

BIOFILTRATION FOR INDUSTRIAL ODOUR CONTROL

ODOUR POLLUTION

Odour emission from industrial and commercial establishment invariably attracts adverse public attention. Regulatory agencies have order closure of industries because of odour complaints. It is also a issue affecting labour relations. Until the development of gas biofilters, odour control was expensive and inefficient.

How is odour measured?

Odour is a complex phenomenon involving interaction of many compounds. The human nose is a very sensitive detector for certain compounds. Odour is evaluated in terms of odour units. A panel of trained persons smell the gas sample at various dilutions. They find out at what dilution the odour is barely perceptible.

A gas chromatograph may be set up measure odour is certain cases. When complex mixtures cause the odour, a reference compound may be selected as measure of odour. The degree of removal of a mutually agreed reference compound may be used for evidencing of process guarantees with regard to odour removal.

ASTM D1292 defines Odour Intensity index and specifies its method of evaluation

Biofiltration uses micro-organisms to remove undesirable components from industrial waste gases. Waste gases are forced through filter material on which micro-organisms are immobilised. After absorption in the filter material, micro-organisms break down the polluting components and transform them into harmless products such as carbon dioxide, mineral salts or acids and water. Biological waste air treatment processes offer a cost-effective solution for the treatment of large volumetric airstreams

containing low levels of pollutants. They have found use in a broad spectrum of industries (see box). Biofiltration is distinguished by its low operating costs, low maintenance requirements and low energy requirements. Properly designed biofilter achieve very high odorant removal efficiency (>99%).

Biofilters can be designed as low-cost open systems with single stage media. Where land is not available, biofilters can be provided as multi-storey units. Biofilters can also be located on roof of factory buildings to have maximum space savings.

Alternative technologies for volatile organic compound and odour control

- thermal or catalytic incineration
- physical or chemical treatment
- UV irradiation
- Masking
- biological treatment

NIIST BIOFILTER TECHNOLOGY

NIIST undertakes careful study of customer requirements before design of the odour control system. The most important step in the design of a successful odour control system is that characterisation and estimation of quantity of odour emissions. In most cases, direct measurement of quantity of emissions is impossible. It requires considerable skill and creativity to make reasonable estimates required for design.

Pretreatment requirements and media composition have to be selected to suit the emission characteristics. Hot gases have to be cooled and humidified before biofiltration. NIIST designs the ventilation

system required to collect odour from open spaces like dumps or sumps and closed spaces such as sheds. NIIST also design incineration system for high strength emissions not treatable by biofiltration.

Odour threshold	(mg/m ³)
Ammonia	2.6 x 10 ⁻²
Butyric acid	1 x 10 ⁻⁴
Chlorine	2.9 x 10 ⁻²
Petrol (heavy)	150
Hydrogen sulphide	1.5 x 10 ⁻³
Ethyl mercaptan	4 x 10 ⁻⁵
Vanillin	2 x 10 ⁻⁷

one gram of vanillin distributed uniformly in air up to a height of 100 m can be smelt 5 km away!

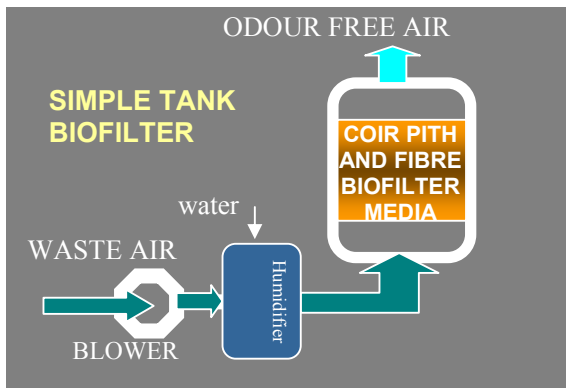
Industrial odour	
Meat and fish processing Tanneries	cystine -> H ₂ S, methyl mercaptan
Cooking smells	dimethyl disulphide, furan, pyridine
Fruit warehousing	ethylene
Sewage treatment	H ₂ S
Refineries	H ₂ S, methyl mercaptan, acrolein, methionine, BTEX

- high water holding capacity
- long life
- green eco-friendly material

Cost of biofilter system	
	Total cost Rs per million cft of air treated
Incineration	4550
Chlorine	2100
Ozone	2100
Activated carbon (including regeneration)	700
Biofiltration	280

Micro-organisms in a biofilter
 bacteria : *thiobacillus, psuedomonas, actinomyceces globosporus, microcococcus albus, micromonospora vulgaris, proteus vulgaris, bacillus cerus, streptomycetes sp* : fungi such as *Pleurotus ostreatus, Trametes versicolor, Bjerkandera adusta, and Phanerochaete chrysosporium, pecillium,*

Depending on VOC to be removed media is formulated to neutralise acids formed by bacterial action. This biofilter media has the ability to accommodate highly varying "puff" loads which is a common occurrence from many industrial sources. Bacteria are at the heart of a successful biofilter and a key factor is the growth of suitable microbial population. NIIST brings experience and internationally recognised competence in biological treatment systems to guarantee biofilter performance.



NIIST high-performance, low-cost BIOFILTER MEDIA (US Pat. 6,696,284) features

- very low pressure drop,
- quick start-up of activity,

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