D-NOSES

Distributed Network for Odour Sensing,
Empowerment and Sustainability

Guidance for Industries

- Odour Management Plan (OMP) -

Table of content

1. Introduction

This industry guidance toolkit is aimed at all industrial sites, establishments, businesses and institutions which activities may emit odours.

As an odour emitting stakeholder, you may hold an environmental regulatory permit which you must comply to, or you may simply want to be an exemplary neighbour to the communities located in the vicinity of your plant(s).

Odours may be an unavoidable byproduct of a process which benefits society. While they may be unavoidable, you may wish to be proactive and put in place adequate protocols and measures to avoid introducing nuisances and deteriorating your neighbours' quality of life. Doing so, you may anticipate rising conflicts and tensions, and establish a friendly relationship with communities around you.

This toolkit is designed to help you anticipate the odour impact that your activities may have on your neighbours. This toolkit walks you through the steps you need to take to establish an Odour Management Plan (OMP), which should help you comply with your environmental responsibilities and prevent conflict associated with odour nuisances.

If you find yourself in the conflict zone already, you may wish to have a look at the Odour Observatory's first Industry Guidance, which covers odour related conflict management.

This toolkit uses official British Guidance for Odour Management and Chilean Instructions for the Implementation of an Odour Management Plan as main sources of information. This toolkit serves as a general guide, but is by no means exhaustive.

1.1. What is an Odour Management Plan (OMP)?

An Odour Management Plan (OMP) is a framework developed by an odour emitting stakeholder which outlines their **commitment(s)** and **strategy** to **manage odours.** These commitment(s) and strategy, undertaken by the stakeholder, enable them to:

(1) Comply with their environmental regulatory permit *and / or*
(2) Prevent or minimise industry-related odour nuisances.

1.2. Why should you implement an Odour Management Plan?

You may find yourself in different situations which require you to establish an Odour Management Plan, as shown below in Figure 1.

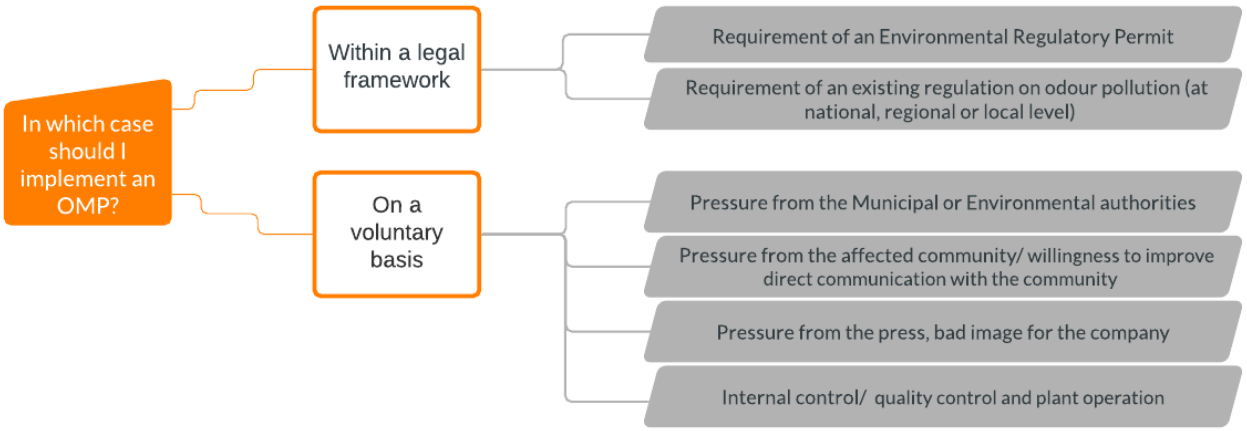

Figure 1. Situations in which to implement an OMP.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

2. Basic odour concepts

2.1. Emission, Dispersion and Human Response to Odours

For an odour to become a nuisance, a number of aspects come into play. These aspects include the characteristics of the odour perceived, the emitting source and its proximity to the receiver(s), as well as the characteristics of the receiver(s) themselves.

Odour nuisance
Generally speaking, an odour is considered a nuisance if it has a negative impact on a person's well-being.

To characterize an odour, its sensory properties can be described. They usually fall under the categories of concentration, intensity, quality and hedonic tone (more information on odours on the International Odour Observatory). The combined effect of these properties is related to the degree of discomfort or pleasure they can cause.

When analysing an odour nuisance, the **trajectory of the odour emission**, **dispersion** and h**uman response** are three essential aspects to consider.

Odour Emission
The extent to which an odour is emitted depends on the industrial process at play, and the substance or raw material that is being processed.

Odour Dispersion
The ways in which an odour is dispersed in the atmosphere depends on meteorological variables, stability of the atmospheric layer, wind speed and direction, temperature, relative humidity, among others.

Exposure of the receiver(s)
The extent to which someone is exposed to an odour depends on the type of activities they are carrying out at the time and the times and location at which an odour is present in the atmosphere. The longer the activity is carried out, and the more regular, the more the receiver is exposed to an odour.

2.2. Understanding when an odour becomes a nuisance

The scale of the impact that an odour has on an individual exposed to it can be determined by 5 factors, grouped under the acronym FIDOL: **frequency**, **intensity**, **duration**, **offensiveness** and **location**. Each of these factors may contribute to an odour becoming a nuisance.

Table 1. Description of the FIDOL Factors.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment.

FACTORS		DESCRIPTION
F	**Frequency**	How often an individual is exposed to the odour. A pleasant smell can cause discomfort if exposure is too frequent. Also, a low concentration odour that fluctuates rapidly is more detectable than a background odour at a stable concentration.
I	**Intensity**	Refers to the perception of the strength of the odour. An odour that in principle is not considered unpleasant, but is perceived at a high intensity, can become annoying, even though the frequency to which it is exposed is reduced.
D	**Duration**	Period of time during which people are exposed to the odour. It indicates the time of an odour episode, that is, how long the odour concentration remains above the detection threshold.

O	**Offensiveness**	Refers to the characterization of the odour, which can be pleasant, neutral or unpleasant. This factor is a mix between quality, hedonic tone, and odour concentration.
L	**Location**	Refers to the type of land use and the nature of human activities surrounding an odour source. The "location" factor can be considered to encompass the characteristics of the receiver such as its sensitivity, vulnerability, among others.

3. The Odour Management Plan (OMP)

An Odour Management Plan, hereafter OMP, is a framework which formalizes and describes the actions that an odour-emitting stakeholder implements to ensure the prevention, reduction and / or control of odour emissions.

An OMP is not an impact assessment, but rather plans a series of prevention, reduction and control measures for the proper management of the risks associated with odours.

An OMP will describe the internal control actions of the facility to prevent risk situations and also any contingency plan in the event of an odour nuisance. An OMP must cover the whole industrial or operational process of a plant, but it must also be able to anticipate and plan abnormal events, contingencies and incidents.

Ideally, an OMP must be part of the operational management of a facility, so it must follow the basic elements of a management system:

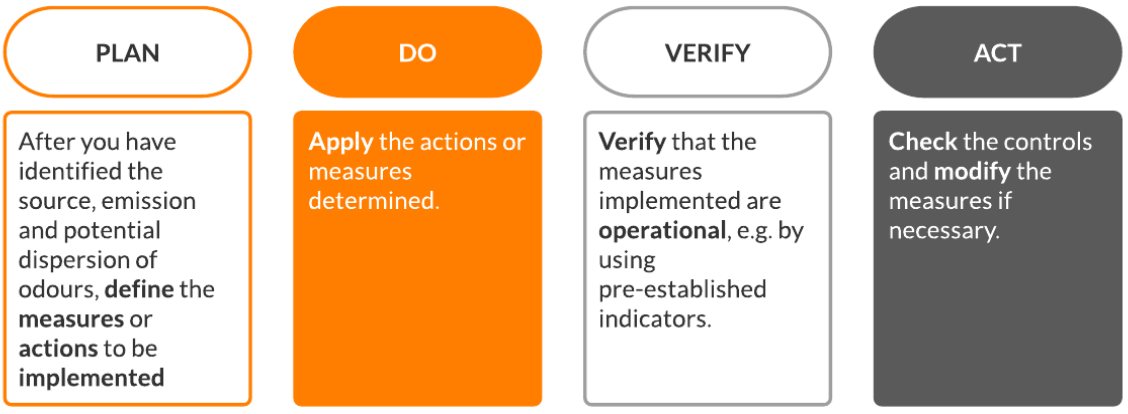

Figure 2. Basic elements of an OMP.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

For the sake of simplicity, this **toolkit describes an Odour Management Plan in 4 stages**, as inspired by official suggestions from the Chilean Ministry of Environment . However, the toolkit will also refer to hints from British suggestions for the design of an OMP.

These two sources are non-exhaustive, and you are most welcome to check suggestions and standards from your own country, if available.

In a nutshell, the Odour Management Plan proposed seeks to answer 4 basic questions which you may find helpful, as shown in *Figure 3*.

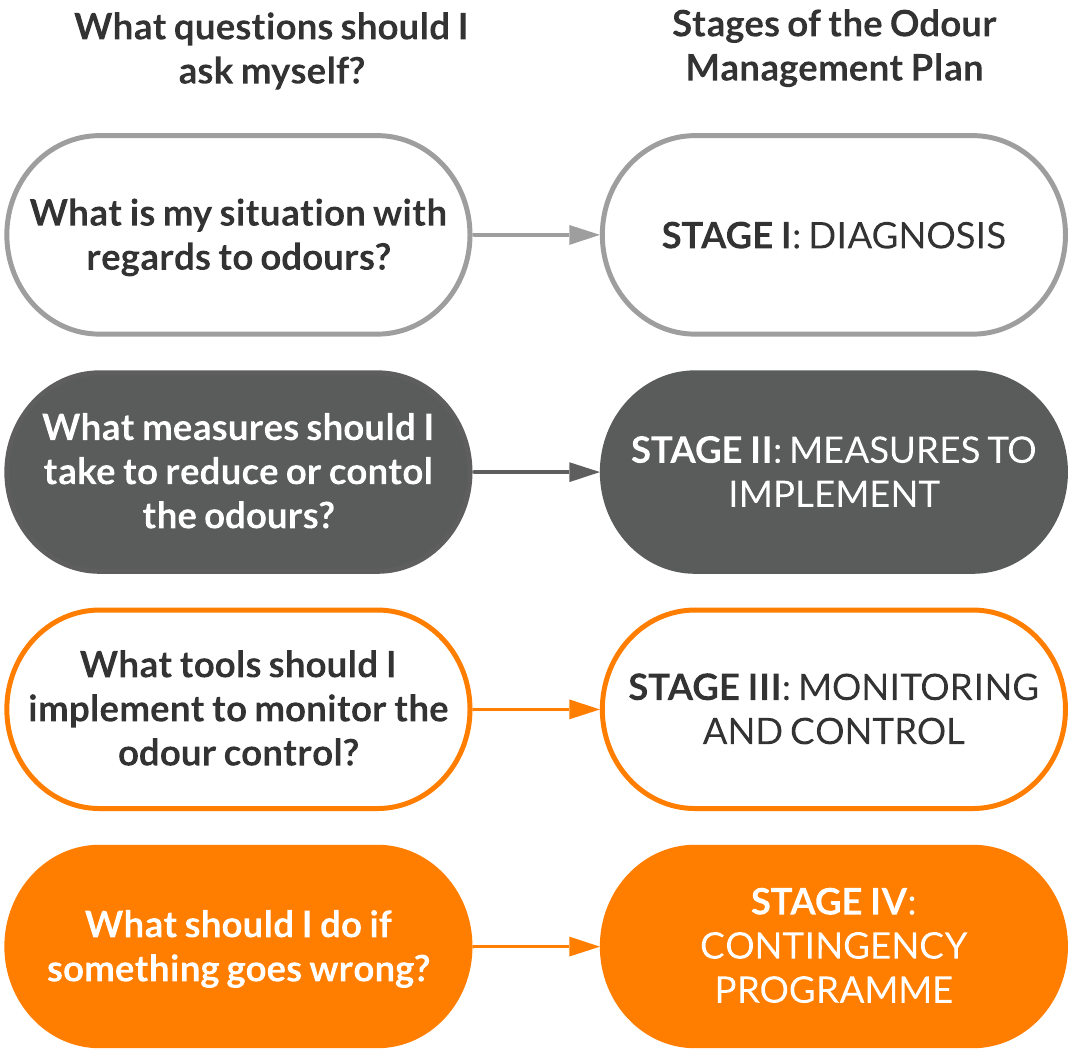

Figure 3. Questions to ask yourself when designing your OMP.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

4. How to develop your own Odour Management Plan (OMP)

In this section, we look through each stage of the Odour Management Plan (OMP) in a detailed manner. We will walk you through the steps to take during each stage, from the **information to be collected**, to the **decision(s) to be taken**. *Figure 4* summarizes the objectives and information to be collected for each stage.

