

Collections Conservations

Chalons sur Saone

April 22nd 2010



Airborne spread fungal contaminates : a major risk for collections and archives



Documents damaged by fungus growth.

Source: Parchas M.D., Comment faire face aux risques biologiques?, Direction des Archives de France, Paris, Avril 2009



- Documents stored constitute a particularly sensitive material :
 - often hygroscopic
 - dust deposited on collections is a source a nutrients

➤ **Microorganisms' growth is very susceptible to occur and serious consequences may derive from it : from unsightly modifications to actual physical damage and loss of information.**

New conservation policies have reduced systematic chemical treatments and overall frequency of restoration interventions due to potential detrimental effects.

➤ ***Preventive conservation policy***

Evaluation of a novel air treatment unit to reduce airborne fungal burden in a collection storage



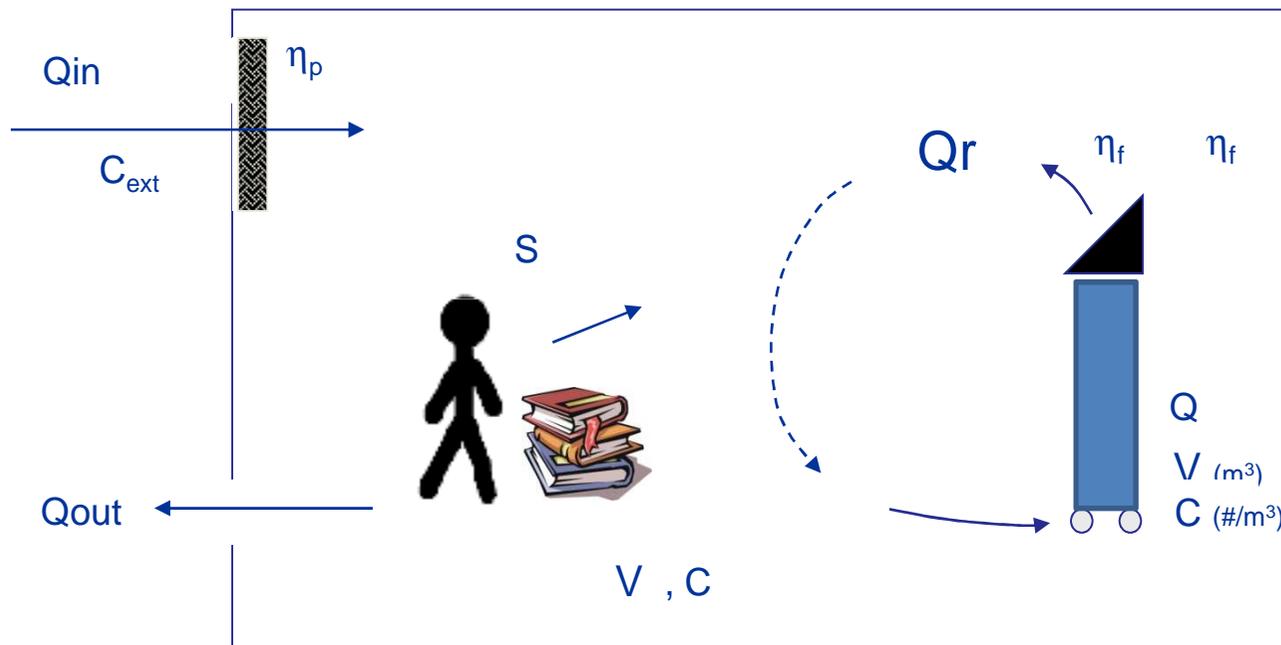
In 2007, the T2006 model of the Plasmair™ mobile unit from Airinspace was tested out in a 450m³ storage of graphic documents by the Research Center on Collections Preservation (Centre de Recherche sur la Conservation des Collections - CRCC) and the Department of Preservation of the French National Library (Département de la conservation de la Bibliothèque Nationale de France - BNF)

