VENTILATION TO A WHOLE NEW LEVEL

The next generation Plenum Integrated Filter Fan (PIFF), a ventilation system created a decade ago by M+W Products, now Exyte Technology, is available for the cleanest cleanroom classification with the bonus of hydrogen peroxide integration. The promise, however, remains: to halve energy costs while optimising space for operational processes. ***Murielle Gonzalez*** *reports*

"Of course, the cost reduction is project-specific, but the system is proven to save up to 50% of energy consumption toward operational cost in comparison to conventional central air handling units," Tobias Resch, Sales Engineer Cleanroom Products at Exyte Technology Technology (formerly M+W Group), told me after his presentation at the Cleanroom Conference 2018. At the May event, Resch described the benefits of the next generation Plenum Integrated Filter Fan, (PIFF); the decentralised ventilation system for cleanrooms.

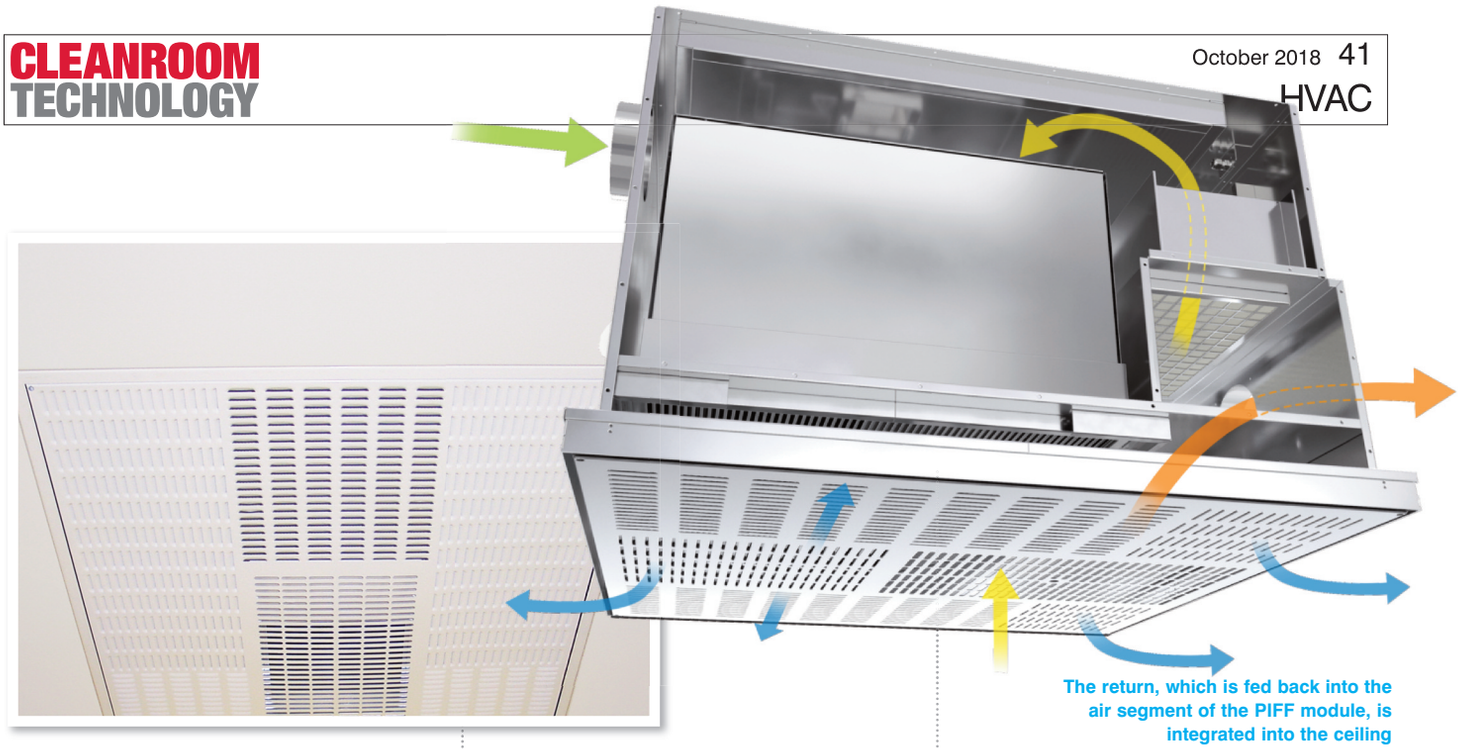
Created by the German engineering and construction company a decade ago, the PIFF system is now available for the cleanest GMP cleanroom classes up to grade B, delivering a significant reduction in energy costs while optimising the space.

What makes the PIFF system cost-effective? According to Resch, the secret of this ventilation system is that the system pressure drop can be significantly reduced by using PIFF in comparison to conventional air recirculation concepts. How does it work? The integrated filter fan unit releases cooled filtered air by an special shaped outlet grill in the cleanroom. A turbulent air flow gets created. The same unit extracts the air without any recirculation ducts. The air gets cooled in the integrated plenum, gets filtered and distributed in the cleanroom again. Air recirculation with a minimum of pressure loss.

