Odour Regulation and Odour Management: a possible and necessary synergy

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Abstract

Over the last 15 years it has become apparent that a large proportion of facilities with odour issues have two common deficiencies: non-existent or ineffective odour management and monitoring plans (OMMP) and non-existent or rudimentary odour control systems. The uncertainty related to the operational aspects of the facility processes coupled with the inherent difficulty of assessing odour emissions for complex odour sources was the major reason of the lack of effective and appropriate odour regulatory conditions.

By clearly identifying the sources and practices within an operation that have potential to emit odour, and by designing a comprehensive and relevant OMMP for moderate to high odour risk sites, industries can more effectively demonstrate to the regulator their understanding of their process and operations, pre-empt the odour risks and proactively implement corrective actions should the risk become real. This strategy is intimately coupled with appropriate monitoring of key performance indicators that are more readily accessible and accurate than odour measurements. Key elements of OMMPs can then be incorporated into regulatory conditions for premises in order to establish what may be termed “regulating by management”.

Introduction

In Western Australia (WA), for the Greater Swan Region (capital city Perth and its suburban area), 60% of all complaints received by DER in 2009 were claimed to be attributed to odour and are indicative of community concern. These complaints have been validated in some cases through odour surveys undertaken by DER. Complaints decreased to 44% in 2011 and have remained around 36% for the last three years [DER, 2015]. This shows a net decrease in odour complaints while the population has rapidly increased in WA over last five to ten years. Residential areas have moved closer to industrial and rural activities. With the high levels of awareness and quality-of-life expectation in the community, there was, and remains, a significant concern as a result of siting incompatible land uses close together. These situations hinged on a limited availability of tools (processes and policies) for industry and the regulator.

Limited regulatory conditions to control odours

About 10 to 15 years ago, odour regulatory conditions were not commonly imposed at existing plants in WA. Several sites were classified contentious due to the numerous odour complaints related to their emissions. Complaints were the only gauge of the level of performance of industrial premises. This situation left both industry and regulators ineffective when facing community anger. Using complaints data only, industry could not address the cause of the emissions that were impacting the community, and regulators had limited options to initiate corrective or enforcement actions.

Regulatory conditions have subsequently improved, resulting in more effective conditions. Industries had to audit their operations and their management plans and propose infrastructure upgrades and improvements to better limit and control their odour emissions.

New regulatory conditions required monitoring odour emissions and other physical parameters such as temperature, humidity and pressure at the inlet of a biofilter for example. These specific parameters were used as surrogates that were more readily measurable and accurate than monitoring odours themselves. Since these changes, specific industries have been able to achieve improved periods of 'steady state operations' and odour complaints have significantly decreased accordingly.

Monitoring is also a requirement for some existing plants in some North American and European states and other Australian states for odour dispersion modelling purpose. These states have odour control regulations and compliance that require dispersion modelling for comparison of odour criteria to observed values. Western Australia does not consider odour dispersion modelling of the emissions of an existing industry as a specific condition to demonstrate compliance. The faith put in modelling relies on unrealistic expectations of precision and accuracy of the predictions on potentially impacted areas.

Major limitations of odour dispersion modelling include: the model used [Featherston et al., 2014], the uncertainties of the emission data, the simplistic geometry of the sources and emission frequencies, the frequently poor quality of the meteorological dataset, the choice of exposure criteria and other specific model limitations such as low wind speeds or intermittent emissions.

Tools for odour risk assessment

In the past, the odour risk assessment for new or modified facilities was predominantly reliant on measured or literature derived emissions data that was then used as input to dispersion modelling to estimate ground level odour impacts. These were then compared against the odour modelling criteria in force in WA at the time.

However, one new facility presented a comprehensive environmental impact assessment with an odour dispersion modelling showing no impacts at the sensitive receptors. Soon after commissioning, residents started being impacted by strong and frequent odours. Another site applying for expansion, proposed an odour modelling contour of the current situation that was significantly smaller than empirical indications of impact extent (e.g. complaints or odour field surveys).

In order to reduce the reliance on odour dispersion modelling, new and existing plants (before changes) should comply with minimum separation distances [DER Sep. Dist.]. For some activities, separation distances can be estimated by using S-factor equations, e.g. for piggeries [NEGP, 2010].

DER is developing a land use planning policy where separation distances are the key factor to inform DER's risk-based approach to its regulatory functions [DER Land Use Planning]. Where separation distances are met, risks and the complexity of infrastructure and management levels required will be lower. Regardless, regulatory controls to protect public health and amenity will be proportional to the level of the estimated risk for this activity.

Separations distances, S-factor equations and sometimes modelling are a few tools in a suite to support a proposed new facility or the modification of an existing activity. Although not required for low risk sites, a comprehensive OMMP has historically been missing for sites with moderate or high odour risks that have infrastructure such as enclosed secondary controls that require management conditions. OMMPs should provide, in the long term, more confidence to

industry, the community and the regulator in effective odour emission control and acceptable outcomes for sites assessed as medium and high risk.