➤ Objectives :

- demonstrate a quantitative reduction of airborne fungal contaminates counts
- evaluate a potential impact on surface deposited contamination
- evaluate the safety of the Plasmair treatment as regards to potential oxidation reactions on documents



Entire room treatment relies on air treatment recycling rate and mixing



Strategy:

- Control Sources
- Limit intake from outside
- High Recycling
- Good mixing
- Good one pass abatement
 - Bio contamination
 - VOCs, O3
 - Particulate matter

While ensuring:

- > no emission
- > low noise
- > no taking off of particles
- > no storage /release

$$dC(t) = \underbrace{-\eta_f C \frac{Q_r}{V} dt}_{\text{Treated recycle Air}} - \underbrace{C \frac{Q_{out}}{V} dt}_{\text{Air removed}} + \underbrace{(1 - \eta_p) C_{ext} \frac{Q_{in}}{V} dt}_{\text{Air introduced}} + \underbrace{\frac{S}{V} dt}_{\text{Source}}$$

Microbial Growth and Release from Air Filters A Real Problem Especially in Humid conditions

Conventional filtration limitations

- Air Treatment solutions aim at delivering clean purified air, typically through mechanical filtration (conventional HEPA filters)
- Conventional mechanical filters are designed to capture germs but do not destroy them
- Captured contamination can proliferate on filter media turning the filters into sources of contamination

Microbial Growth

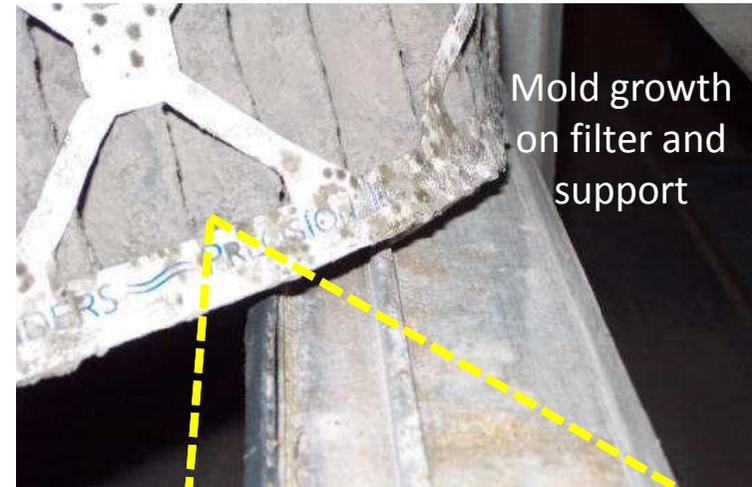
- Twenty years of evidence based research.

Most recent citation:

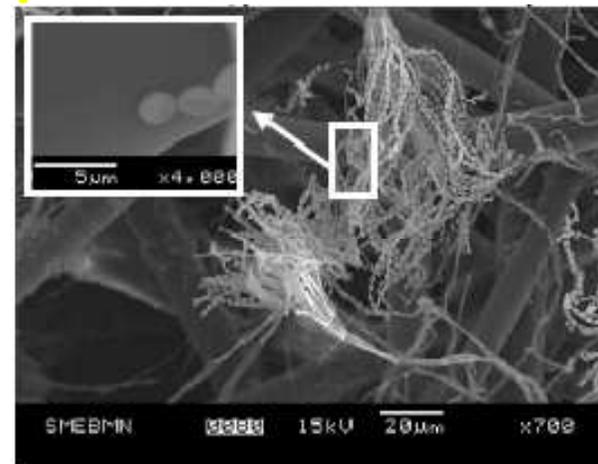
Bonnevie-Perrier et. al. "[Microbial Growth onto Filter Media Used in Air Treatment devices](#)", *IJCRE*, Vol 6 A9, 2008.

Microbial Release and Infection

- Numerous nosocomial infection outbreaks have been identified as originating from the air-treatment system.



