



Odour Management Plans for Waste Handling Facilities

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We are the Environment Agency. We protect and improve the environment and make it **a better place** for people and wildlife.

We operate at the place where environmental change has its greatest impact on people's lives. We reduce the risks to people and properties from flooding; make sure there is enough water for people and wildlife; protect and improve air, land and water quality and apply the environmental standards within which industry can operate.

Acting to reduce climate change and helping people and wildlife adapt to its consequences are at the heart of all that we do.

We cannot do this alone. We work closely with a wide range of partners including government, business, local authorities, other agencies, civil society groups and the communities we serve.

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Executive summary

Since the beginning of the environmental movement, a wide range of strategies have been employed by successive governments and their agencies to improve the environment. For example:

- Direct spending of public money (flood defence infrastructure)
- Establishing regulated monopolies (sewage treatment)
- Permissive licensing (water abstraction)
- Monitored permitting (waste management)
- Registrations (Waste Carriers Registration)
- Registered exemptions (some low risk waste treatment activities)
- Legal prohibitions (fly tipping)
- Subsidised or free advice and research (Association for Organics Recycling composting odour guide)
- Support for environment education schemes (recycling in schools)
- Incentive schemes (renewable energy feed-in tariffs)
- Limits – trading schemes (Landfill Allowance Trading Scheme)
- Pollution taxes (landfill tax)
- Tax breaks for environment improvement (landfill tax allowance scheme)

Each of these approaches are useful in specific instances and for specific purposes. Indeed, some environment industries, such as wastewater treatment, will encounter many or even most of these strategies across the range of their business activities. This represents a flexible approach to achieving desired environmental improvements.

As an environmental regulator, the Environment Agency needs to keep its own approach to achieving government environmental objectives and implementing its policies flexible and under review. In the case of odour pollution we need to pursue solutions which provide fast, effective relief for people living and working in England and Wales. At the same time we need to ensure that the burden on industry is no greater than proportionate to the level of environmental impact (including odour) caused. We say no greater than, because sometimes dramatic odour control benefits can be achieved with little or no expenditure. These are the opportunities we really don't want to miss.

Within the environmental permitting regime we regulate a number of sectors which demonstrate a high potential to cause odour pollution. Dealing with these problems after they reveal themselves can be time-consuming, costly and, sometimes, ineffective. Regrettably, some companies have not survived this process.

While it will always be necessary to react to odour pollution incidents, it is clear that our performance and that of the industries we regulate could be improved. We feel that the best way to achieve effective odour pollution control which is proportionate, cost-effective and fair, is to plan ahead.

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1 Odour Management Plans

The idea of Odour Management Plans (OMPs) is not new but before they can be approved we will need to be satisfied that several essential elements are in place:

Control,
Monitoring,
Contingencies.

Once in place, these plans will be used to assess whether your site is applying all appropriate measures for the control of odour pollution as required in standard permit conditions.

1.1 Your permit condition

The Agency's standard permit condition 3.3.1 states:

Emissions from the activities shall be free from odour at levels likely to cause pollution outside the site, as perceived by an authorised officer of the Environment Agency, unless the operator has used appropriate measures, including, but not limited to, those specified in any approved odour management plan, to prevent or where that is not practicable, to minimise, the odour.

Your permit may also state:

The operator shall:

- if notified by the Environment Agency that the activities are giving rise to pollution outside the site due to odour, submit to the Environment Agency for approval within the period specified, an odour management plan
- implement the approved odour management plan, from the date of approval, unless otherwise agreed in writing by the Environment Agency.

Clearly, our goal and yours should be to prevent odour pollution. The wording of the condition indicates that your Odour Management Plan will be an important part of your evidence that you have used all appropriate measures if you were to cause odour pollution. However, the overriding and practical objective of an OMP is to help you plan how you will minimise or, if possible, prevent odour pollution in the first place. If your OMP, whether approved or not, has not been based on a thorough assessment and does not represent all appropriate measures, then it will be little use as a legal defence.

The second point to draw out is that the condition refers to an 'approved' OMP. This begs questions about approval such as 'Whose?', 'When?', 'How?' and 'Why?'.

1.1.1 Whose?

Decision making within the Environment Agency is governed by our Non Financial Scheme of Delegation. Decisions such as whether to issue a permit or to accept an OMP will normally be made by local area or permitting managers. These decisions will typically be supported and informed by the environment officer who attends the site, legal advisors, local odour advisors and, sometimes, head office odour advisors.

