>Minimum</td>
<td>51</td>
<td>84</td>
<td>10</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>Average</td>
<td>815</td>
<td>634</td>
<td>157</td>
<td>156</td>
<td>605</td>
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<tr>
<td>Maximum</td>
<td>1175</td>
<td>745</td>
<td>300</td>
<td>300</td>
<td>611</td>
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<td><strong>2009-2010</strong></td>
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<tr>
<td>Minimum</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Average</td>
<td>306</td>
<td>370</td>
<td>65</td>
<td>22</td>
<td>372</td>
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<tr>
<td>Maximum</td>
<td>1178</td>
<td>1439</td>
<td>246</td>
<td>66</td>
<td>633</td>
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<tr>
<td><strong>2010-2011</strong></td>
<td></td>
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<tr>
<td>Minimum</td>
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<td>10</td>
<td>10</td>
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<tr>
<td>Average</td>
<td>144</td>
<td>146</td>
<td>130</td>
<td>12</td>
<td>162</td>
</tr>
<tr>
<td>Maximum</td>
<td>594</td>
<td>298</td>
<td>488</td>
<td>35</td>
<td>840</td>
</tr>
</tbody>
</table>
ROI

- Return on investment
  - No covering:
    - CAPEX saved: about 8 m€
    - CAPEX capital cost saved (rate: 5 %): 400 K€ / year
  - Production limit increase
    - New income: 30 € * 10 000 tonnes = 300 K€ / year
    - CAPEX saved: environ 500 K€
    - CAPEX capital cost saved (rate: 5 %): 25 K€ / year
  - Energy savings
    - Expense savings: 11 k€ / year
  - Stakeholder management
    - Human resources: 6 k€ / year

Net gain: 742 K€ / year
Odor Management Plan

- Added Value:
  - Improved relationship with stakeholders
    - Reduced complaints
    - Reduced risk of shutdown or scale-back of activities
    - Improved corporate image
  - Capital
    - Optimized production
    - Increased production capacity (with existing infrastructures)
    - No abatement (deodorization processes) costs
Conclusion

• Taking time to understand the problem is the key to find the best solutions
• Often the best solutions may be hidden in the process itself
• Using real-time odor monitoring is part of the solution

• The concept has been reproduced on 6 other composting sites owned by the company

• For more information:
  www.odowatch.com
  blog.odotech.com