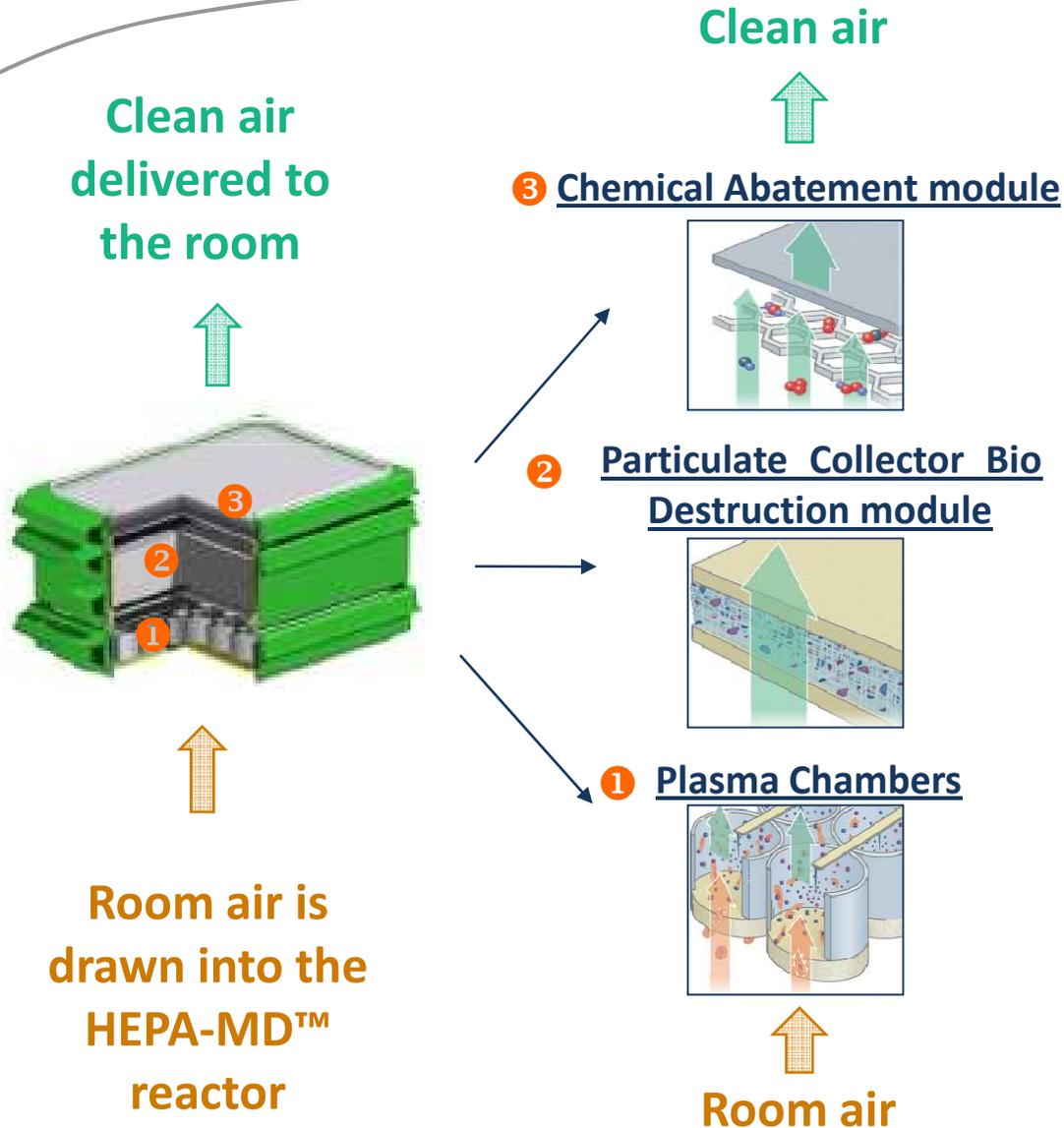
Conventional Mechanical HEPA filter



Source: Bonnevie-Perrier et.al. *IJCRE* 2008

Electron micrographs show internal mold propagation

