Managing laboratory exhaust at a world-class medical research facility

How the Albert Einstein College of Medicine safely handles fume hood exhaust at 300 laboratory workstations

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Educational research centers with extensive laboratories in urban areas face special problems with regard to safely exhausting sensitive laboratory workstations, particularly biosafety level (BSL) labs. This was the case at the Albert Einstein College of Medicine of Yeshiva University (www.yu.edu) in New York City, a four million square foot facility where 300 laboratory workstations are employed for a variety of cutting-edge medical research applications. In addition to the obvious indoor air quality (IAQ) issues to be managed in this critical environment, because Einstein’s buildings are located in an urban setting, major concerns focused on efficiently and safely exhausting the fume hoods at its laboratory workstations.

As with most major institutions of this kind, new facility construction has been a key factor for Einstein’s growth cycle. To that end, when the college originally built its Samuel H. and Rachel Golding Building, Peter Pessoni, assistant director of operations and maintenance, learned about a well-proven, energy efficient method of laboratory workstation exhaust that would help meet the institution’s requirements of healthy IAQ as well as safe, legal atmospheric exhausting.

Pessoni said that the Golding Building’s mechanical systems were designed by Cosentini Associates (www.cosentini.com), New York City mechanical, electrical, plumbing engineers who suggested use of Tri-Stack® mixed-flow impeller laboratory exhaust systems to replace traditional, individually dedicated mushroom-type fans on the roof, each of which was connected to a tall, unsightly rooftop stack. Pessoni also commented that, “Tall roof exhaust stacks generally create a negative perception of a neighborhood polluter,” and that, “It was the first time we had used Tri-Stack systems for managing our laboratory workstation fume hood exhaust.”

There are eight laboratory floors at Einstein’s Golding Building. Each workstation’s fume hood (with integral HEPA filter) is ducted into a common plenum to a cluster of mixed-flow impeller systems on the building’s roof. Pessoni said that another laboratory research facility at Einstein, the Michael F. Price Center for Genetic and Translational Medicine/Harold and Muriel Block Research Pavilion (223,000 sq. ft.) was constructed in 2007 and now also has Tri-Stack mixed-flow impeller systems on its roof. He added that similar systems are also used at Einstein’s College of Medicine’s Irwin S. and Sylvia Chanin Institute for Cancer Research—a six-story facility dedicated to cancer research. Each of the biosafety level BSL-2 and BSL-3 laboratory workstations at Chanin incorporate dedicated mixed flow impeller systems and, “We have one floor dedicated to biohazard research which is basically isolated from the rest of the floors,” Pessoni added. As for the type of research accomplished at Einstein, Pessoni called it, “Cutting edge medical research including studies on cancer, HIV, diabetes, and more.”

In determining the best approach for managing the college’s laboratory workstation exhaust, Pessoni worked closely with Cosentini which specified detailed wind studies as part of its evaluation process. Wind studies were done to determine how the mixed-flow impeller systems would perform in this environment as well as the most appropriate uses of these systems with regard to the laboratories’ exhaust requirements. In applications such as this—particularly in urban locations—wind studies are a prerequisite for facilities/installations of this type, especially when sensitive or odiferous laboratory workstation exhaust fumes might cause potential problems. Specifically, the objective of a wind study is to determine possibility of laboratory workstation exhaust re-entrainment both in the laboratories as well as in adjacent buildings. These studies are conducted using empirical data and are considered accurate towards making these determinations and subsequent recommendations. Essentially, building exhaust wind studies are used to predict exhaust air flow under a wide variety of atmospheric conditions, mainly to help determine whether re-entrainment may cause problems in the area. Because Einstein’s laboratory buildings are in an urban environment, virtually surrounded by other buildings (many with operable windows), the wind study was critical prior to specifying and installing the Tri-Stack systems.

