



---

## **A Report on Odor Monitoring and Management in A Linear Alkyl Benzene Sulphonic Acid (LABSA) and Sodium Lauryl Ether Sulphate (SLES) Production Plant**

**Harshita Budhadev<sup>1\*</sup>**

Department of Bioscience and Biotechnology, Banasthali University, Rajasthan India

\* Email: [harshita.budhadev0809@gmail.com](mailto:harshita.budhadev0809@gmail.com)

DOI: <https://doi.org/10.55248/gengpi.5.0124.0216>

---

### **ABSTRACT:**

Clean and natural air is considered a global fundamental right and also considered a prerequisite for a sustainable civilization. The presence of any undesirable contaminant, pollutant, or odor might severely affect the natural quality of air, which in turn may significantly have a deleterious impact on human health. Recognizing the ardent need for the requirement of pollutant and odor-free pure air, this report presents insight into the odor management plan of a particular factory/ manufacturing unit/ or production unit. We hope that this report will serve as a useful tool for Regulatory Agencies to ensure odor-free clean and pure air.

---

### **INTRODUCTION:**

The odor is technically defined as the perception of a smell. The odor may also be defined as stimulation or sensation resulting from the reception of the expression by the olfactory system of a living organism. Odor sensation is induced by inhaling airborne volatile organics or inorganic compounds, which may be toxic or non-toxic. Partial putrefaction of the waste results in the production of obnoxious odorous volatile organic and inorganic compounds which spoils the aesthetic environment for human beings as well as other living beings.

---

### **CHARACTERISTICS OF ODOR:**

There is a certain general character with reference, to the perception of the people. Few of the characteristics of odor are indicated below;

- The constituents of similar or dissimilar chemical compositions may have a similar odor. The nature and strength of odor may vary upon dilution.
  - Strong odorants have the potential to mask the weak odorants irrespective of their concentration. The odor of the same strength blends to produce may produce a certain combination in which they might be unrecognizable by sensory receptors.
  - The invariant intensity of odor might result in an individual quickly losing perception of the sensation which only could be noticed when it varies in intensity.
  - Fatigue for one odor may not affect the perception of dissimilar odor but will interfere with the perception of similar odor.
  - An unfamiliar odor has been reported to be more likely to cause a complaint than a familiar one.
  - Two or more odorous substances may have neutralizing, additional, and deleterious impacts on each other.
  - Odor has the property to flow in the direction of the movement of the wind.
- 

### **IMPACT OF ODOR:**

Odor sensing olfactory cells are linked to certain areas of the brain which control emotions as well as memory processes. Offensive odors can therefore have impacts on the physical and mental well-being of humans which in turn depends upon the exposure duration and also varies depending upon the age, sex, and physique of a particular living organism. Few of the deleterious impacts of the odor on the health of a living organism are indicated below;

- Vomiting, Headaches, Nausea

- Stress, anxiety, frustration.
- Social problem due to unwillingness to host guests due to embarrassment.
- Restriction in outdoor activities
- Discomfort for infirm elderly people.
- In addition to the above, the odourants responsible for odor may impact health due to their toxic nature.

## ODOR SENSITIVITY:

Due to the complex nature of odor perception by the human olfactory system, levels of sensitivity to odor within a population might vary depending upon person to person.

The sensing of smell is regarded as the most complex and unique sense in human beings. Sense of smell is carried out by two main nerves:

- Olfactory nerve (First cranial nerve):- these nerves process the perception of chemicals.
- Trigeminal nerve (Fifth cranial nerve):- process the irritation or pungency (sensation of chemical).

All the olfactory signals meet in the olfactory bulb where the information is distributed to two different parts of the brain. One of the major pathways of information is to the limbic system which process emotions and memory response of the body. The second major pathway is to the frontal cortex. This is where conscious sensations take place, as the information is processed with other sensations. And is compared with accumulated life experiences for individuals to possibly recognize the odor and make the decision about the experiences. This entire activity from nostril to signal in the brain is completed within 500 milliseconds. As odor is a perception, it is difficult to measure by any instrument or chemical method. However, conversion of equivalent sensory signal into a measured value is the basic behind odor measurement, termed "OLFACTOMETRY". Considering the odor menace at the LABSA/SLES production unit, this pioneering study was planned to prepare a guideline for better odor management. This document is prepared based on the experience from this study and in-depth research on worldwide best management practices available, which could be adopted particularly in terms of odor control.

