BIOFILTERS
EXCELLENCE IN AIR EMISSION TREATMENT
**What is Biofiltration?**

Biofiltration refers to the removal and destruction of organic compounds contained in contaminated air (such as volatile organics or odoriferous substances) by using microorganisms.

Air stream containing vapour-phase organic pollutants is passed through a bed of biologically active material where the pollutants are adsorbed and subsequently degraded by specific bacteria present in the biofilter.

As the pollutants are destroyed and not just adsorbed, the biofilter bed retains no residues of the organic compounds removed from the contaminated air stream. In this way, pollutants contained in treated air are ecologically, safely and effectively transformed into harmless products.

**Principle of Biofiltration Process**

- **IN** Contaminated air enters biofilter
- **TREATMENT** Bacteria consume pollutants adsorbed in a biofilter bed
- **OUT** Treated air exits biofilter

**Why Biofiltration?**

Unlike conventional technologies, such as thermal and catalytic incineration, scrubbing or carbon adsorption, biofiltration allows effective pollution control at relatively low capital and operating costs, and without the generation of secondary streams that may need subsequent treatment.

**Why DEKONTA?**

Established in 1992, DEKONTA is a leading Czech supplier of environmental services and products including efficient solutions for air emission treatment.

With a track record of over 20 years, we build our success on the delivery of services individually tailored to our customers’ needs.

**DEKONTA offers three basic types of biofilters:**
- Bed biofilters
- Biofilters with air scrubbers
- Biotrickling filters.
Operation of biofilters delivered by DEKONTA is fully automated. Biofilters are equipped with numerically controlled system comprising a control unit (PC station), continuously measuring devices and automatically controlled active elements (valves, heaters etc.).

The polluted air stream is humidified before entering the biofilter. The molecules of pollutants slowly diffusing through the biofilter bed are transferred from the air phase to the biological film covering surface of the bed particles. Here the bacteria producing specific enzymes break the molecules of pollutants down to carbon dioxide and water.
Biofilters with Scrubbers

Biofiltration itself is not suitable for removal of non-biodegradable or semi-biodegradable compounds – such as ammonia (when present in high concentrations) or hydrogen sulphide. In case that treated air contains such pollutants, it is necessary to install a scrubber unit in front of the biofilter to remove them effectively.

Technological scheme of a typical installation combining a biofilter with a scrubber is provided below:

Biotrickling Filters

Biotrickling filters are biological scrubbers in which polluted air is passed through column filled with suitable packing material (packed bed) on which a mixed culture of pollutant-degrading microorganisms is naturally immobilized. The packing material shall be inert, constantly moisturized and shall provide sufficient surface for the microorganisms’ growth.

Types of Biofilters

When compared to conventional biofilters, the main advantages of biotrickling filters are:

- smaller footprint (less space required for construction due to its vertical disposition),
- better process control (pH, mineral nutrient and salt concentrations, conductivity, etc.),
- longer life of the biofilter bed.
Odour control is one of the primary concerns of composting facilities, biogas stations, wastewater treatment plants, animal farms, slaughter houses, food-processing industry, rendering plants, gelatine and glue plants, meat and fish packing factories, tobacco, cocoa and sugar industry, bulk handling terminals and many other operations—especially those located near residential areas. Though good process management and careful housekeeping can significantly reduce odour generated by these operations, in many cases some method of odour treatment is still necessary.

Application of Biofilters

Biofilter application should be considered always when air emission problem related to odour control or pollution by volatile organic compounds is identified.

Typically biofilters are used to treat air emissions in chemical, petrochemical and pharmaceutical industries, oil and gas operations, paint shops, printing works, waste treatment facilities, wastewater treatment plants, soil and groundwater remediation installations etc.

Overview of typical pollutants treated by biofilters is provided below:

- aromatic hydrocarbons (toluene, xylene, styrene etc.)
- alcohols (methanol, ethanol etc.)
- organic acids (e.g. acetic acid)
- esters
- aldehydes
- ketones
- amines
- merkaptanes
- ammonia
- etc.
DEKONTA offers complex range of qualified and highly competitive services related to biofilters delivery and operation comprising the following:

- Designing - including data collection at the client’s site (air flow measurement, chemical analyses etc.)
- Testing and verification - including pilot-scale testing at the client’s site
- Production and delivery
- Installation and commissioning
- Maintenance
- Air emission monitoring

Biofilters are designed project by project according to the site-specific conditions and limitations. Our experts carefully listen to the client to find the most efficient and cost-effective solution for him.
Henniges Automotive, Czech Republic

The installation of a biofilter for removal volatile organic substances from the air stream generated in a production hall operated by Henniges Automotive Company.

The main pollutants were xylene, ethylacetate, urethane polymer, propan-2-ol, toluene and dibutyltin-diacetate.

Parameters:
- Volume of treated air (flow): 28 000 m³/hour
- Air pre-treatment: Air scrubbing
- Volume of the biofilter bed: 250 m³ (0.4 kg/m³, porosity 25 %)
- Biofilter dimensions: Length 16 m, width 12 m, height 1.8 m
- TOC inlet concentration: Over 120 mg/m³
- TOC outlet concentration: less than 40 mg/m³

INVESTPOL, Slovakia

The installation of the biofilter for removal odour compounds generated in the composting hall of the company KOMPALA, a.s.

The main contaminants were hydrogen sulphide, ammonia, mercaptan and other disulphides.

Parameters:
- Volume of treated air (flow): 13 000 m³/hour
- Air pre-treatment: Air scrubbing
- NH₃ inlet concentration: Over 10 mg/m³
- TOC inlet concentration: over 50 mg/m³
- Efficiency of biofiltration: over 80 %

ULtZAMA Biogas plant, Spain

The installation of a biofilter for odour control in a biogas station located in the city of Ultzama in Spain.

Parameters:
- Volume: 500 m³/hour
- Air pre-treatment: No
- Volume of the biofilter bed: 5.5 m³ (400 kg/m³, porosity 25 %)
- Biofilter dimensions: Length 3.3 m, width 2.2 m, height 1.8 m
- Ex-proof equipment

Parameters:
- Volume of treated air (flow): 13 000 m³/hour
- Air pre-treatment: Air scrubbing
- NH₃ inlet concentration: Over 10 mg/m³
- TOC inlet concentration: over 50 mg/m³
- Efficiency of biofiltration: over 80 %

Selected reference Installations
Operational Parameters

Typical operational parameters of biofilters delivered by DEKONTA are provided in the following overview:

• Air flow: 100 – 100,000 m³/h
• Input concentration of pollutants: 1 – 300 mg/m³
• Temperature of the input air: 15 – 80 °C
• Efficiency: 70 – 98 %

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