1.1.2 When?

If your site is identified as being in one of the high odour risk categories in our publication *How to comply with your environmental permit* then you will be required to prepare and submit an OMP for approval as part of the permitting or permit modification process. If your permitted site is causing odour, or we believe there is a high risk of odour pollution, then we may require you to produce an OMP and submit it for approval. Further details are provided in *How to comply*.

1.1.3 How?

Once you have submitted your OMP for approval, it will be reviewed by an odour advisor. They will provide structured feedback and recommend that the plan is either approved or returned for further work. If it is returned, then the feedback will help you to understand where we think there are problems. If, after several tries, you cannot or choose not to prepare an OMP we can approve, then we will have to decide on an appropriate response. We will consider factors such as why an approved OMP is required for your site and the nature of any deficiencies.

1.1.4 Why?

Our review provides an opportunity to give you constructive feedback on how you could improve your plan. If we approve your plan, that means that we agree it appears to represent all appropriate measures for your site at the time. Important qualifications to this are detailed in our H4 guidance. **Adherence to an approved plan is an excellent defence against prosecution in the event that you do cause odour pollution.**

1.2 Active odour management

Managing odour requires a thorough understanding of your process and how each part of it may be contributing to odour pollution. We encourage you to take a thorough and systematic approach to assessing the best and most cost-effective way of managing odour. The structure given here is not mandatory, but we hope it will be helpful.

Also, for individual sectors, or even specific sites, some of the individual methods described below may not be applicable or helpful. For example, opportunities for increasing dispersion from existing sites is often quite limited. Nevertheless, the approach encourages a thorough assessment of odour management opportunities and we recommend it to you for consideration across all types of site.

1.2.1 Managing materials

Understanding the odour potential of materials you hold in inventory and how they need to be managed is, in general, the single most important and most frequently overlooked step of the assessment process. This is referring primarily to solid or liquid materials, or even living animals. Very occasionally, one might include gasses, but these are usually better dealt with under containment and abatement.

Your inventory is what is imported onto the site, materials you hold on site for treatment and any finished materials awaiting shipment. Opportunities for management include

exercising control over receipts, limiting total quantities of material on site, and managing the condition of that material when it is on site.

Operators sometimes raise concerns that they do not have control over how odorous materials, such as waste, are when they arrive at their site. We want to stress that it is unusual for a site to be able to completely control odours using a single method, such as control of feedstocks. However, in almost all cases, it is possible to strongly influence the nature of feedstock materials. This may involve educating and negotiating with waste customers to better manage holding times and conditions. Any improvements you can realise through feedstock controls means that there is less pressure on the rest of your process to treat and contain those odours. This may result in significant savings to your company. If your site specialises in treating highly odorous feedstocks, such as putrid chicken feathers, (and of course we need sites which can deal with such wastes), then you will need to have much more robust controls for odour.

The way you manage materials can also have a strong influence on how rapidly odorous chemicals contained within them are broken down. Poor handling conditions can dramatically increase the odour potential of your materials through the build-up of intermediate breakdown products or the production of anaerobic decomposition products, such as reduced sulphur compounds.

In managing your odorous materials, it is a tremendous advantage to have a thorough understanding of the materials you are handling and how they interact with your process. For example, if you are undertaking a biological process such as composting, then an understanding of the needs of a healthy microbiological community is essential. Unfavourable feedstock mixtures, wrong moisture levels, low oxygen or damaging temperatures will all interfere with effective management of odorous materials.

Of course those factors will also strongly influence the effectiveness and efficiency of any composting process. For the most part, optimum odour management conditions will also dramatically improve performance as well. This kind of synergy can sometimes be found between the control of odours from sewage and reducing damage to steel and concrete from hydrogen sulphide as it is transformed into sulphuric acid. Controlling hydrogen sulphide also makes sewers and wastewater treatment plants safer places to work.

Our objective is not specifically to make your process more efficient. However, you may find that a good understanding of the factors which influence odour generation will help you to improve your process performance. In many cases, using all appropriate measures for the management of odorous materials can actually help make you more profitable.

1.3 Reducing evaporation

Odorous chemicals cannot actually have any impact unless they are released in the form of a gas. Also, most odorous chemicals have at least some solubility in water. Chemicals which are completely insoluble in water do not tend to dissolve in your olfactory mucous later and therefore are not detected. This reveals two different strategies for controlling the evaporation of odorous chemicals.