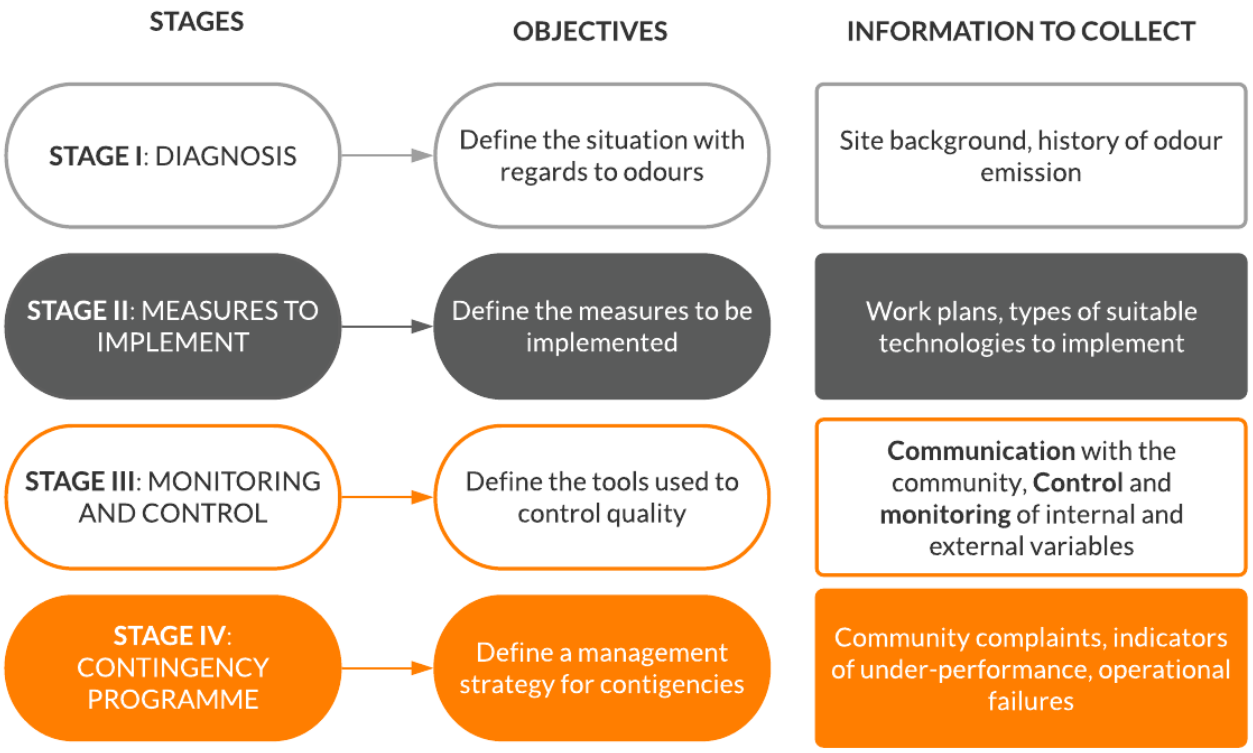

Figure 4. The 4 stages of an OMP.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

4.1. STAGE I: DIAGNOSIS

This stage can be divided into **three mains aspects**:

(1) You should provide a **diagnostic of the propensity of your plant to emit odours**, how they might disperse in the atmosphere and who they might reach
(2) You should provide a diagnostic of **the history of odours in your area**: has the local community ever faced odour nuisances? Are there natural conditions (soils, geography) which may increase the propensity of your plant to produce odours?
(3) You should **estimate** the **odour emissions** your plant **produces** / **may produce**

These three aspects are essential to provide a full picture of the odour situation you and the local community may face.

4.1.1. First aspect: odour diagnosis of your facility

A. Determine your facility's geographical remit

Use cartography or any preferred means to **identify** your **facility(ies) geographical remits**.

- How many plants do you have?
- How spread out are they?
- How close are they from the nearest residential area?

B. Identify the type of operations and processes of your facility

- Indicate the **production / operation units** of your facility, the total production capacity and number of employees
- Detail the **products** or **substances** that will be **treated**
- Report the **production process** through a **flow chart**

C. Identify when odour emissions may occur

Identifying the **stages** during the operational process **during which odours may be emitted.** Indicate **which substances** will be emitted and what type of odour by-product might be created as a result.

D. Characterise the emitting sources

Once you have identified the stages within your production process which may emit odours, you should **identify** and **describe** the specific **sources** at which odours may be emitted. Examples include:

- Transportation (indicate route)
- Activities related to maintenance
- Cleaning of process equipment
- Loading and unloading of materials
- Emissions from storage tasks, storage sites
- Abnormal or periodicoperating situations

Please refer to *Table 2* for an example of how to classify odours sources within your operational process.

Table 2. Classification of odour sources during the operational process.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

TYPE OF SOURCE	EXAMPLE	PARAMETERS	GENERAL PARAMETERS
Point source	Chimneys Ducts	Emission point height Diameter Temperature Output speed	• Operation cycle of each source (Months, weeks, days, hours). • Abatement systems and their respective percentages (%) of efficiency or abatement if applicable. • Duration of the issue; Continuous, Punctual, Periodic (frequency / duration).
Diffuse source	Sedimentation ponds Composting piles, Biofilters	Temperature Emission surface Height Area Exit velocity	
Passive source	Pavilions Lagoons	Emission height Exit velocity Area	
Fugitive source	Leaks Breaks in pipes	Emission height Emission velocity Area	

E. Characterise the type of odours likely to be emitted

You should characterize the odours your facility is likely to emit according to standard odour properties, describing at least:

- The quality of the odour(s)
- Their intensity
- Their hedonic tone

More information on the International Odour Observatory.

F. Identify the probability of generating an impact due to odour emissions

The probability of an odour emission to have an impact on its surrounding area will depend on:

- The frequency of a given odour episode
- Its duration
- The period of year (season) at which it happens

Table 3 shows an example of how you may understand the likely impact of an odour emission according to its duration and frequency. Basically, the most frequent and the longer episodes are likely to create the most impact.

Table 3. Impact of an odour emission according to its frequency and duration.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

	Duration of the odour emission			
Frequency of the odour emission		**Short**	**Medium**	**Long**
	High	Moderate	High	High
	Moderate	Low	Moderate	High
	Low	Negligible	Low	Moderate
	Negligible	Negligible	Negligible	Negligible

Points A to F are summarized in *Figure 5* below.

