AIR PURIFYING IN THE MOLECULAR BIOLOGICAL COMPANY

1. Case metadata

- ***Country/ies of origin:***

Finland

- ***Year of publication by agency:***

2012

- ***Sector:***

M 72.11 - Professional, scientific and technical activities - Research and experimental development on biotechnology (NACE Rev. II)

- ***Keywords:***

24401C Case studies

40271B Nanotechnology

40256C Nanoparticles

24361C Good practice

58321C Laboratories

31281D Enzymes

13961F Fume hoods

2. Organisations involved

Finnzymes is a part of Thermo Fisher Scientific. Finnzymes' core strength is its long experience and extensive know-how in PCR and qPCR technology. Its PCR product line includes all of the components required for PCR: DNA polymerases, PCR instruments and reaction vessels. Research and development is a very significant part of the company. Occupational safety is considered an important part of the everyday work in this laboratory. The company continuously controls the working environment and searches for improvements.

Genano is a Finnish manufacturer of air purification units. Genano's mission is to create clean air solutions for commercial and industrial applications by using its patented GENANO® technology. Its air purification systems can be used in many applications e.g. offices and isolation wards, industrial environments (hospitals, dental, laboratories etc.). The core of this air purification technology is the ability to clear indoor air of particulate matter of any size, starting with nano-sized particles.

3. Description of the case

3.1. Introduction

GENANO® technology, which cleans all the airborne particles, also nanosized particles and molecules, is used to purify the indoor air in the laboratory of Thermo Fisher/Finnzymes' molecular biological company.

Finnzymes has laboratories for DNA (research, analytics, diagnostics) and for the production of DNA and protein molecules. Part of the company's strategy to ensure the purity of its products and that no contamination can be allowed to be present. The analytical methods it uses are extremely sensitive such that small amounts of DNA-molecules can be detected. By using air purifiers of GENANO® technology, Finnzymes has succeeded in minimising the risks of contamination in their products, cross contamination from room to room and helped in its DNA-analytics by reducing false positive[1] results.

With GENANO® technology it is possible to remove all types and sizes of particles. With this technology it does not matter whether the particles are living organisms (microbes) or inert e.g. metal dust. It is able to collect very small particles even nanoparticles, which is normally not possible with fibre filters. Larger particles e.g. mildew (blight) and dust particles do not clog the purification unit, as can happen in filter-based technology. The removal of airborne particles operates at 100% efficiency from the air into the collection surfaces and then readily washed into the collection container. In the GENANO® technology, particles are collected into washable collection surfaces while in the filter technology, particles are collected onto the filter which must be changed regularly. GENANO® technology can be described as a state of the art electrical filter, where the air flows freely between the collection surfaces or in a collection tube. The airborne particles, also nanosize particles, are subjected to a powerful ionic spray, which confers on them a negative charge and pushes them forward. The particulate matter settles onto a collection surface from where it is flushed into a separate vessel or sewage system with a mixture of water and detergent. The particles are collected into a vessel, providing tangible proof of the efficiency of this technology.

3.2. Aims

- Air purification of a molecular biological company that is working in biological enzyme development.
- Protect products from contamination.
- Protecting the laboratory personnel from nanosize and molecular size particles.
- To clean the impurities from the air before it gains access to the enzyme production process – to avoid cross contamination.
- To keep clean the Hepa filters in the enzyme packing machines.
- To avoid expensive regular filter changes.

3.3. What was done, and how?

In order to achieve detailed above, which could be considered as risks, air purifiers made with GENANO® technology are placed in the working rooms that have the greatest influence on the purity of the products or have an influence on cross contamination between laboratory rooms by airborne particles.

In these rooms the following activities take place: dispensing of final products, mixing and preparing of liquids and buffers and laboratory work. The aim is to prevent the airborne particles from spreading from room to room along with employees and through any possibly open doors.

In Figure 1 the air purifier is installed and connected to a dispensing machine to ensure a particle free atmosphere, which then ensures that open vials remain pure until they are capped and labelled. The laboratory technician opens the cabinet doors daily to control the process. In Figure 2 an air purifier is

[1] false positive = sample that is recorded to be contaminated, but later it is analysed to be pure

connected to the cabinet of the dispensing machine thereby providing purified air. The tube is the air suction line equipped with GENANO® technology and filter.

Figure 1: The air purifier is installed and connected to a dispensing machine

Source: Courtesy of GENANO and Finnzymes, Finland.

Figure 2: The air suction line equipped with GENANO® technology and filter

Source: Courtesy of GENANO and Finnzymes, Finland.

Figure 3: Cabinet of a dispensing machine with pure air connection (on top) from GENANO® air purifier

Source: Courtesy of GENANO and Finnzymes, Finland.

The dispensing machine (Figures 1 and 3) is an automatic machine equipped with a dispensing unit, capping unit and labelling unit. The product itself is fed to the small product tubes by using a peristaltic pump controlled by a computer. A typical dispensing volume varies between 0.01–2 ml. The employee (laboratory technician) monitors the process and in case of any process fault he/she also opens the cabinet doors to fix the fault or adds more vials and caps to the bowls of the machine. This process is not recognised as a sterile process but is considered as a hygienic process, which is a standard level in biotechnology industry. The employee wears personal protective equipment (PPE) such as a laboratory jacket, gloves and head bonnet to ensure the purity of the product.

3.4. What was achieved?

- Laboratory workers were protected from all kinds of airborne particles, even nanosize and molecular size particles.

  Proof: The airborne particle measurements have not been conducted in the laboratory, but the air purification equipments have been tested in several institutions and they have proved very efficient at cleaning all particles from the air. GENANO® technology is based on air purification and decontamination with strong ion jets and collecting particles into collection surfaces. Then the

particles are washed into a collection container. The efficiency of the purification can easily be measured by determining the amount of particles in the collection container.

- The air after purification was clean from impurities and caused no contamination in the enzyme production process.

  Proof: The purification of the enzyme products are under control all of the time. Several enzyme quality tests are performed after the purification process. These sensitive tests will reveal if there are any contaminants present in the product, such as bacterial cells and DNA-molecules.

- The need for expensive Hepa filter changes was reduced to less than one change per year.

3.5. Success factors

Good laboratory practises (educated employees and hygienic working methods) together with GENANO® technology assure good work practices in the laboratory.

3.6. Further information

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3.7. Transferability

GENANO® technology is efficient, environmentally friendly and an easy to use air purification and decontamination method. It makes no difference to this technology whether the particles are living organisms (microbes) or inert particles e.g. metal dust. It is able to collect very small particles even nanoparticles, which is normally not possible with fibre filters. Devices can be used in a wide variety of establishments e.g. in offices, bureaus, schools, nurseries, hospitals, healthcare centres, dental laboratories and clinics and in various manufacturing industries etc.

4. References, resources: