



Hygienic Air Quality for the Food Industry

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TRAINING DOCUMENT

FREUDENBERG FILTRATION TECHNOLOGIES

 **FREUDENBERG**
INNOVATING TOGETHER

Hygienic Air Quality for the Food Industry

Introduction

- **Short Introduction to Freudenberg**
- **Food Quality Standards and Air Quality Guidelines for the Food Industry**
- **Ventilation;**
 - **Why do we need it?**
 - **What is important?**
 - **The ventilation survey**
- **Filter Systems**
 - **Optimising your filtration.**
 - **The importance of pre-filtration.**
- **Energy efficient filter systems – case study.**

Freudenberg Group

Freudenberg is a family-owned group of companies

- founded in 1849
- offers its customers technically challenging product solutions & services
- comprises 16 Business Groups operating on various markets in 56 countries around the globe
- Products: seals, vibration control technology components, nonwovens, release agents and lubricants, household cleaning products, medical components, **filtration solutions**

	2012	2013	2014
Sales (in mill. EUR)	6,322	6,623	7,039
Consolidated profit / loss (in mill. EUR)	433	400	478
Workforce (per 31.12.)	37,453	39,897	40,456

Complete filtration know-how: Products, System Solutions, Services



Filter mats



Pocket filters



Cassette filters



High-temperature filters



Filter bags



Filter cartridges



Gas phase filtration systems



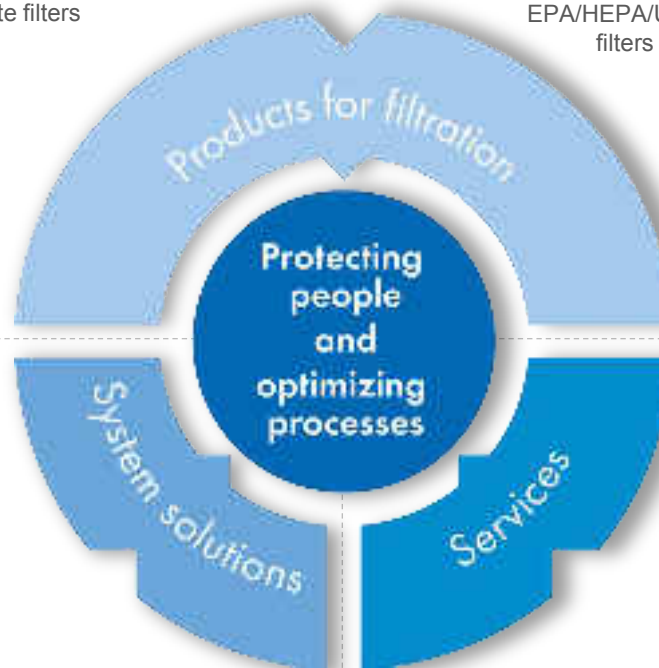
Ventilation systems
Food & Beverage



Air filtration systems



Water filtration systems



EPA/HEPA/ULPA filters



Gas phase filters



Filters for laser printers



Diesel exhaust filters



Cabin air filters



Engine intake air filters



Air quality control
Food & Beverage



Services for gas phase filtration systems



Viledon® filterCair



Filtration testing center

Hygienic Air Quality for the Food Industry Reference List.

Dairy



RTE / Chilled Foods



Beverage



Bakery / Cereals



Cooked Meats



Confectionery



Hygienic Air Quality for the Food Industry Standards & Guidelines

Hygienic Air Quality for the Food Industry

CODEX ALIMENTARIUS

Recommended International Code of Practice General Principles of Food Hygiene.
CAC/RCP 1-1969, Rev. 4 (2003)

4.4.6 AIR QUALITY AND VENTILATION

Adequate means of natural or mechanical ventilation should be provided, in particular to:

- minimize air-borne contamination of food
- control ambient temperatures
- control odours
- control humidity

Ventilation systems should be designed and constructed so that air does not flow from contaminated areas to clean areas.