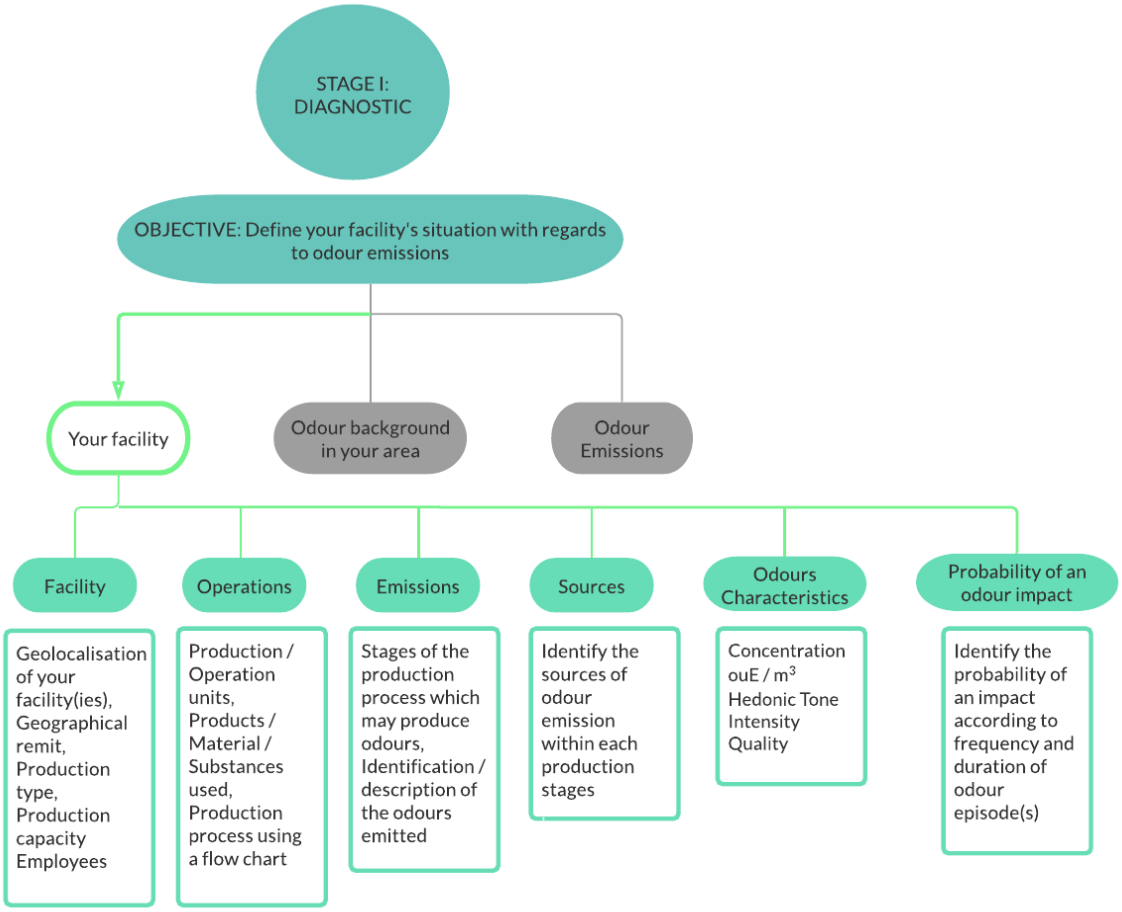

Figure 5. STAGE I: Odour diagnostic of your facility.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

4.1.2. Second aspect: odour background

Determining the odour background within which your facility will (is) operate(ing) is crucial to understand the potential impact that your plant might have on its surroundings. Looking at the history of odours in the area, the type of land your facility is located in, external sources of odours already present and so on and so forth are details you should consider when designing your OMP.

A. Type of land use

You should find out the type of land and land use your facility(ies) is located in, with reference to the national standards of the country in which your industry operates.

B. External sources of odours

You should identify external sources of odours located in the vicinity of your facility(ies):

- Are there any other industrial sites located nearby?
- Is there any natural odorous settlement?
- Are there any roads, airports, or transport networks?

C. Receivers' background

You should investigate the history that the local community or your nearest neighbours have had in relation to odours.

- Identify all your surrounding neighbours
- Determine your neighbours distance to the facility(ies)
- Investigate history of odours in the area: has the local community ever complained about odours? Are there antecedents with other industries you might want to be aware of?

D. Record of odour complaints

Collect information on the history of complaints from the local community. Where possible, the information you collect should include:

- Dates and times of odour complaints
- Wind direction if available
- Operational status of the previous / current facility(ies) being blamed for the odours.

Do not forget the community might complain via the local authority, social media, local newspapers and other channels that may not be the channels you have established to record odour complaints. You should keep an eye on these other channels too.

WHY IS IT IMPORTANT TO HAVE A COMPLAINT HISTORY FROM THE COMMUNITY?

It is crucial to understand the context within which your business will operate. Knowledge about previous and current sentiments of the local community with regards to your activity will help to deliver appropriate and respectful communication. Secondly, looking into pre-existing logs of odour complaints from the community, if they exist, will enable you to understand the trends and patterns in odours that your own business may experience. It may help you to anticipate the potential impact that your facility(ies) may have on the local community and may help you to manage your neighbours' expectations.

Similarly, it is essential that you establish your own protocol for odour complaints and keep a log of any complaints expressed by the community.

Figure 6 summarizes the second aspect of your facility's diagnosis.

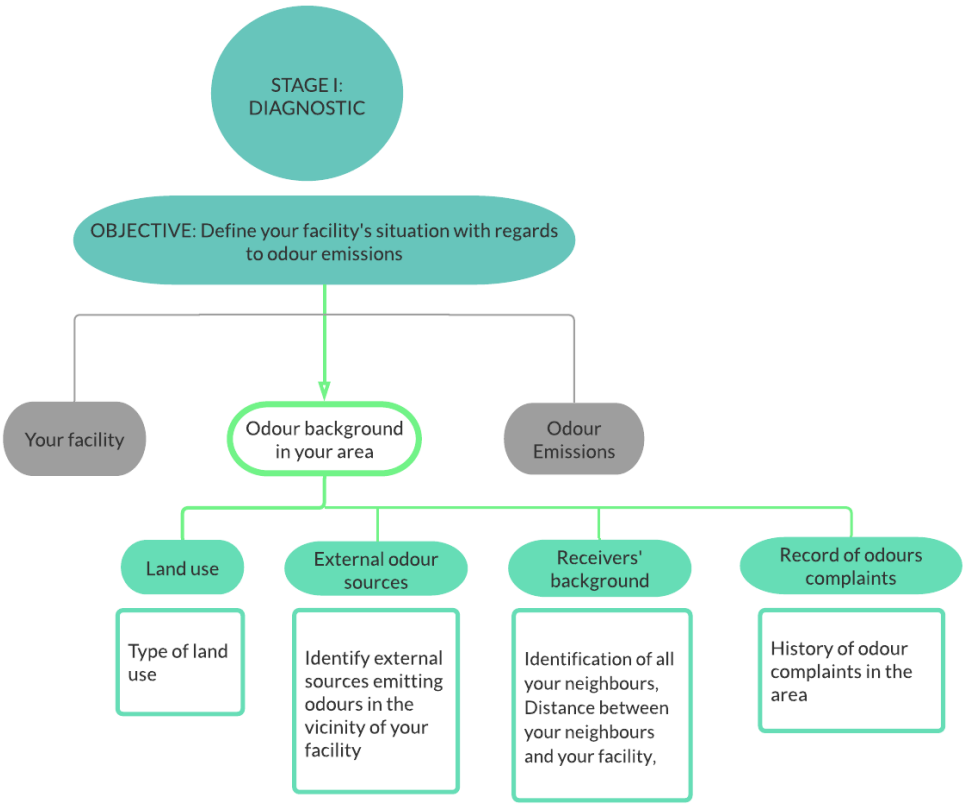

Figure 6. STAGE I: Diagnosis of the odour background of your facility.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

4.1.3. Third aspects: estimating odour emissions

There are varying contexts within which your facility may operate. 2 cases will be described here.