The Three-stage Reactor, HEPA-MD™



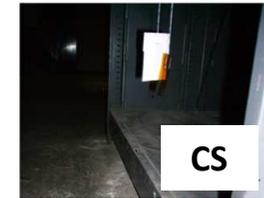
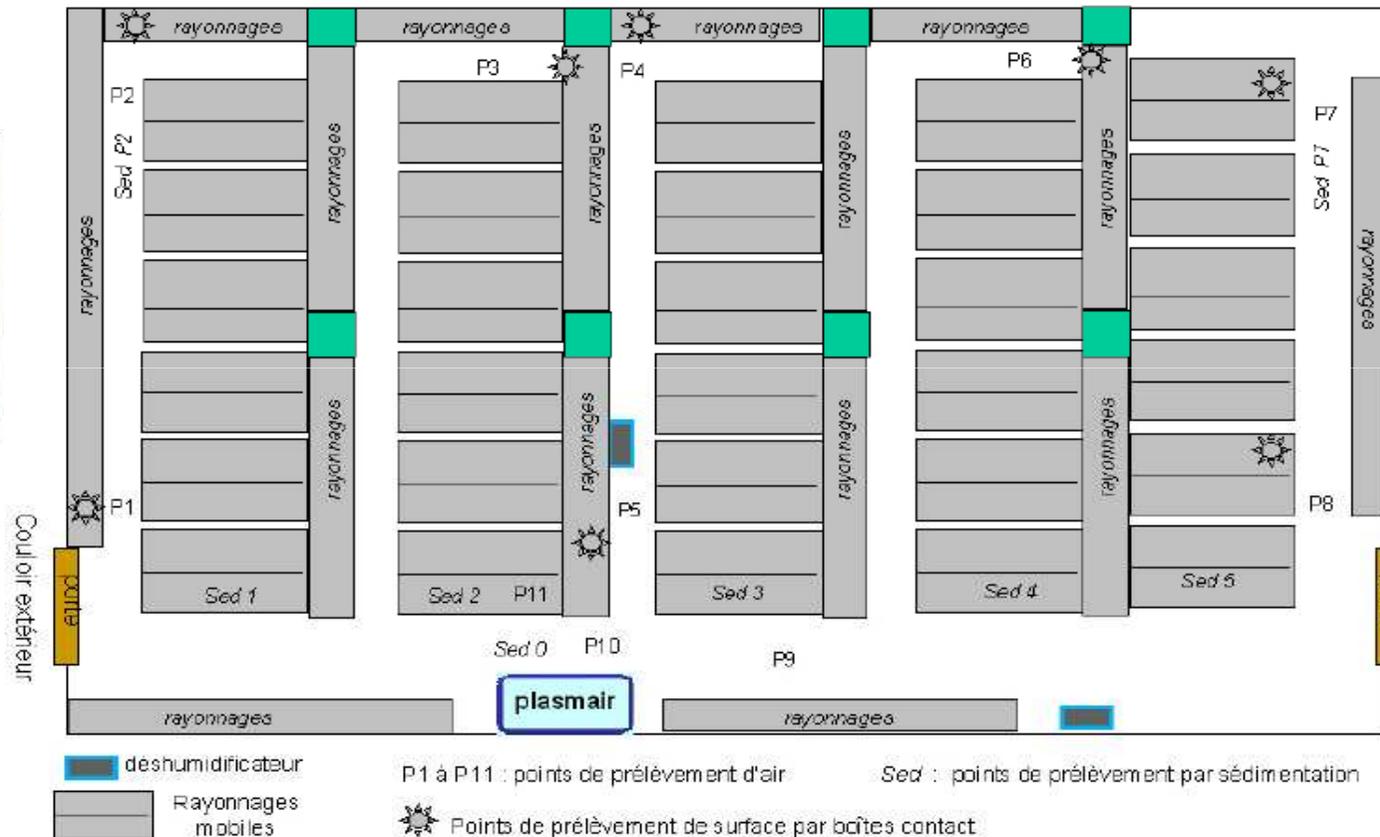
➤ Broad-spectrum efficacy : particles, microorganisms and molecular pollution

➤ The risk of microbial growth is eliminated

➤ Low pressure drop profile : low noise emission, low energy consumption

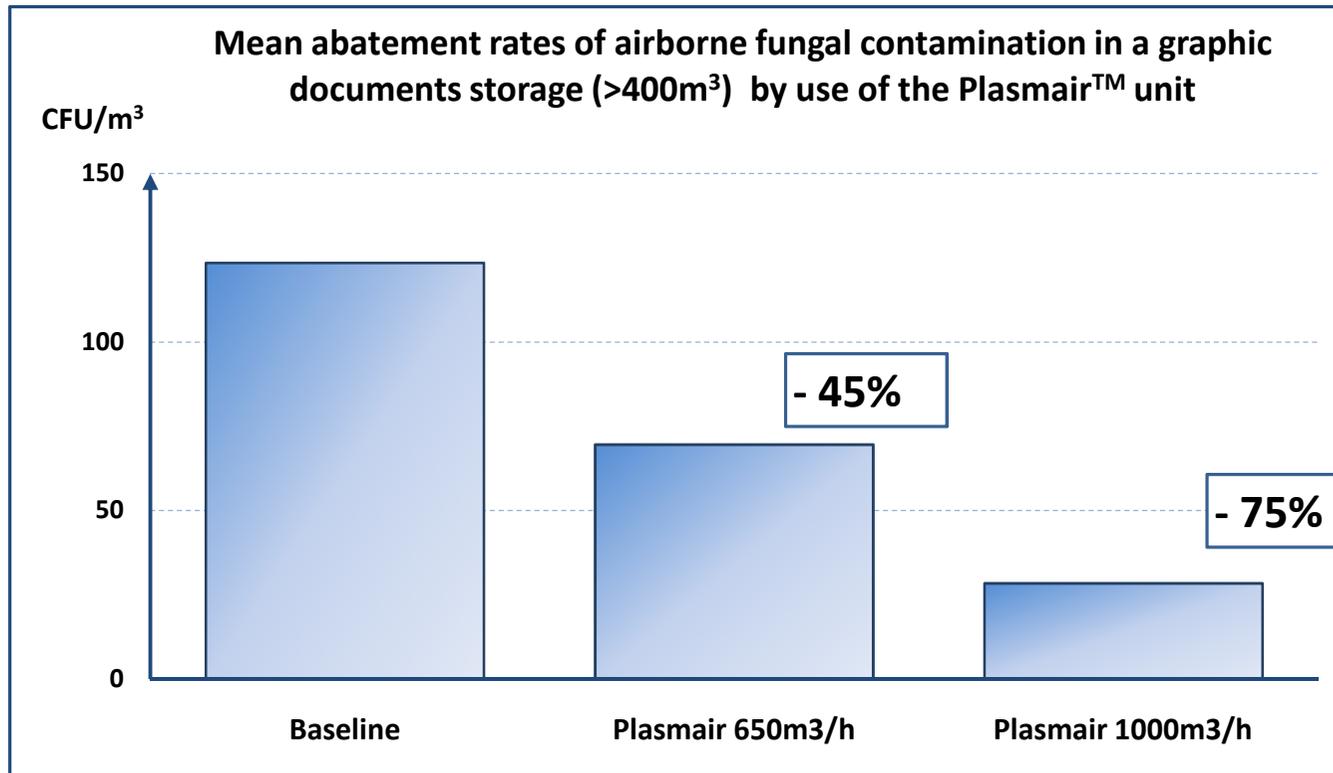
A one month experiment under standard activity conditions