The first is to change the chemical so that it is very soluble in water. For example, adjusting the pH of compost to be slightly acidic can effectively contain ammonia by

transforming it into highly soluble, and non-volatile, ammonium ions. The opposite strategy, making a material alkaline, can help to reduce the evaporation of odorous organic acids. Unfortunately, you cannot use both strategies at once.

The second strategy is to reduce the evaporation of water from odorous materials. Of course evaporation is an essential part of many processes such as pet food drying or composting, but it is still beneficial to limit that evaporation to more favourable times and circumstances. For example, compost which is being heat treated in primary tunnels will then need to be moved into second heat treatment tunnels. Where hot, wet material is disturbed and moved in the open air, large quantities of odorous materials can be evaporated in a short time. If evaporation can be limited to those times when the material is contained in a tunnel and emissions are routed through abatement, then overall emissions can be greatly reduced.

Principles of reducing evaporation of water are simple, if not always easy to implement:

- reduce temperatures;
- reduce access to air (low surface area);
- increase relative humidity in the immediate vicinity;
- use evaporation barriers.

In the case of a compost transfer operation, evaporation might be reduced by:

- increasing airflows in the tunnel prior to transfer to cool the material;
- providing windbreaks immediately around loading and tipping areas;
- using large loading shovel buckets with hydraulically activated clam shell lids;
- tipping material out of the loading shovel at as low a height as possible;
- using misting or wetting sprays in loading and tipping areas.

Many activities take place inside large buildings which may be ventilated to abatement. While many of these buildings do a very poor job of containment, most are very effective at reducing wind speeds to very low levels. These stagnant air environments can make some evaporation controls much more effective. For example, misting systems can reduce ambient temperatures and increase relative humidity. Evaporation barriers may also be much more effective.

1.4 Containment and abatement

Abatement, in particular, is a large and technical topic. Therefore, this paper must necessarily be limited to a discussion of general principles. It is quite common to see sites where tremendous capital investments have been made in containment and abatement, with great expectations for performance. However, it is equally common to see systems fail to live up to these high expectations.

It can be a tragedy for communities and operators alike when elaborate and expensive odour abatement systems dramatically fail to perform as expected. The Environment Agency will not object to OMPs with capital intensive solutions, indeed sometimes expensive and complex abatement systems are necessary. However, we will expect all other appropriate measures to be explored as well and large price tags for capital equipment will not always be the right solution.

Furthermore, complex systems will need suitable management controls and must be properly engineered. Just as the local authority may require an assessment of plans for a building by a qualified structural engineer, we will require professional assessments

for features such as complex air handling systems or scrubbers. The Environment Agency does not have the responsibility or the expertise to undertake detailed engineering assessments.

Where we have concerns about the suitability of a particular system, we will make these known to you in as helpful a manner as possible. However, unless it is apparent to us that a particular system will not work, we will not normally withhold approval of your OMP because of technical reservations. Where appropriate, we may expect you to declare emissions performance figures which we will then incorporate into your permit in the form of Emissions Limit Values (ELVs). This is consistent with the enforcement approach advocated in the Pollution Prevention and Control directive. Any failure of your systems to perform as expected will then be a breach of your permit.

We want to encourage you to consider a number of basic principles which will help to keep costs down and make systems as effective as possible. Of course, if you are able to effectively manage your inventories and control evaporation, containment and abatement may not be needed at all.

1.4.1 Make containment as local as possible

As already mentioned, it is very difficult and expensive to use a large industrial building as a primary containment feature. Not only must the building withstand infiltration pressures due to wind, but ventilation rates must typically be very high to ensure all leaks are the right direction and to maintain a healthy working environment inside. Furthermore, the cost of abatement is not particularly sensitive to the concentration of odour to be treated, but it is very sensitive to the volumes of air which must be treated. These factors combine to make building containment strategies quite risky and not very cost effective.

Wherever possible, local containment can provide much greater performance at greatly reduced cost. For example, an enclosed skip can be contained and ventilated at a rate of 20 air changes per hour by moving and abating very modest quantities of air. In contrast, ventilating a barn at even 1 air change per hour will involve much greater volumes of air. Furthermore, if that skip is located within the barn, then any ventilation of the skip will contribute to ventilation of the barn as well.

The stagnant air environment provided by even poorly contained buildings will allow relatively modest containment features to perform to a much higher standard. For example, a hood around a waste screen might not perform well in ambient air with wind speeds routinely in excess of 5km per hour. However, air movement speeds within a building will be greatly reduced and the associated performance of even rudimentary containment features will be greatly enhanced.