Odour Monitoring and Management Plan: the critical document

In Western Australia, environmental impact assessments accompanying applications are generally undertaken by consultants who may often limit their review to process generalities. They may omit, or not comprehensively consider, site-specific worst-case scenarios and more importantly often do not take into account site-specific management practices. Therefore, some applications for regulatory approval present conclusions that rely on a constant, close to optimum process and management regime. Unfortunately, my experience indicates that real world management and practices may be far from the assumed ideal standards presented in the assessment.

Generally, a section of the application documentation supporting the proposal is dedicated to the sources, their emissions and operations. However, it is rarely specified in enough detail to be considered an OMMP. For example, a list of the corrective actions related to the identified risks or maintenance tasks are rarely provided.

A site may operate cutting-edge processes and odour control equipment that should guarantee minimum emissions. However if they become victims of the “fit and forget” syndrome without any appropriate management and maintenance in place, the investment may not result in desired outcomes. Infrastructure solutions do not, in themselves, directly achieve odour reductions, but must be complemented with management plans and actions.

Emphasis is often placed on attempts to minimise complaints, rather than to minimise the cause of the complaint [Longhurst et al., 2004]. Where there are odour impacts, there are odour emissions. I have found that odour emissions when minimised through appropriate design coupled with good management, alleviates the risk of possible and significant odour impacts by tackling the issues before, or soon after they occur and possibly escalate. In Western Australia, a significant number of contentious sites have benefited greatly through the implementation of a comprehensive, well-constructed, and clearly defined OMMPs that promote proactive management of risks before possible escalation.

The OMMP should become a key document provided to the regulator detailing odour risk management procedures for a proposed project. It should be as comprehensive as possible and developed with appropriate consultation with major stakeholders.

OMMP: the result of a wide consultation

It is industry’s role to draft OMMPs appropriate to their proposal. When developing an OMMP, a proponent should undertake comprehensive consultation with workers on-site who are involved in tasks that may generate odours. Consideration of staff feedback is a key element and their involvement and ownership in the management process is crucial [Longhurst et al., 2004]. Benefit can be gained by involving staff in the drafting of the OMMP as they are generally more aware of specific conditions of the process that may be the source of significant emissions.

Some staff may even be trained to perform ambient odour surveys. These surveys may be carried out at a fixed frequency and/or under specific process or meteorological conditions. Because such surveys can be easily and frequently implemented, the probability of capturing

specific odour impacts from intermittent emissions or from sources under special conditions is higher. This information is highly valuable but is unlikely to be captured during a limited quantitative odour assessment or through odour dispersion modelling. Another purpose of in-house ambient assessments in the vicinity of the site would be for simple operations, to find a correlation between off-site assessments and on-site operational or process conditions. By obtaining an adequate database under various operational and meteorological conditions, it may be possible to identify trends or even specific key performance indicators (KPIs) that could be used to proactively monitor on-site processes and emissions and thus limit the risk of off-site odour impacts.

As the community is a key stakeholder it should be invited to be part of both the development and implementation of the OMMP. Community engagement should occur at the OMMP draft stage and also during the life of the facility. Consultation during drafting may be an opportunity to manage community expectations in regards to odours. Once the facility is operating, one way for the community to provide feedback is by directly complaining to the industry rather than to the regulator. Another approach is to form reference groups where industry and the community share information on the operations, the works undertaken and off-site observations on a regular basis. Such arrangements can build trust between the community and industry and assist in gaining and maintaining a "social licence" to operate. Community feedback, if positively handled by industries, can be used to identify specific operations or processes that may need upgrading or better management. A third approach hinges on the recruitment of volunteers from community to act as "odour sentries", similar for instance to the NOSE program [Suez, 2008]. Once trained to recognise different odours and levels, these volunteers are able to quickly inform the operator about odours at specific times and locations. Thus, industry has the opportunity to quickly investigate which source(s) or operation(s) may be responsible for the odour emissions and respond to such situations by following the procedures set out within the OMMP.

OMMP: a comprehensive living document

An OMMP should be a live, risk-based and site-specific document. The initial phase when drafting an OMMP is to review all processes on site that are likely to be the source of odours under normal operations. Then, scenarios and operations under both normal and upset conditions need to be identified along with their likely frequencies and intensities of emissions. The likelihood and consequence of the odour impacts also need to be identified. Once risks have been identified, the parameters, KPIs or criteria need to be determined to monitor the efficiency of the operations from an odour emission point of view. The criteria may include surrogate parameters to be compared against targets or triggers (internal or external) for environmental performance purposes. In most cases, surrogates may be more readily accessible and accurate than measuring or assessing odours themselves. The next critical step is to establish specific corrective actions that will be implemented for each scenario identified, should the event with the identified risk occur. The effectiveness of the corrective action has to be monitored through parameters/KPIs/criteria including surrogate parameters. For each risk and corrective action, contingencies need to be listed should the corrective action be ineffective. The final step is the design of tests to verify whether normal operations can be resumed following the implementation of contingency actions. This OMMP can be complemented by including a ranking of the residual odour risk as a result of the combination of the likelihood of the event and its possible consequence for the amenity.