Air circulation is a crucial aspect in any cleanroom. To draw the filtered air into the room and extract it again, most facilities have central ventilation systems featuring tremendous ducting infrastructure for the supply and exhaust of air. As well as the huge cost of installation, the greatest disadvantage of these systems is the enormous loss of pressure via the long conduits, elbows and other components such as volume flow, controllers and silencers. In all, this means a large amount of energy is needed to keep the system working and recirculating the air.

Such ventilation systems turn energy costs into a deciding factor in the production process, so Exyte Technology developed the decentralised PIFF system with cost-effectiveness and increased profits in mind. Resch explained: "The design concept of PIFF eliminates the ducting infrastructure for recirculation air and therefore we can reduce the required power and energy for the fans. This also allows the freeing-up of space above the ceiling."

The first generation PIFF, designed and installed more than 10 years ago, was tailor-made for a major company in the



The return, which is fed back into the air segment of the PIFF module, is integrated into the ceiling

electronics industry; many other installations have followed in that sector and for semiconductor plants. However, Resch told me, the system really proves its capacity with the challenging demands of the pharmaceutical and life science sectors.

Turbulent dilution flow

In pharmaceutical facilities, different qualities and forms of airflow are used in clean zones, therefore the selection of suitable ventilation technology is decisive for optimum operation in these areas. With this in mind, Exyte Technology developed the next generation PIFF for purity classes B, C and D.

In the manufacture of pharmaceuticals, current good manufacturing practice (cGMP) distinguishes four different classes of cleanliness: Class A, B, C and D:

- Class A are local zones for processes with high contamination risk, eg filling areas. This is where low-turbulence displacement flow (laminar flow) is applied
- Class B is for aseptic preparation and filling. This area frequently encompasses the Class A zone, hence airflow with turbulent dilution flow is recommended in this case
- Class C and D are less critical areas for the production of sterile products, for which turbulent dilution flow is also suitable

"We meet the cleanroom classes by circulating the air within this unit down from the top of the ceiling to the floor and recirculating it back inside the cleanroom," Resch explained. "The system works and we have made various measurements for different cleanroom classes with particle counters; we have found that the cleanroom classification is met without issue."

According to Resch, the PIFF system is simply installed in the cleanroom ceiling. It supplies the room below with pure air via a special air outlet grill that ensures turbulent air in the cleanroom The return, which is fed back into the air segment of the PIFF module, is integrated into the ceiling. An optional G4 prefilter, a heat exchanger, a fan with the latest EC technology and an H14 particle filter are all integrated into the unit. Moreover, the concept design makes it possible to connect air for fresh air supply, maintaining overpressure and humidity control in the cleanroom.

Room exhaust air can be discharged via an exhaust air spigot. The fan is monitored and speed controlled via bus systems by which the fans can be individually controlled and monitored.

A winning formula

The PIFF system not only takes little space in the cleanroom ceiling, it is easy to monitor and can be retrofitted in existing facilities to achieve a defined cleanroom category. The air volume can be individually adjusted and the air exchange rate is derived from the required cleanroom class. Furthermore, the PIFF's self-contained modules are designed to be quickly replaced, so if one of the devices fails, it does not affect the entire cleanroom but is limited to one area.

For specialised applications in pharmaceutical manufacturing, the technical basis of the PIFF goes an extra mile with the integration of a hydrogen peroxide (H_2O_2) filter. Highly concentrated H_2O_2 is used in the form of vapour or fine spray to disinfect and sterilise in pharmaceutical production. This highly corrosive substance is toxic to people. Although it gradually decomposes into its non-toxic components of water and oxygen, the process takes several hours; valuable time during which production is at a standstill because workstations are out of use. Naturally, the faster the H_2O_2 decomposes, the better and with this in mind Exyte Technology's next generation PIFF has been developed to be used with a H_2O_2 filter solution hence helping to reduce the downtime.

According to Exyte Technology, the PIFF module extracts air and the integrated H_2O_2 filter removes the hydrogen peroxide, so the cleaned air is then blown back into the cleanroom. "This means that the environment is safe for the staff in the shortest possible time and production can continue sooner. It is a valuable advantage for companies and one that no other system currently offers," the company said in a statement.

Noteworthy is the quality of the filter. Exyte Technology said that during extensive testing of the filter material, the analysis showed more than 99% separation without any loss of performance across hundreds of disinfection cycles during operational use.

Currently, the PIFF system is a tried and tested ventilation operation mainly installed at electronics and pharmaceutical facilities in Germany, Exyte Technology's main market. Resch told me that the company is now making strides with the system in Europe, US and Asia with big players in these industries. Given the cost-efficiencies and bespoke possibilities, the PIFF system takes cleanroom ventilation to a whole new level.

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