(1) Case 1: Your business operates with an environmental regulatory permit which **sets an odour emission standard**.
(2) Case 2: Your business does not operate with a permit, and does not have an odour emission standard to refer to.

In case 1, you should estimate your odour emissions according to the legal requirements detailed in your environmental regulatory permit. **In case 2,** you can estimate your odour emissions using the tips detailed below.

A. Choosing a method / tool to measure odour emissions

You should choose a method / tool to determine / estimate the scope and extent of the odour emissions of your facility(ies). You may estimate odour emissions from the source(s), using method such as:

- Measuring odour emission at the source using techniques detailed on the International Odour Observatory. You can then use your measures as parameters in an odour dispersion model.
- Measuring odour emission using emission factors (i.e. bibliographic references) to estimate odour at the source. Emission factors can be national or international standards.

B. Characterize the scope of the emissions

You should report the results of your analysis and provide sound justification of the methodology you have used.

- Why is it the appropriate technique?
- Did the technique you used accurately capture the odour emissions of your facility?

C. Conclusion: the odour impact of your facility

Based on the **diagnosis** you drew with regards to:

- Your plant(s) / site(s) / facility(ies),
- The history of odours in the area
- Your estimation of the odour your activity emits,

You should draw an appropriate conclusion and provide a clear statement about the impact that your facility is likely to have on neighbouring communities.

You may refer to *Table 3* to understand in which category the odour emissions your facility produces fall.

Table 3. Odour impact description.
Source: Modified from the Environmental Agency (2011). *How to comply with your odour permit - H4 Odour Management*.

LEVEL	DESCRIPTION
HIGH	One or several odours emitted represent(s) a serious contamination, or are(is) likely to cause annoyance to identified recipients, **regardless** of whether **appropriate odour control measures are already being used**. You **must take additional measures** or you may have to **reduce** or **discontinue operations**.
MEDIUM	The odour contamination generated is likely to disperse outside of the perimeter of the facility and reach the closest receptors. **Appropriate measures must be taken to minimize odour**. If proper measures are used, the residual odour should be tolerated by the community. For some operational activities, appropriate measures will ensure that the odours do not leave the perimeter of the facility or, failing that, that they do not reach the closest receptors.
LOW	There is **no odour outside the perimeter**, however, a **preventive approach must be maintained** and additional odour control operations may still be considered.

Figure 7 summarises this last step of your diagnosis.

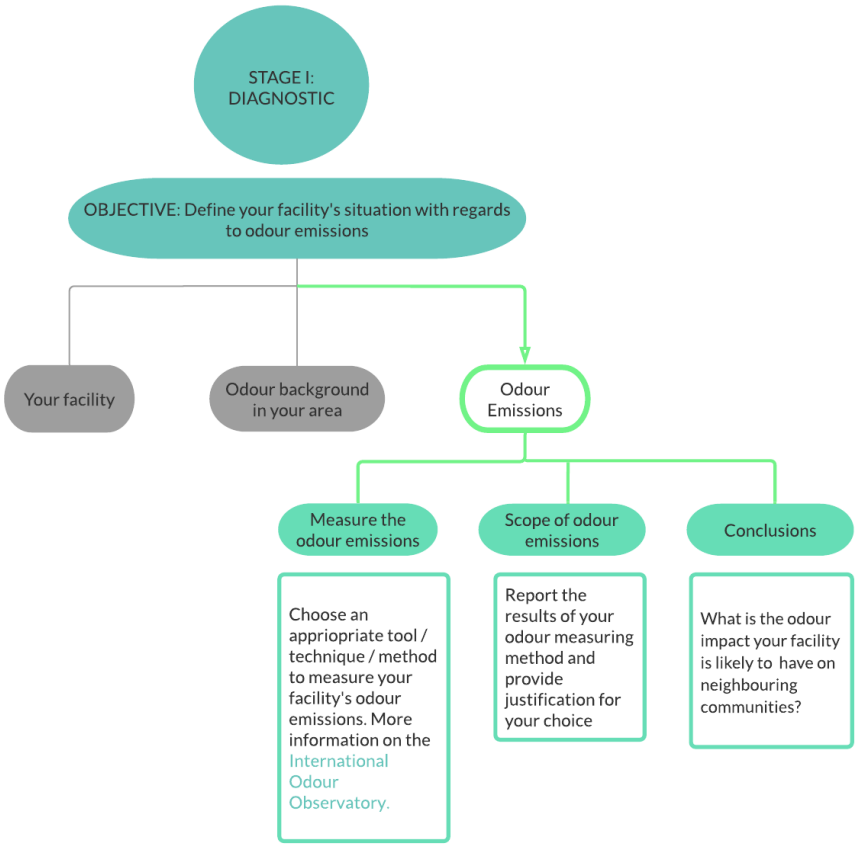

Figure 7. STAGE I: Diagnosis of the odour background of your facility.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

4.2. STAGE II: MEASURES TO IMPLEMENT

The objective of this stage is to **identify appropriate odour control measures** which your plant can put into place to minimize odour emissions, mainly at their source. This section contains a **general explanation** of how to deal with odour nuisances, however the **design**, **operation** or **maintenance details** of the measures will depend on a **case-by-case basis**.

We recommend you consider a **comprehensive approach**, taking into account all the measures that can be implemented during your operational process, and giving priority to the measures that can be used at the earliest stage of the process.

4.2.1. Define a work plan

Working backwards, from your odour reduction goals to the choice of odour abatement measures to be implemented may help to make the best-suited choices for your facility.

- **Define the objectives** that must be met for each odour emitting source/ activity carried out by the facility.
- **Establish the internal and external commitments** of your business towards employees, neighbours and any other stakeholder involved in the odour emitting issue.
- **Define the department/ team(s)** responsible for each **odour emitting activity** and the **department/ team(s)** in charge of **implementing odour control measures**.
- **Define the terms** within which you propose to meet your objectives, and describe your commitments on the short, medium and long term.
- **Define the means of verification and monitoring, as well as each indicator** which you will use to measure the success of the odour reduction operations, in accordance with your pre-established schedule.
- **Define the actions to be carried out** if your indicators show that things **do not go as planned**.

4.2.2. Choosing your odour control measures

The **International Odour Observatory** reviews a number of **existing odour abatement methods** for point sources and other odour emitting sources, which you may find useful.

The general advice when selecting your odour control method is to **adopt a systematic approach**. It is advised to **prioritise controls** that can be **used at the earliest possible stage** of the industrial process, **in order to reduce subsequent odour nuisance directly from the**

source. If, for one reason or another, no odour control method can be implemented at this stage, an analysis should be carried for the next stage of the process, and so on and so forth, in a systematic manner.