On a case-by-case basis, a reproducible odour source assessment methodology may be added within the OMMP for regular audit of emissions from specific sources. Similarly, a reproducible odour field assessment methodology may be incorporated within the OMMP to validate that risk assessment. The purpose of this methodology is to perform odour field surveys before and after the construction of a new facility or the modification of an existing facility. The results of the initial survey undertaken prior to construction or modification may then be used as a benchmark against which the post-construction or modification survey results can be compared. The various actions to be implemented, should the post-construction or modification survey results be significantly higher than the pre-construction or modification surveys would need to be anticipated within the OMMP. Such a situation would suggest that the new or modified activity generates more intense odours or a larger odour footprint than originally estimated.

As the facility, the operations and the sources evolve with time, so should the OMMP. The plan should be updated to reflect the latest status of the site whenever new information or modifications impact on sources, operations, corrective actions or contingencies.

Possible integration of the OMMP into regulatory schemes

The documentation provided to the regulator in support of applications may generally contain a description of the type of activity, emission data, location of the sensitive receptors, modelling outcomes and recommended separation distances. The regulator then assesses the odour-risk related to the proposed site based on the information provided, relevant environmental standards or guidelines and its experience with similar facilities.

However, due to the identified limitations on source characterisation and modelling, added to the frequent observation that poor management is a common denominator for contentious sites, the regulator's focus is shifting to management-based conditions, i.e. the OMMP. An OMMP is primarily a risk management document. It will only be required when the risk of odour emissions from the site is moderate or high since proposed infrastructure solutions will require management controls. An OMMP will not be required for most low odour risk sites.

Following the assessment of compliance with the required separation distance, the regulator can verify, through an OMMP, that the major sources or operations and associated risks have been adequately identified for medium to high risk sites. An OMMP should ensure that the proposed monitoring is applicable to the purpose it has been designed for and management triggers are present. The proposed corrective actions have to be appropriate to the risk, be implementable and their results measureable. Finally, contingency actions should address issues for which they have been proposed. The OMMP becomes a living document that reflects the proposed modifications which relate to the sources, operations, monitoring conditions, corrective actions and contingencies

If the regulator integrates an OMMP within a regulatory instrument, the key components of this plan must be clear, auditable and measureable. Regulatory conditions would require industry to implement the OMMP once in operation. Industry should then be able to control the operations and the emissions to address possible issues that may occur, with no real need for the regulator to interfere with the process. Minimal reporting to the regulator to maintain records of the actions and odour management performance would almost be the only other regulatory condition required along with provision of a complaints registry. As the ultimate purpose of the regulatory instrument and its OMMP is to limit odour impacts from facilities by

controlling emissions through thorough management, this approach of “regulating by management” will provide significant benefits to the community, industry and regulator.

Conclusion

Poor process or corrective management planning are the major cause of odour impacts observed at a large number of contentious sites. Project proposals lacking appropriate risk identification, emissions management consideration and showing only a simplistic assessment of odour impacts, are unlikely to address inadequate emission control and odour impacts. Similarly, limited regulatory conditions without a holistic approach will not drive industry to improve odour management and environmental outcomes.

Due to limitations in odour monitoring and dispersion modelling, separation distance is the key factor to inform DER’s risk-based approach to its regulatory functions. The OMMP is, where necessary, an important additional tool for long term emission control, integrated management and required environmental performance.

The ultimate purpose of an OMMP is to reduce odour impacts on the community from moderate or high risk sites by better limiting and controlling odour emissions and, where they do occur, to respond quickly and effectively. With industry being more aware of the benefit of limiting its emissions from a corporate, cost and a production point of view, the OMMP is a cost effective and indispensable tool to achieve better and more informed odour emissions management.

An OMMP is risk-based and site specific. It is drafted and owned by the industry and should use the expertise and knowledge of its staff. It would, in addition, enhance the awareness of odour emissions, which is a precursor of effective management. Community input is similarly important to manage expectations in regards to odours. In addition, the use of a pool of community members as sentries for the odour impacts of a site is another option that may be initiated by industry.

With a comprehensive OMMP, industry can foresee the various scenarios and risks associated with processes and odour emissions. Procedures would be in place to implement corrective actions should the risk become real. Odour assessment pre or post-construction or modification of a facility may be a valuable additional tool to be utilised within the OMMP. It provides additional confidence to community, industry and the regulator on the success of the proposed odour management.

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The number of odour complaints halved between 2009 and 2014 for the Greater Swan Region in Western Australia. The growing awareness of industry about better management of odour and the regulator’s response to environmental outcomes has contributed to this decrease. The move towards consideration of a comprehensive OMMP by both industry and regulators would be a positive contribution to minimising the number of odour impacts by limiting odour emissions and reducing odour nuisance. It would offer to all stakeholders a beneficial alternative for the effective management and regulation of odours and aid industry to gain and maintain its regulatory and social licence.

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