## ODOR MONITORING STRATEGIES:

Odor generation from a particular process, or a particular site is inevitable. However, detailed strategic arrangements should be adopted for monitoring the generated odor. A lot of studies indicated various mitigative measures for monitoring the odor and thereby have provided various routes of mitigation to deal with such problems. Detailed monitoring and scrutiny of the various sources of odor generation and thereby modeling the problem followed by the optimization of the different factorial parameters to minimize or cut off the generated odor. After a detailed literature review, survey, and identification of the adaptability, a protocol for sampling and analysis of odor and odor generating compounds has been proposed in Figure 1.

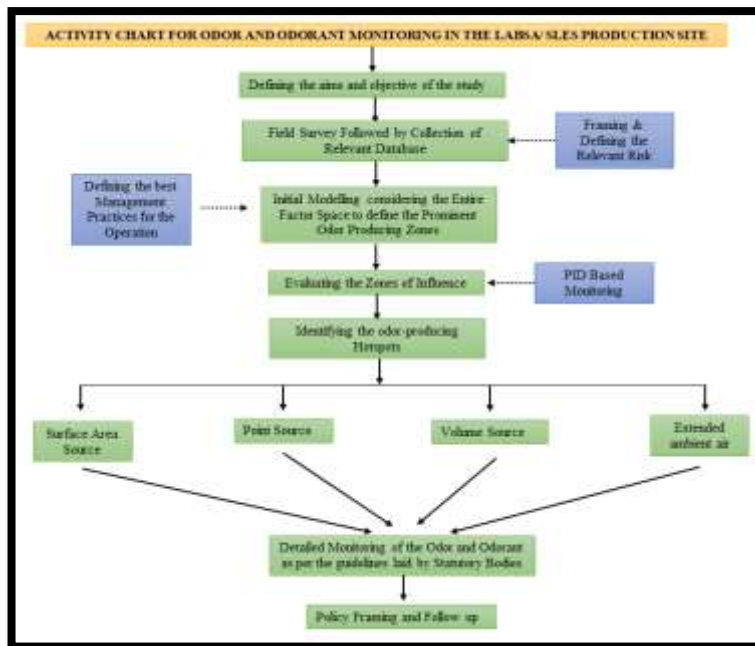


Figure 1. Activity chart detailing the outline for conducting odor monitoring.

## PREVENTIVE MEASURES FOR ODOR ABATEMENT:

As it is a well-known fact that odorants are generated through the various steps of the production of LABSA, below are the preventive measures that can be adopted at the different stages of the production site;

- Odor control by site selection, modification, and design.
- Operational management.
- Minimization of odor release through physical prevention.
- Odor counteractants.

A detailed schematic overview of the preventive measure for odor management has been provided in Figure 2.