Hygienic Air Quality for the Food Industry

Food Quality Standards

- **Most Food Quality Standards give little guidance on ventilation and air filtration.**
- **Typically state that:**
 - **Adequate natural and/or artificial ventilation shall be provided.**
 - **Heating, ventilation and extraction systems must be effective at preventing condensation and excessive dust.**
 - **A documented risk assessment must be conducted to determine the requirement for air filtration.**
 - **A system must be in place to maintain positive air pressure from High to non-High areas.**
- **Little detail on the “how to” or even on where to get the information from.**

Hygienic Air Quality for the Food Industry

Guidelines on Air Quality

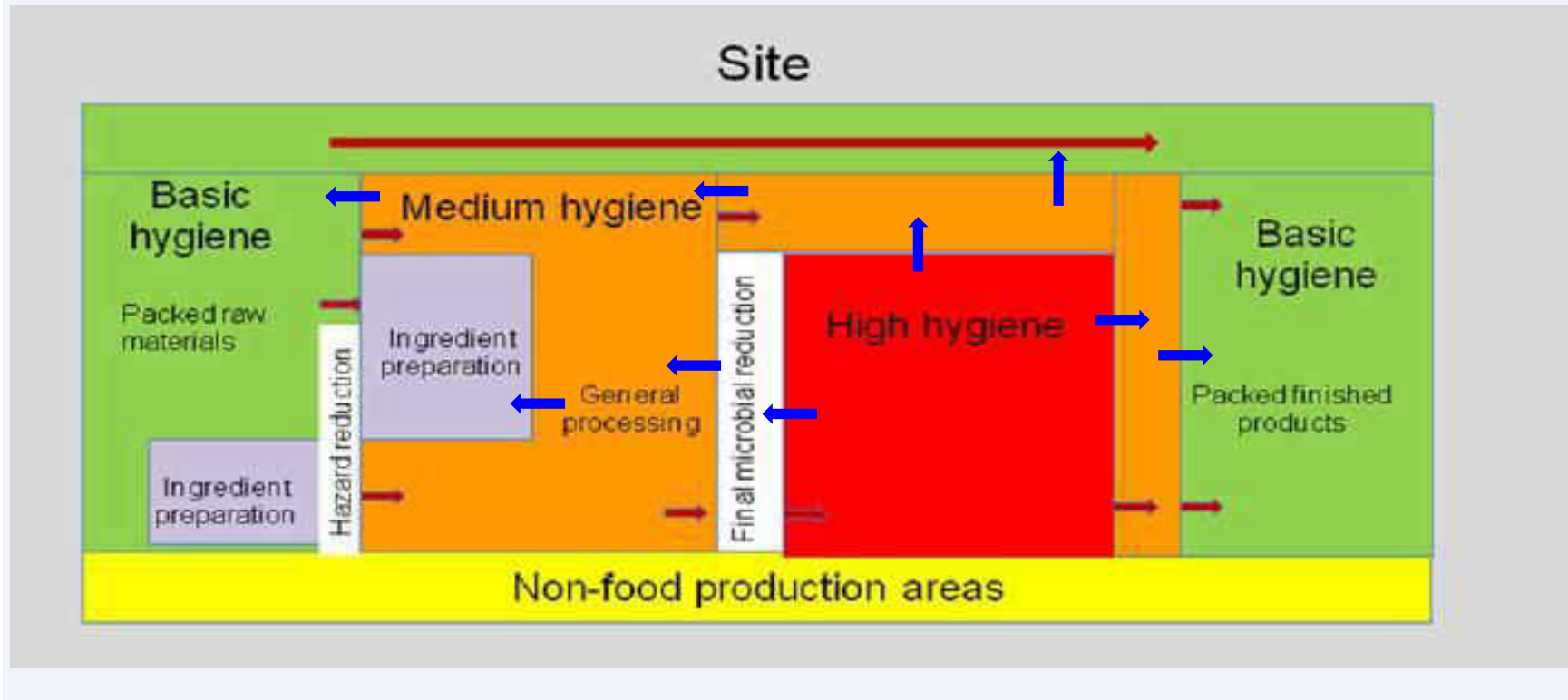
- **Need to look to Food Industry Guidelines which give advice on Hygienic Air Quality Control. Recommend;**
 - **EHEDG - Air Handling Systems in the Food & Beverage Industry 2005**
 - **EHEDG (Draft) Air Handling Systems in the Food Industry – Air Quality Control for Building Ventilation (2016).**
 - **EHEDG - Hygienic Design Principles for Food Factories 2014**
 - **Campden BRI: Guidelines on Air Quality Standards for the Food Industry 2005**
- **EHEDG - Importance of Zoning in Food Production;**
 - **Zone B (Basic Hygiene): Prevent product contamination by adopting good manufacturing procedures.**
 - **Zone M (Medium Hygiene): To control or reduce the creation of hazardous sources that can affect a higher zone classification.**
 - **Zone H (High Hygiene): To control all product contamination hazards and to protect the interior of food processing equipment from exposure to the room atmosphere.**

Hygienic Air Quality for the Food Industry

EHEDG: Guidelines on Air Quality

Designing Air Movement Systems for the Food Industry

Food manufacturing zones showing potential routes of product flow →
and air flow from areas of higher positive pressure →



Hygienic Air Quality for the Food Industry

EHEDG: Guidelines on Air Quality



	Zone B Basic Hygiene	Zone M Medium Hygiene	Zone H High Hygiene
Air filter recommendation for environmental and process air	1. Stage M5-F7	1. Stage F7 2. Stage F9	1. Stage F7 2. Stage F9 3. E10-H13 (risk dependant)
Positive air movement from higher to lower zone (controlled over-pressure).	----	optional	essential
Temperature control	optional	essential	essential
Humidity control	----	Optional (depends on risk assessment)	Optional (depends on risk assessment)
Minimum air changes per hour to maintain air quality		5	10
Microbiological monitoring (HACCP)	optional	recommended	essential

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Hygienic Air Quality for the Food Industry

Ventilation

- All food factories require ventilation.
- Air filtration is necessary to ensure the containment of critical working areas.
- Air can act as a source of contamination;
 - from outside the processing area.
 - as a transport medium, moving contamination from other sources within the processing area.
- Supply air of a specified quality;
 - Temperature
 - Humidity
 - Particle concentration
 - Quantity (fresh air volume)
- Hygienic Air Quality is required for;
 - The comfort and safety of employees.
 - Maintain a safe working environment.
 - To reduce the possibility of contamination.
 - To help ensure shelf-life of the product

Hygienic Air Quality for the Food Industry

Ventilation

- It is essential to have continuous room pressure to prevent contamination entering High Hygiene Zones
- The ventilation system design will be influenced by the level of over pressure and / or number of air changes required.
- The total number of air changes must be risk assessed based on the size of the area, number of personnel and the equipment used.
- Room pressurisation and optimised air changes can often provide the required levels of hygienic air quality without the need for high energy consumption cleanrooms.
- A final filter grade of between F9 and E11, (depends upon the type of product and risk assessment), can give an optimised operational compromise between energy cost, filter lifetime and high hygiene process protection.
- Aseptic filling and some more critical operations will require HEPA Grade Filtration.

Hygienic Air Quality for the Food Industry Ventilation

- **Ventilation systems can be overlooked.**
- **Important to carry out a Hazard analysis (HACCP) to determine the air quality standards required.**
- **Company with expertise in ventilation and filtration can give advice on;**
 - **Condition based monitoring & filter lifetime**
 - **Filter performance - grade, type, efficiency**
 - **Air quality survey**
 - **Air flow mapping**
 - **Maintenance of ventilation equipment**
 - **Engineering solutions**
 - **Air quality documentation for audit purpose.**



Hygienic Air Quality for the Food Industry Filter Systems

Filter should not be a source of contamination:

- Moisture resistant.
- No fibre shedding.
- Inert – no breeding ground for microbial contamination.

Construction & assembly of the filter frame:

- Seals remain intact through lifetime of the filter.
- Frames are sealed to prevent bypass of air.
- Fit filter elements able to withstand mechanical stresses during operation.
 - Filter media should remain rigid in turbulent conditions.
 - Remain air-tight & leak free.
 - Correct fitting of filters important.
- Cheap filters are rarely cost effective.



Synthetic Rigid Filter



Hygienic Air Quality for the Food Industry

The Importance of Pre-Filtration

Typical Pre-filters

- Cardboard or metal framed panels
 - Inexpensive.
 - Difficult to sealing to the frame.
 - Low dust holding – short life.
 - Cardboard frame warps with moisture.
 - High pressure loss.
-
- Glass Fibre pocket filters
 - Brittle fibres – Danger of fibre shedding
 - Thin nonwoven layer to stop shedding.



Hygienic Air Quality for the Food Industry

The Importance of Pre-Filtration

Filter Characteristics

- Synthetic media – non-breaking fibres
- Self supporting pockets.
- Suitable for operation up to 100% RH.
- Microbiological inactive.
- High dust loading
- High air volume capacities.
- Number of filtration stages can be reduced, without compromising on air quality / lifetime.
- Important to have an air-tight seal to filter frames.
- Filter wall sealed against leakage.