Therefore, odour prevention, reduction and control measures must be defined according to the stages of the industrial process at play, considering the sources or emission points that have been identified as the main generators of odour emissions.

Measures implemented can be **associated** with **Good Operational Practices** (GOP) and / or **Technology** (GOT). Stages of GOP and/ or GOT are generally presented as follow:

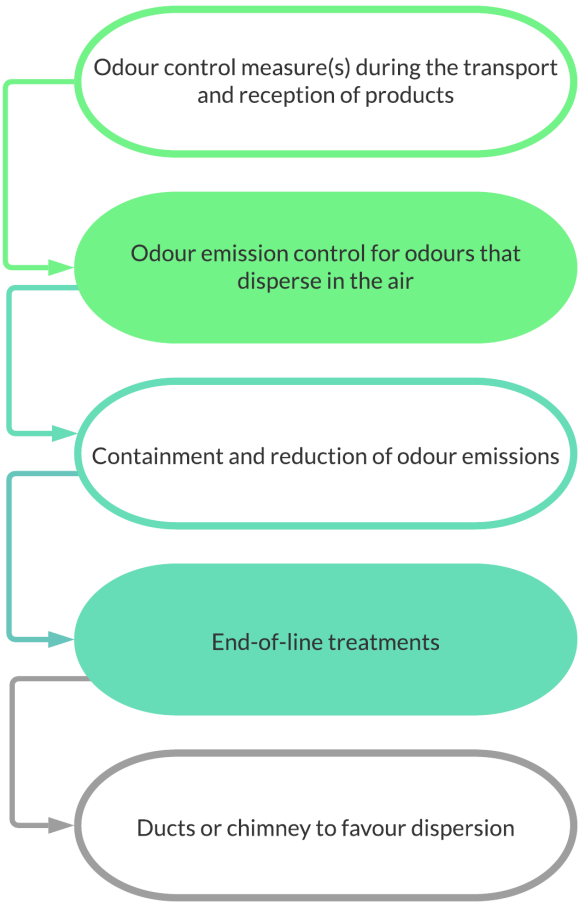

Figure 8. STAGE II: Choosing a control measure. Stages of a Good Operational Practices / Technology (GOP/T).
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

4.2.3. Implementing odour control measures

Based on the information you obtained from your diagnosis in stage I and considering the information shared above in section 4.2, you should now **select the odour abatement measures** most suitable to your industrial activity, and **develop a programme for the implementation of Good Operational Practices (GOP)** within which to operate selected measures.

Good Operational Practices and/ or Technology requirements may **vary** from one industrial stage to another and from country to country. You may find resources about your own country's Good Operational Practices on the Chilean Ministry for the Environment's website.

A. Reception and management of supply

Generally speaking, during the transport and storage stages of an industrial process, raw food materials such as animal waste or by-products are the products which generate the most noticeable and unpleasant odours due to their decomposition or denaturation.

If your facility handles such odorous products, it is advisable that you, as an operator, contact your supplier in order to verify the handling of the odorous product(s), e.g. based on its freshness conditions in the case of food materials.

In general, you must ensure that processes that are external to your facility but come into play in its geography (such as during the transport, reception and storage of products) are taken into account when trying to minimise odour emissions.

B. Emission control

Another aspect of odour control is to look at the emission rates of odorant substances handled during the industrial process.

Emissions of odorant substances can be controlled by **reducing their evaporation rate**, through the implementation of **chemical** or **physical methods**, such as:

- **Lowering surface temperature** by avoiding direct sunlight
- **Incorporate temporary surface treatments** to lower surface temperature or create a chemical barrier.
- Reducing the evaporation rate of when **releasing dissolved odorant chemicals**;
- **Reduce airflow** over the surface (physical barrier) of odour-releasing materials to reduce the rate of evaporation;
- **Control the acidity / alkalinity of materials**, waste, etc., to make odorant compounds more soluble in water and less likely to evaporate.
- **Reduce the surface of an odorous material** (including the surface of exposure or contact to ambient air);

- **Avoid activities that create turbulence** and / or that dramatically increase the exposed surface area.

For more information, please refer to the International Odour Observatory.

C. Containment and reduction of odour

If you cannot avoid producing significant levels of odour emissions, priority should be given to containing or encapsulating the emissions before treating them. As a recommendation, you should:

- **Choose containment and treatment methods** in addition to the proper management of ventilation rates:

Containing, channeling or confining the emissions generated by an odour emitting source in a localized way **reduces the volume of air required to be treated**, making this process much more cost-effectiveand efficient.

- Keep the windows and doors of buildings used for confinement closed. Ideally have **doors with automatic closing**.
- Incorporate **inspection of pipes**, valves and tanks regularly for **leaks** and **damage**.
- In some cases, **airtight containment measures** such as pressure vessels in an anaerobic digestion plant **will not require ventilation except** to transfer the produced gases to an engine.

D. End-of-line treatment

After considering points A, B, C and D, there may be some **emissions** left, which will **require end-of-line treatment methods.**

You should **identify** and **confine** these **emissions**, and then proceed to select an odour reduction technology that best fits **your emission target level** and whose costs allow its implementation. Do not forget that at this stage, it is important to define an odour reduction efficiency indicator.

More information on the International Odour Observatory.

E. Ducts and odour dispersion

Finally, you might want to consider the aspect of **odour dispersion**. As a measure to favour dispersion conditions, **ducts** or **chimneys** can be used to channel the odorous air. With a chimney, the emission or expulsion of odourous substances and gas will be at a height that allows odours to disperse before reaching ground level.

Importantly, you should take good notes of the characteristics of the environment surrounding your facility and consider any negative and secondary consequences that may arise from the use of a chimney or duct.

For new installations, it is recommended to consider these variables in the design of the installation, so that the operating units are located as far as possible from the perimeter of the installation and, consequently, from the receivers.

Maximum impacts can be avoided by scheduling operations. For example, suspending operations when there are low dispersion conditions and / or when the wind direction is towards nearby receivers. When this is part of a control strategy, you should be monitoring the weather and forecasts to be ready to take quick action.

4.2.4. Communicating with your neighbours

A communication plan should be established. Any connection established or relationship formed with the community that may be affected by the installation is very important considering that this very community will likely want to have means of communication with your facility/ business.

Likewise, the participation of the community as a sensor is important and relevant. The community can participate through citizen science projects[1], registration and management of complaints, odour diaries, surveys, technical visits from the community. This way, links and direct participation of the community with the installation are also established.

What impacts can odour nuisance have on neighbouring communities?

- Generation of discomfort
- Possible health effects (headache, excessive cough, nausea, fatigue, etc.)
- Changes in behavioural patterns in daily activities
- Mood swings

Community participation (or even Citizen Science) not only helps people to get to know the facility, its role and staff, but it also helps people to understand what is being done. Some of the workers may live in the surrounding community and can be important ambassadors in this process.

In addition to the aforementioned, it is important that the facility implements a system for receiving complaints or claims, defining the communication channel and informing the community about it. The implementation of a complaint or claims channel/ system should be considered, whereby the channel for receiving said complaint takes into account the specific

[1] For more information, you may want to refer to the Internation Odour Observatory. Citizen Science projects have been established throughout the world to foster citizens' participation in finding relevant solutions to odour pollution issues. See our pilot case studies and information about Citizen Science.

context and characteristics of the local community. For example, it would not be appropriate to establish the receipt of complaints in a web platform in a rural area that has a poor internet connection, in which case the telephone line would be a better communication channel.

Annex 1 provides an odour claim/ complaint template which you may want to use or find inspiration in, to determine the data that is relevant when recording an odour complaint. Said relevant data will be provided for the investigation of the cause of the complaint or claim.
To complement the information on the complaint system, review section 4.4.3. Complaint Management for contingencies or incidents.

4.3. STAGE III: MONITORING AND CONTROL

An essential part of an Odour Management Plan is its monitoring and control programme. This aspect ensures that your odour control measure(s) operate as projected and is necessary to correct possible deviations from your projections.
Monitoring and control requires **well-defined** and **programmed** procedures and a clear assignment of responsibilities, as well as the establishment of **compliance** and **effective indicators**.

4.3.1. Monitoring and control programme: content

This toolkit proposes to categorise the monitoring and control measures that your facility can implement. This may help you to broaden your vision about the type of measures that exist and should be considered for different industrial stages. Internal measures, such as those related to the operation of a plant and external measures, such as those related to potentially affected communities are reviewed.

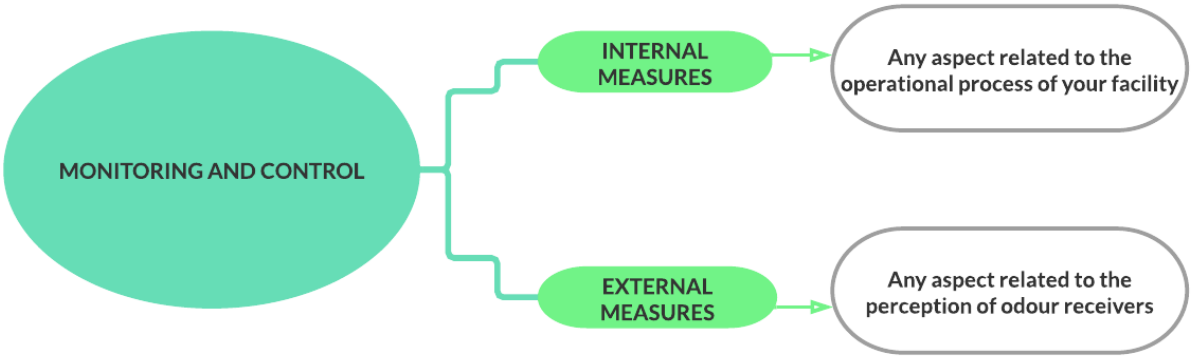

Figure 9. Approaches to Monitoring and Controlling odour emissions.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

Any Odour Management Plan is, in essence, a preventive approach to odour nuisances. The goal of such a plan is to design and implement a management and control plan such that any impact on the community is avoided (except for contingencies).

However, it is necessary to create clear channels of communication (See section 4.3.4., Communication with the community) very early on, even prior to the functioning of your facility, to determine perceptions and sentiments of the neighbouring community as an external control and monitoring measure. If this proves not to be effective, you may want to refer to the following point made in section 4.3.2.

Importantly, monitoring and control should include all aspects of the industrial process as some odour emitting sources may not have been identified yet or may reveal themselves as the equipment ages or becomes damaged.

Finally, the responsibilities for the monitoring and control programme devised should be distributed clearly to a team or department within your organisation.

The contents that should be considered in the odour Emissions Monitoring and Control Program are shown below.

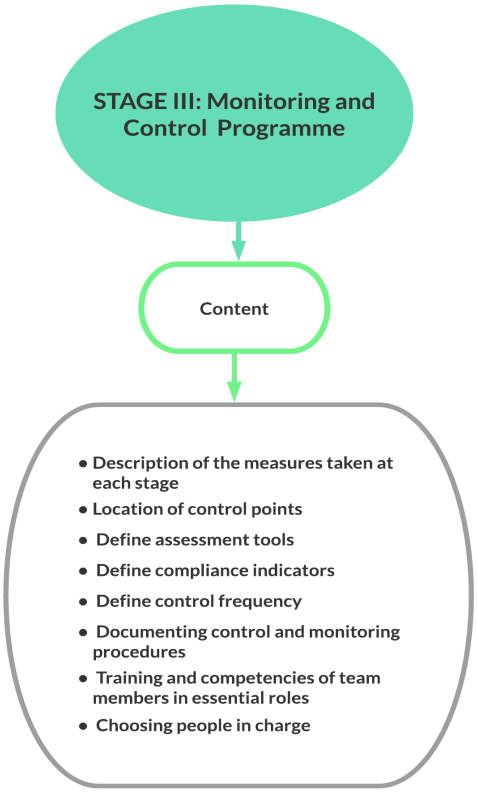

Figure 10. Contents of the Monitoring Programme.
Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

A. Description of the measures taken at each stage

You should describe all the odour control abatement measures you have selected to implement in your facility (Stage II, Measures to Implement).

B. Location of the control points

Control points must be established in each odour emitting units / processes identified.

C. Defining assessment tools

The tools selected for monitoring and control may be the same as those used for the odour diagnosis, but the objectives for which you use these tools is different. More information in the next section, 4.3.2..

D. Define compliance indicators

For each of the control units, **compliance indicators** must be defined. Indicators must be established according to the objectives defined for each of the units. This step is crucial to verify if the odour control technique at a particular stage/ unit is adequate. Based on the indicator, necessary actions will have to be taken to achieve set goals if necessary.

E. Define control frequency

The frequency at which certain controls will be carried out in determined units/ stages must be figured. This frequency should be based on the probability of risk and impact of the controlled units. The most critical units should be prioritized and a more frequent control periodicity should be adopted.

F. Documenting the control and monitoring procedures

You should keep a clear and organised record of any control activity carried. Keeping a log will help to see patterns of improvement and areas of good functioning. It may help refining your understanding of odour emissions and their triggers within your own facility.

G. Training and competencies of team members in critical roles
Employees must be trained appropriately to generate the necessary competencies to fulfill the roles required in each aspect of the control programme.

H. People in charge of control
A person or a team in charge must be chosen for each control point. This person or team must carry out the controls within the established frequency, will be responsible for reporting any deviation in the results based on the compliance indicators, etc..

4.3.2. Tools for the monitoring and control programme

Table 5. shows the methodology(ies) that could be used to monitor and control odour emissions. The internal monitoring measures, which control the operational functions of the plant, are very relevant, because if an adequate diagnosis of the critical control points was carried out and these variables follow the projected behavior, it is expected that there should be no emission that impacts receivers, if external conditions (meteorological) allow.