Significant benefits may also be realised by treating different air streams individually, rather than commingling concentrated and dilute air streams which may have different chemical characteristics. A hybrid strategy might involve inexpensive local pre-treatment of a low volume but highly odorous air stream before it is then added to higher volume but lower odour air streams for polishing treatment.

1.4.2 Design containment and abatement together

Any containment system will be designed to deliver a particular concentration of odorous air containing a particular mix of odorous trace gasses at a particular volume.

Any mismatch between what the containment system delivers and the abatement system is designed to treat will result in poor performance.

When considering abatement, it will also be necessary to consider whether the containment system is delivering a consistent stream of air for treatment, or whether it will be variable. That variability may be in terms of volume of air to be treated or the specific chemical makeup of the odorous air. Highly variable air streams can be particularly difficult to consistently treat and may strongly influence the best choice of abatement equipment.

1.4.3 Don't forget management and maintenance

It is very common to see systems which are fitted and then forgotten. Biofilters in particular require an understanding of how they work in order to inform maintenance which will deliver consistently good levels of performance. In some cases carbon filters may be more robust in the short term, but will stop working completely when they become saturated, and must be either regenerated or replaced.

Management and maintenance requirements are often quite specific to the abatement system as well as the context in which they are working. If vendors of abatement equipment make claims for their systems, it is often appropriate to ask them to back these up with warranties. You may wish to contract with suppliers to maintain these systems if you do not have the necessary expertise to do it yourself.

1.5 Dispersion

Your primary options for improving dispersion are limited to increasing distance to receptors or increasing the distance at which people are exposed to your odorous emissions by discharge through a stack. Of course increasing the distance to receptors may be quite difficult for an existing site, but if neighbours are very near it may help if you relocate odorous activities to a point on your site which is further away. Tall stacks will require planning permission which may not be granted and their effectiveness can be severely impaired by building downwash effects. In some cases, modelling may be a helpful tool when considering the relative benefit of increased dispersion methods.

You may be able to dramatically reduce odour pollution caused by poor dispersion by being aware of conditions such as low night-time wind speeds or cold drainage flow. By constant monitoring and even forecasting of poor dispersion conditions, you can trigger contingency measures to temporarily enhance other odour controls.

1.6 Exposure and perception

The perceived intensity and annoyance potential for odours are influenced by a number of factors. Awareness of these factors may help you to minimise the pollution impact of your odorous releases.

For example, people are generally more sensitive to odours when they are eating or relaxing and less sensitive when they are working. Also, odours are perceived as more intense when they are variable. When people are indoors their exposure to odours is much more constant and therefore the odour is perceived as being less intense.

Episodic emissions from your site, such as short-term opening of barn doors, on a warm summer's afternoon when people are outside enjoying a barbeque in their backyards or having a picnic on the village green, can be expected to have maximum impact.

Annoyance reduction

Odours are mostly annoying because they have a negative meaning. There is some debate over whether some of those meanings are instinctive in the biological sense (born with them) or whether they are all learned. Either way, learned associations are hugely important. Of course, you do not have control over whether people find your odours offensive, but you can be very influential.

1.6.1 Communication

If you are perceived as transparent in your activities and respond to people's concerns, then the level of threat you pose can be reduced. We would normally expect to see a complaints response procedure in your OMP. This is partly because it is valuable monitoring information, but also because it helps to alleviate some concerns people may have. It is also a good idea to be the primary source of reliable information about your site, rather than relying on the local community action group to do that for you.

1.6.2 Be a part of the community

You may find odours from your site less offensive because you associate them with your means of earning a living. Unfortunately, many of your neighbours will not have this positive association. If you are seen as an asset to your community then you may find that some members of the community actually welcome your presence and defend you. Don't overlook the role your employees can play in this.

We can require very little in an OMP for reducing annoyance. Nevertheless, opportunities are there if you are willing to explore them. Of course annoyance reduction is no substitute for controlling odour pollution in the first place and as a good neighbour this should be your first priority.

1.7 Monitoring

Any periodic or special observations which can be made, whether by instruments or not, and which are useful for decision-making, should be thought of as monitoring. Within this broad definition, observations that a reception bay is full or complaints received from someone in the community are all forms of monitoring which should influence your decision-making. The type and quality of monitoring must always be fit for purpose. Poor quality monitoring will result in bad decisions.