Archives nationales - Cave SHF 15 (L) x 8,25 (l) x 3,5 (h) = 433 m³



- 11 locations of active biological sampling (500L) - AB
- 7 locations of passive biological sampling (settling plates exposed for 2h) (Sed)
- 8 locations of surface sampling (contact plates) (*)
- Colloidal silver samples dispatched throughout the room (CS)

Significant abatement of the airborne fungal contamination levels achieved by the Plasmair



- + Low deposition of fungal agents on settling plates / mostly activity related
- + High level of fungal contamination on surfaces / due to presence of dust (no cleaning prior or during the study)
- + No deterioration of colloidal silver samples / short exposure and low humidity may have contributed

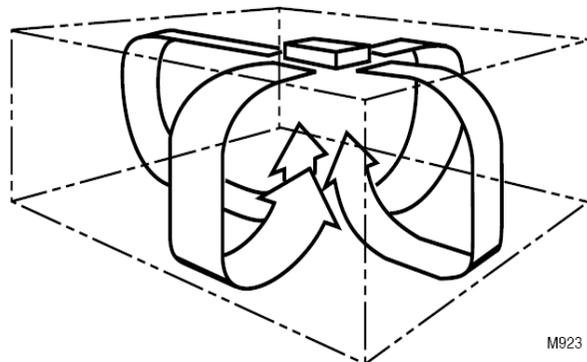
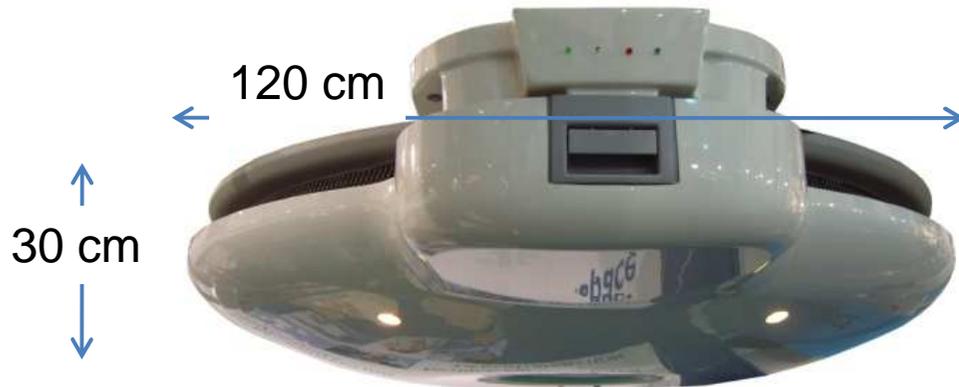
Plasmair : efficient and adaptable solutions for air decontamination in archives and collection storages



- *Sustainable control of airborne fungal contamination risks achieved in a large storage room*
 - *No chemical detrimental effects on sensitive collections*
- + Fast and easy implementation*
- + Immediate and automated diagnosis of the operating parameters*
- + Low sound level for the staff comfort*

Plasmair C2010 – A promising line extension for small rooms where Plasmair T2006 does not fit

- **Silent**
- **Does not take precious floor space**
- **Optimized airflow pattern**



M923

Fig. 5. F90 Coanda air flow pattern.



First step towards smaller consumer healthcare lower price design

Thank you for your attention !

Airinspace would hereby like to thanks :

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Ms Malalanirina Rakotonirainy (CRCC)

Mr Tony Basset (BNF/ Department of Preservation)

Ms Christiane Baryla (BNF – IFLA/PAC)

- Publication: Support/Tracé n°8, 2008 Revue de l'ARSAG
- Communication DITN/BCMC: Parchas M.D., Comment faire face aux risques biologiques?
Direction des Archives de France, Paris, Avril 2009

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References: Chambéry, Limoges