Table 5. Objectives, parameters and proposed alternatives for monitoring and control. Source: *Instructivo para la Elaboración de un Plan de Gestión de Olores (PGO)* (2018), Chilean Ministry of the Environment

	Status	Objectives	Parameters to quantify / evaluate
MONITORING AND CONTROL	**Internal**	Determine the source (s) with the highest generation of specific odour / odour substances	• Concentration of odour and / or odorant compounds • Odour quality (descriptors) • Intensity • Hedonic Tone • Smell emission
		Verify and control compliance with Good Operational Practices (GOP)	• Tasks and activities committed in the Clean Production Agreement (APL)

			• Internal procedures for operational control • Checking frequency / frequency • Maintenance plan
		Verify and control compliance with Technologies and levels of odour / gas reduction in emission sources	• Procedures for operation control • Periodicity / frequency of check-ups • Maintenance plan. • Odour / Odour Removal Efficiency
		Evaluate operational and odour / odour removal processes.	• Technology design parameters • Internal procedures for operational control • Periodicity / frequency of checks • Maintenance plan • Efficiency of Odor Removal/ Odorant Compounds
	External	Online monitoring of odour and odorous substances	• Odour emissions • Odorant scope • Weather variables
		Investigate the sources and predominant orientation of impact	• Odour emissions • Odorant scope • Weather variables
		Estimate the impact of the odorant range	• Odorant range (area and maximum range)

			• Scent pen
		Evaluate the impact or odorant reach	• Frequency of impact on receivers (via modeling) • Maximum odour concentration in receptors (via modeling) • Odour perception frequency (via grid method) • Discomfort due to the perception of odour (registration of complaints, surveys, etc.)
		Assess exposure in receptors	• Annoyance due to the perception of smell (registration of complaints, surveys, etc.). • Frequency of smell perception (via the grid method) • Maximum odour concentration in receptors (via field olfactometry).
		Trace odour/ do gas tests.	• Maximum odour concentration in receptors (via field olfactometry) • Concentration of odorant compounds (static or portable monitors) • Odorant range (area and maximum range)

4.4. STAGE IV: CONTINGENCY PROGRAMME

4.4.1. On contingencies

The last stage of an Odour Management Plan consists of devising a **contingency programme**, which will help to deal with potential risks that may occur. It first aims at minimizing or preventing things from not going according to plan. If a situation occurs, it aims to establish a clear protocol to deal with the issue as quickly and adequately as possible.

To prevent issues from happening, a few aspects are worth considering when establishing a contingency plan.

A. Define the possible origin of the issue

Identify exceptional situations or events that could occur within your facility. The origin of the issue could be from operational failures, or other anticipated external factors.

B. Define the scope of the contingency programme

You may want to answer the following queries:

- The conditions that must be satisfied for a situation to be declared,
- The possible causes for a situation to occur (e.g. human failures, system failures, meteorological factors or others),
- The goals of the contingency program,
- Who is responsible for complying with the contingency programme,
- Who is responsible for executing the activities described in the contingency programme,
- Deadlines to comply with the contingency measures to be adopted if a situationarises,
- Success indicator(s) of the contingency measures to be applied,
- Communication channels for the community and relevant authorities, if applicable.

C. Define the units/ department involved in the contingency programme

In an effort to anticipate issues, units, machineries or stages in the industrial process that are most likely to keep on generating odours should be identified. When doing so, you should consider the following points:

- Identify possible risk factors in each of the process units, looking at abnormal situations, spills, power failures, door failures, equipment or reduction etc.

- Identify the critical processes, that is, those that are more susceptible to generating significant odour impact.
- List the odour consequences of these critical factors or points.
- Find out about the process schedule of the units or sources involved.
- Define alternative solutions for the possible odour generation event.
- Describe the additional measures that will be applied during the period of the contingency.

D. Define contingency measures

Depending on the cause that gave rise to the situation and the existing conditions at the time of its occurrence, measures to be implemented must be defined:

- Immediate action measures, e.g. Stopping the operation of the plant, stopping the operation of the process at play, etc.
- Setting contingency measures that match the condition that generated the odour event.

It should be noted that if the measures are shown to be insufficient, then they will need to be more stringent or otherwise possibly cease or reduce operations.

4.4.2. Incidents

In the event of an unexpected event that affects neighbouring communities, you may want to establish the following actions:

- Immediate action measures, e.g. Stopping the operation of the plant, stopping the operation of the operating unit , etc.
- Select a solution measure tailored to the condition that generated the odour incident,
- Notify relevant authorities,
- Reach out to the affected community to estimate the impact of the event,
- Give notice to the community of the event and the measures that are put in place,
- Analyse the origin of the incident to identify the failure and prevent the error from repeating,
- Define the team/ employees responsible for taking preventive measures after an incident.

4.4.3. Management of odour complaints

When receiving odour complaints from the community, you should put in place appropriate investigations and corrective actions to address the issue or incident that occurred. For this, you may want to think of the following:

- You should define an **efficient communication channel** through which to receive complaints. When a complaint is received, the community should be made aware of it, and adequate investigations should be launched.
- Once the community complaint has been registered, the contingency program should be put into action, like so:
    - The team in charge of carrying out the contingency programme above should proceed to a quick evaluation of the issue , in order to determine the origin and causes of the annoying odours and estimate how big of an issue the problem is.
    - The relevant team(s) must inform by telephone or email, preferably within 24 hours, a designated environmental management manager. The information that should be passed on can be found in the example of an **Odour Claims Report Form** in Annex 1.
    - Once the relevant people have been alerted and the severity of the situation has been verified, solution measures to counteract the odour nuisances should be initiated.
    - A report should then be sent out to the relevant authorities. This report should include the origin and cause of the odour nuisance, as well as the solution measures put into place to remedy the issue. Ideally, this report should be within 24hours of the solution measures being implemented.

Annex

- Odour Management Plan (OMP) -

Annex 1. Odour Claims Report.

Odour Claims Report	
Date and time of claim:	**Name of complainant:** **Address of complainant:**
Contact of complainant **Tel. :** **Email:**	

Odour perception date	
Odour perception time	
Location of odour perceived	
Weather conditions	
Temperature	
Wind force	
Wind direction	
Description of the odour:	
What type of odours is perceived?	
Odour intensity	
Duration of episode	
Constant or intermittent odour during episode	
Any other comment from complainant?	
Is there any other odour claims related to the facility or location?	
Any other relevant information	
Do you accept the claim that the odour episode is coming from your facility?	
What activities were carried in your facility at the time of the odour episode?	
Operating process conditions during the odour episode (for example, flow rate, inlet pressure, and outlet pressure)	

Measure taken and results

Odour Intensity						
0	**1**	**2**	**3**	**4**	**5**	**6**
No odour	Very Weak	Weak	Distinct	Strong	Very Strong	Extremely Strong