Hygienic Air Quality for the Food Industry

Lifetime & Energy Costs

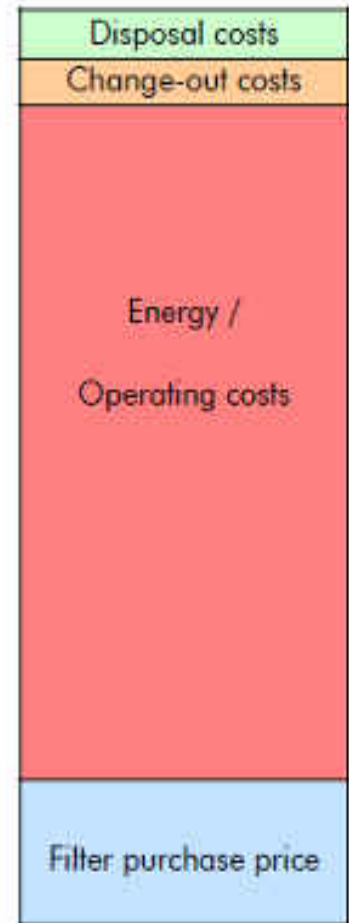
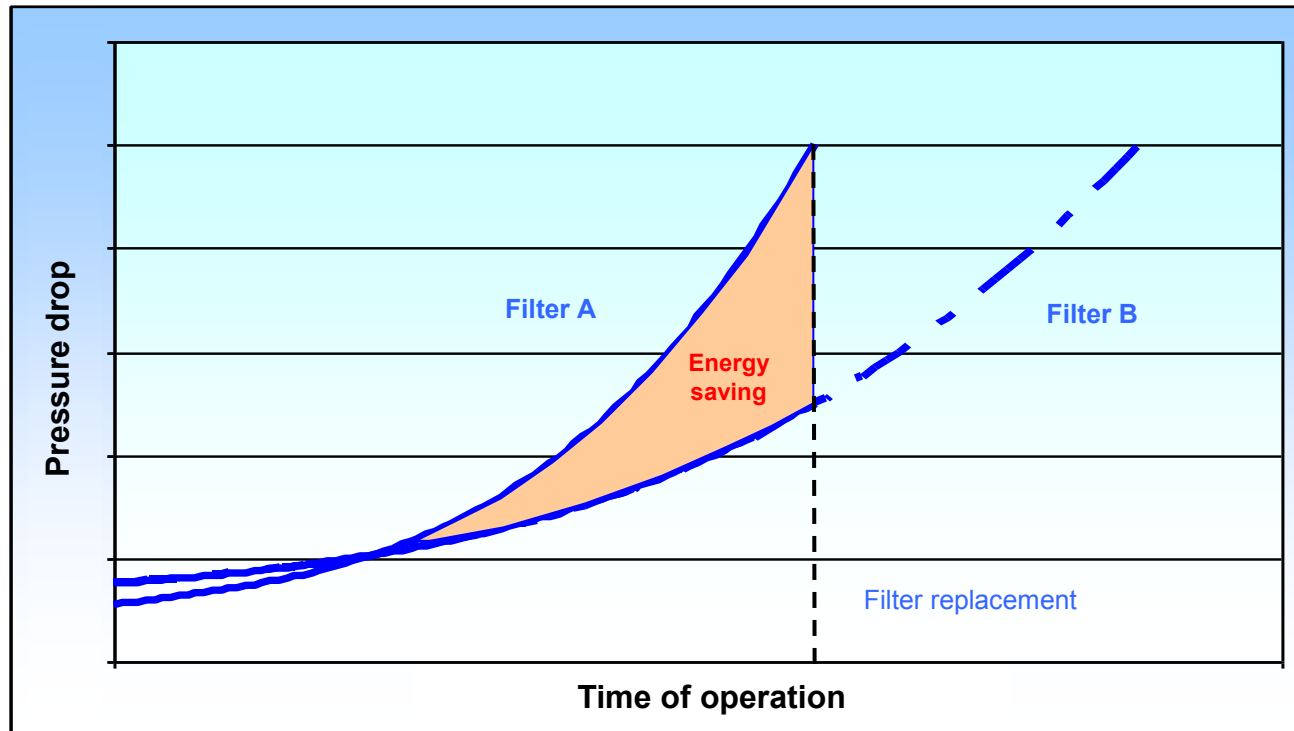
- A relatively simple and effective method for achieving significant cost reductions is to use high-quality, highly energy efficient air filters.
- European Committee of Air Handling and Refrigeration Equipment Manufacturers (EUROVENT) developed a European energy efficiency classification system for air filters as part of the EUROVENT Certification.



- Important you look at systems, not individual filters.
- An A+ energy efficient filter protected by a G4 Panel means that as a system it has a higher energy consumption than the A+ label implies.
- An high dust holding A or B energy efficient filter, running without a G4 panel, may actually be more energy efficient.

