Estrada J.M, Lebrero R, Quijano G, Kraakman N.J.R, Muñoz R. (2013) Strategies for Odour control. In: Odour Impact Assessment Handbook. Edited by: Belgiorno V, Naddeo V, Zarra T. John Wiley & Sons, Ltd, Malaysia. 85-125. ISBN; 978-1-119-96928-0.

# Part 4

# Strategies for Odour Control



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## 4.1 Introduction

Odour pollution is often linked to industrial activities such as waste treatment (wastewater treatment plants, compost facilities, landfills), intensive animal farming, food processing, pulp and paper production, and so on. [1,2]. Today, the stricter environmental regulations imposed worldwide, together with the encroachment of residential areas on industrial facilities in the last decades, have resulted in an increase in the number of public odour complaints [3,4]. In fact, more than half the complaints received by the environmental regulatory agencies worldwide concern malodours [5]. For instance, odour annoyance affects approximately 20% of the population in Europe, with malodours from wastewater treatment plants (WWTP) being ranked amongst the most unpleasant ones [6]. Despite not being a direct cause of disease, long-term exposure to high-strength malodorous emissions actually does negatively affect human health, causing nausea, headaches, insomnia, loss of appetite, respiratory problems, irrational behaviour, and so on. [7–9]. In addition, malodorous emissions can pose a severe occupational risk within confined spaces in WWTPs or pulp and paper industries, due to the accumulation of lethal $H_2S$ concentrations [10]. Odour pollution also entails a significant economic cost, and for instance, housing less than one mile from odour sources can be up to 15% cheaper [11]. Therefore, the minimization and abatement

*Odour Impact Assessment Handbook*, First Edition. Edited by Vincenzo Belgiorno, Vincenzo Naddeo and Tiziano Zarra.

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of unpleasant odour emissions is nowadays ranked among one of the main challenges of major industrial sectors of the economy worldwide.

The minimization of odour impact (in terms of annoyance to the nearby population) involves first a detailed characterization of the key odour sources and composition of the odorous emissions, and secondly, a correct design, operation and maintenance of both the industrial facilities and if necessary the systems implemented for the abatement of the odorous emissions [2,12,13]. Most of the odour control strategies implemented nowadays in industry involve four types of measures oriented to prevent, disperse, minimize the nuisance or remove the odorants from the emission [1]:

- Prevention of odorant formation at source. This involves, for instance, process design and operation devised to maintain aerobic conditions in waste treatment facilities (since anaerobic conditions promote the generation of odorous volatile compounds like fatty acids and reduced sulfur and nitrogen compounds), good operational practices and animal nutrition in animal farms or operation at low sulfidity and anthraquinone addition during kraft pulping in pulp and paper facilities [1,14,15].
- Control of dispersion of the odorous emissions to guarantee an exposure of the nearby population below odour nuisance levels. The implementation of buffer zones (separation between the odour source and the potentially affected population), turbulence-inducing structures such as trees or high barrier fences or chimneys can mediate a dilution of the emission and reduce the odour concentration, with the subsequent reduction in odour annoyance [16]. In this context, the installation of odour covers or enclosures (low and high level covers) has significantly improved the management of odour pollution by minimizing the odorous emissions.
- Minimization of the effects by, for example, spraying masking or inhibitory agents or neutralizers in scenarios of intermittent emissions or where the implementation of other measures is difficult. The rationale underlying this technology is the spraying of additives that mask, inhibit or neutralize the inherent unpleasant hedonic tone of the emission [17,18].
- Implementation of treatment technologies to reduce the odour concentration in the industrial off-gas emission before it reaches the atmosphere. Odour treatment systems are employed and implemented when prevention and control of dispersion are not sufficient to avoid odour nuisance in the surroundings of the plant/factory [1].

The cost of these measures often increases with the degree of development of the odour pollution process. Thus, any measure oriented to preventing odour formation at source will likely entail lower costs than implementing costly additive spraying or odour treatment technologies. Figure 4.1 shows the process of odour pollution in sewer systems together with the evolution of odour control cost and degree of effectiveness. In this particular case, the potential for odour nuisance reduction is larger and its cost lower if industrial discharges are properly managed and anaerobic conditions in the sewer network are prevented [19].

This book chapter will focus on the recent advances on odour dispersion measures, impact minimization and odour abatement methods from an economic, technical and sustainable viewpoint. The sensitivity of the economics of the five most commonly applied end-of-the-pipe technologies nowadays towards design and operational parameters and commodity prices, along with their robustness, will be evaluated. Finally, a critical discussion on the

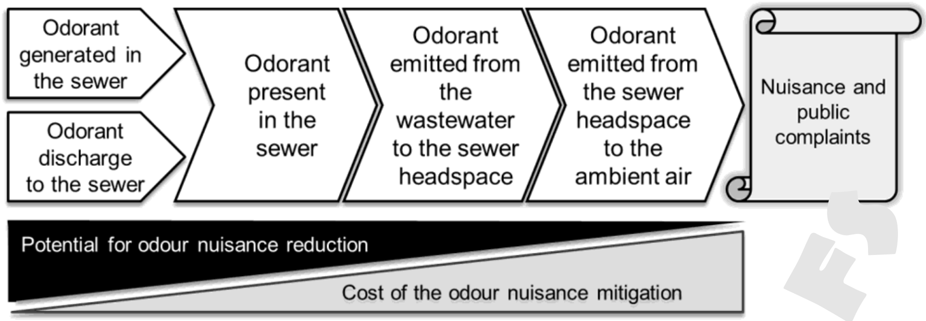


***Figure 4.1*** *Scheme of the odour pollution process in sewer networks (Adapted from [19] Copyright (2008) AIDIC Servizi Last accessed 25/07/2012).*

different odour monitoring strategies in odour abatement facilities will be presented as a key approach to odour assessment and management.