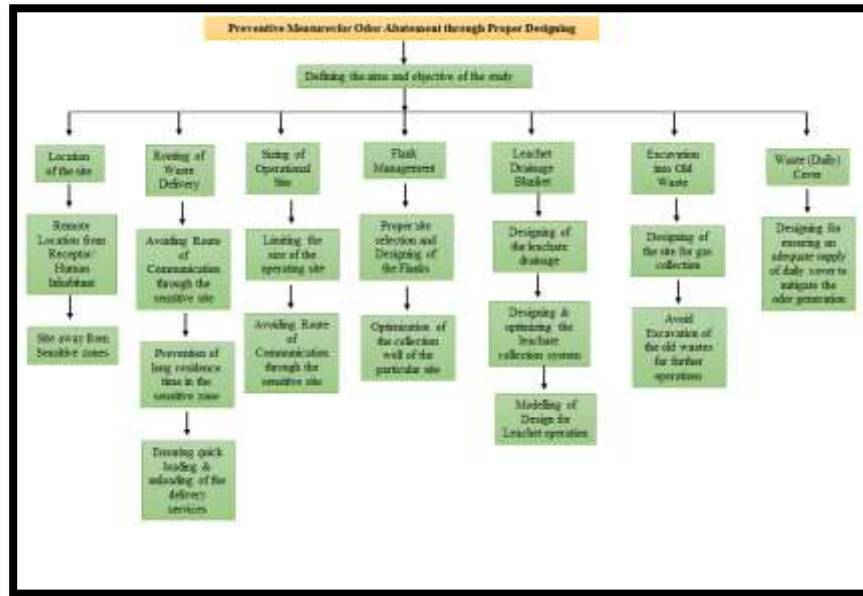


Figure 2. Preventive measures for odor abatement.

## BEST MANAGEMENT PRACTICES FOR ODOR MANAGEMENT:

The implementation pattern of the best management practices (BMP) may vary to an extent on a case-to-case basis. Following are the best management practices for odor prevention & control which should be adopted;

- *Plan:*
  - Assess facility processes and site operations, identify potential sources of odor (continuous, intermittent, or occasional discharge of odor) and the manner of discharge (point source, building fugitive, outdoor).
  - Detail odor avoidance, control, and mitigation strategies specific to the facility and site operations based on material and waste handling, production systems, ancillary services, preventative maintenance, and general site operations.
- *Do*
  - Identify BMPs to be implemented and how the BMPs will be integrated into site operations.
  - Establish odor complaint response protocols.
  - Implement administrative controls such as staff training, development of Standard Operating Procedures (SOPs), preventative maintenance schedules, and recordkeeping.
- *Check*
  - Odor monitoring and inspection protocols.
  - Recordkeeping.

- Accountability and Management oversight of BMPP related activities.
- *Act*
- Periodic review of the effectiveness of the BMPs and update of the BMPP on a regularly scheduled basis, or when changes are made at the facility.

---

### **ODOR COUNTERACTANTS:**

The counteractants used for prevention of odor release from the LABSA/ SLES production site might include;

- Masking agents- Terpenic compounds and some oxygenated molecules like coumarin masks the odorous emission nuisance and block some specific malodourous receptors.
- Surfactants: Amphipathic molecules such as alcohols, glycerol, and esters compounds increase the apparent solubility of the odorous compound in aqueous media, thus reducing the odor emission.
- Neutralizers: Aliphatic and aromatic aldehyde reacts with odorous compounds including viz. Ammonia, TRS, etc. which decreases the odorous annoyance. Further fiber degrading enzyme and plant extraction has also been used as a neutralizer. The enzymes and plant extract decrease the nutrient extraction of monogastric lives stock, and therefore odor emission.

---

### **WAY FORWARD:**

The above proposal has been prepared to keep in view the various mandatory and statutory provisions available nationally and globally. People's participation is the key ingredient of the planning process for odor management. We hope and trust that people at large will abide by the strategies mentioned in the given proposal for the particular LABSA/SLES production site". It will be then helpful for the regulatory authorities and the people at large. The initiative was to address the problem linked with odor generation by a well-planned scientific investigation which in turn may be taken forward to achieve the objective of providing better odor-free air for the particular site of interest. The following measures may be adopted for the process site;

- The inclusion of odor as a parameter under the regulatory framework may be initiated.
- Till the odor is brought into the regulatory framework at least the odor criteria may be included in Environmental Clearance (EC) conditions for upcoming projects.
- International and national level program for the promotion of additional Monitoring Projects on odor assessment, management, and short-term/long-term solution for particular locations of interest.
- Optimization of available models for odor Dispersion and mapping.
- Development of technical and analytical capabilities and competence for odor and odorous compound monitoring for analysis for very low concentrations of odorous compounds like Mercaptans, Butyric Acid, Dimethyl sulfide, etc.
- Establishment of Online monitoring systems for odor and odorous compounds, initially such systems may be installed at one or two particular sites of interest to assess their utility.