Hygienic Air Quality for the Food Industry Lifetime & Energy Costs

Never compromise Air Quality for Energy Cost Savings



Typical distribution of overall filter costs (LCC)

Hygienic Air Quality for the Food Industry Lifetime & Energy Costs – Case Study

Original System

**G4 Grade, Cardboard Framed Filter,
48mm depth**

**6-8 filters per AHU
250 AHU's across UK**

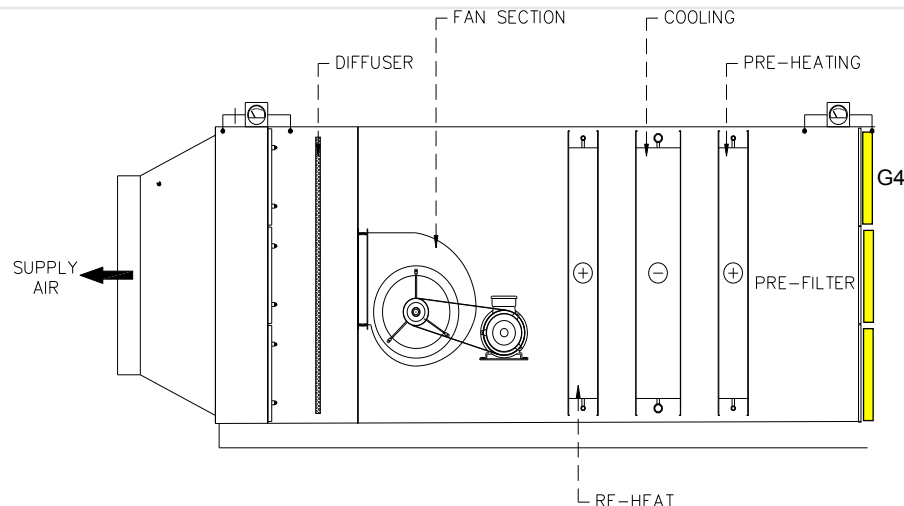
**Filter change every 6 weeks
deterioration of filter seal**

**Contamination of coils and AHU
regular cleaning**

**High initial pressure loss,
fast pressure development**

**Avg. energy consumption per AHU
65,433 kWh p.a.**

**At £0.08 per kWh = £5,235 p.a.
Avg. energy cost of an AHU.**



Hygienic Air Quality for the Food Industry Lifetime & Energy Costs – Case Study

Freudenberg System

**G4 Grade,
Pocket Filter, 330mm depth**

**6-8 filters per AHU,
250 AHU's**

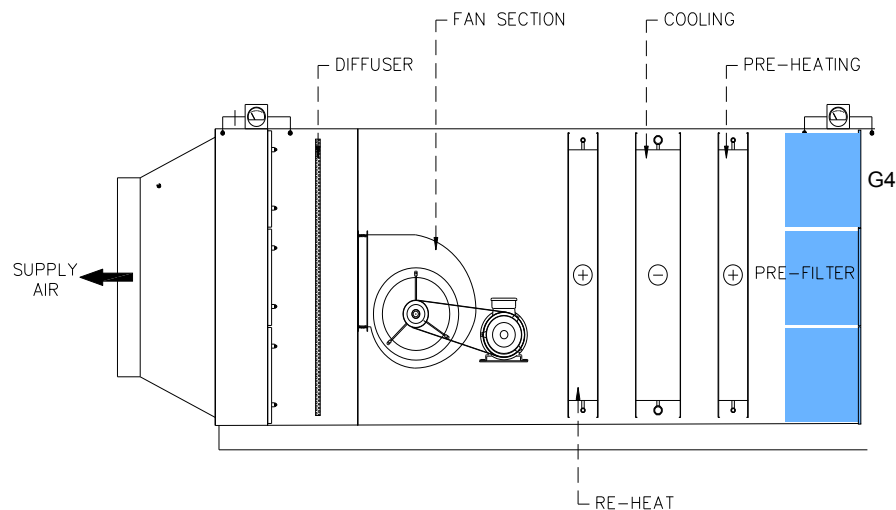
**Re-engineered framework
filter change 12 months**

**Better seal, reduced contamination,
less cleaning**

**Low initial pressure loss,
slow pressure development**

**Avg. energy consumption per AHU
63,598 kWh p.a.**

**At £0.08 per kWh = £5,087 p.a.
Avg. energy cost of an AHU**



Hygienic Air Quality for the Food Industry

Lifetime & Energy Costs – Case Study

Freudenberg System

Maintained same filter grade

Extended filter lifetime from 6 weeks to 12 months – Cost Saving.

Improved filter efficiency

better seal to filter frame, no air bypass

Improved cleanliness of AHU

Reduced requirement for coil and AHU cleaning – Cost Saving

Maintenance company visits every 6 weeks no longer required

Massive Cost Saving

Estimated energy savings across 250 AHU's = £37,000 p.a.

Thank You