1.7.1 Process controls

One key reason for monitoring is to determine whether you need to make any changes to your process. If you understand your process, then you will be in a good position to identify key monitoring parameters which indicate whether your process is under control or something needs to be done to bring it back under control. In composting, for example, aerobic conditions are critical. Indications of anaerobic conditions might include moisture testing, odours, low rate of temperature rise, physical appearance and, of course, measured oxygen levels. If you have a composting site, then you will need to convincingly show that your ongoing assessment of this critical parameter will give you the information you need to keep your process under control.

1.7.2 Emissions

Ongoing or occasional monitoring of emissions can provide valuable insight into your potential for causing odour pollution. This will most often involve instrumental analysis or sampling, but sniff testing may sometimes be appropriate when it is safe and effective.

1.7.3 Transport / dispersion

Good quality meteorological monitoring is key to understanding dispersion conditions. This need not necessarily be located on your site, or even be your instrument, but it must be properly sited to be indicative of conditions at your site. Multiple measurement points may be required for complex terrain or for assessing cold drainage flow.

1.7.4 Exposure / impacts

These may be assessed by sniff test surveys by suitable individuals or tools such as odour diaries. Factors such as adaptation and high annoyance thresholds mean that site workers may be uniquely unqualified to undertake these assessments. Employees who do not work on site, or even community volunteers can be a much better option. Complaints are very valuable but they can be a better indication of impacts than they are of exposure. Very occasionally, instruments may be used but the human nose is often the most sensitive detector available for odour monitoring.

1.7.5 Records

All monitoring should be specified in the odour management plan and complete records kept in a format which can be audited. This is important because you will be expected to take action in response to any monitoring which indicates there may be a problem.

1.8 Contingencies

Your initial contingency in response to monitoring results which suggest there is a problem, may be to do further investigation. However, if a problem is confirmed, then corrective action may be required.

1.8.1 Process controls

Is your compost aerobic? Do you have more material on site than you can effectively manage (or are permitted for)? Are your feedstock materials likely to give you problems later on? Any time process control monitoring trigger levels (either quantitative or qualitative) are exceeded, then specific contingencies should be anticipated and put into place to maintain or regain control of the process.

For a great many processes, when things go badly wrong excess quantities of inventory will be involved. Even within your process limits, odour pollution controls can be more effective when faced with reduced burdens. Therefore, reductions in inventories, suspension of material inputs or even suspension of particular activities will be key contingency measures.

1.8.2 Emissions controls

Is your activated carbon scrubber saturated? Is your biofilter healthy? Are your emissions under control? If not, then you should have plans to correct any problems in a timely manner. It is generally poor practice to wait until you receive complaints from members of the public before taking action. The best answer to a complaint is, 'Yes, we know there is a problem and we have taken corrective action. We expect to have emissions back under control by this afternoon.'

1.8.3 Atmospheric transport

Unlike emissions or processes, you will normally have very limited control over atmospheric dispersion conditions which carry your odorous emissions towards the community. However, you should anticipate poor dispersion conditions and have contingency plans in place to reduce your emissions even further during these times.

1.8.4 Exposure / impact

The worst has happened. Despite all your planning and diligent effort something has gone wrong and you have caused an odour incident. The best thing to do, besides getting odours back under control, is to be open and honest about what has gone wrong and to immediately apologise. If it turns out later that you weren't actually at

fault, you can tell people that and have a lot more credibility. Being defensive can seriously damage your reputation within the community and increase levels of annoyance.

1.9 Incidents and emergencies

The key to incidents and emergencies planning is to be realistic. As an experienced site operator, you should have a very good idea of what could go wrong. Someone might make a serious mistake on site or have an accident, or there may be an offsite incident which affects you. Either way, you should take reasonable steps to prevent the incident from occurring, minimise the impact of the incident and regain control as quickly as possible.

Offsite incidents might include: industrial action, power failures, local transport disruption, etc. Onsite incidents might result from accidents, equipment break-down, or injury / illness of key staff. It may help to use a standard risk assessment matrix where each possible event is assigned a probability and a level of impact to assess the overall risk.

1.10 Conclusion

The Environment Agency has an important part to play in implementing this strategy to control odour pollution. We are actively engaged in developing guidance, training our staff and providing feedback and support whenever possible. There is a lot of work still to do.

However you, your industry associations, consultants and suppliers also have important roles to play. Without your active engagement in seeking odour controls, there is no realistic prospect that odour pollution will be brought under control. This could reflect badly on you and your industry sector. We encourage you to use a structured approach to odour management plans to demonstrate your competence and commitment to controlling odour pollution. We very much want you to succeed.

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