In discussing the mixed flow impeller systems at Einstein, Pessoni said there are 22 individual Tri-Stack fans mounted in “cluster groups” on the buildings’ rooftops, with eleven on the Chanin building, three on the Golding building, and eight on the Price building. Fans in each group are served by common plenums, a configuration that maximizes their effectiveness. The individual Tri-Stack fans at Einstein are rated at various capacities from 300 to 4600 CFM, with electric motors from 2 HP to 40 HP. Because of their low profile design, the fans are unobtrusive on the rooftop, typically 15’
high, and eliminate the perception of a “neighborhood polluter” commonly associated with tall exhaust stacks on the roof, an important issue according to Pessoni.

Mixed-flow impeller systems work by mixing outside (ambient) air with exhaust discharges to essentially dilute the exhaust stream at the rooftop and send it in a powerful vertical plume hundreds of feet above the building. This technology, which has been in use throughout the world for many decades, provides a number of significant advantages for a variety of exhaust applications in addition to laboratory workstation fume hoods (see sidebar).

The College of Medicine employs thousands of people in a wide variety of functions. In addition to its world-class medical teaching facilities, Einstein also serves the city as a first-class hospital. The Facilities Management and Engineering Department, headed by Senior Director of Facilities Management Salvatore Ciampo is composed of 130 people, divided into Construction and Maintenance sections. Pessoni described it this way: “We have a full array of construction shops and technicians of all kinds including plumbers, carpenters, painters, electricians... We do most of our renovations in-house. We have a design department that’s headed by a registered architect, and all of our drawings are also handled in-house. Our Operations Department is composed of about 50 people and includes a full machine shop, refrigeration repair shop, and 35 mechanics and engineers in various disciplines. The facility also generates its own high pressure steam (which requires licensed engineers for operation in Manhattan).” The college was established in 1953 and, according to Pessoni, “Prior to building the school, Albert Einstein himself was asked if they could use his name on it to which—obviously—he agreed.”

In addition to the benefits offered by the Tri-Stack systems for Einstein’s laboratory workstation fume hood exhaust systems, Pessoni also commented that because the systems incorporate high efficiency fan blade design and low horsepower motors, they are able to operate continuously on significantly less power which helps reduce energy costs—a key factor in cities such as New York.

And speaking of energy consumption, mixed-flow impeller systems of this type are also used at many laboratories and chemical/pharmaceutical processing facilities that require conditioned 100% makeup air. In these applications these systems can help reduce heating and cooling costs substantially. While the systems at Einstein are not used for this purpose, many universities with laboratory workstations are seeking relief from high energy costs via this technology, especially since laboratory facilities account for unusually high energy consumption. Mixed-flow impeller systems in these applications add warm and/or cool air to ventilation intake air in order to achieve substantial energy reductions within the facility.

During the evaluation period for determining the best approach to manage its laboratory workstation fume hood exhaust, Pessoni and his associates at Einstein considered at least four discrete goals: these included ensuring worker safety with regard to IAQ; complying with appropriate standards and codes for discharging its laboratory workstation exhaust; and a “good neighbor” policy to prevent exhaust re-entrainment. They also had to achieve these goals without generating objectionable noise levels at the property line and in the laboratories, while consideration of the rooftop profile and its related aesthetic issues were also factors. “All of these goals were achieved with the acquisition of the Tri-Stack mixed-flow impeller exhaust systems” Pessoni concluded.

Company Description

Strobic Air Corporation (www.strobicair.com) is a recognized technological leader in the air movement industry, specializing in advanced exhaust systems for laboratory fume hoods at universities, public health institutions, wastewater treatment facilities, government agencies, and chemical, pharmaceutical, industrial, and other process industries. With over four decades of experience managing critical requirements of laboratory researchers and facility owners, Strobic Air has continued to develop and enhance its Tri-Stack® mixed flow technology roof exhaust systems to provide greater flows, reduced energy costs, decreased noise levels, and compliance with all appropriate air pollution standards. The company also offers complete engineering, design, and technical support for its Tri-Stack systems and accessories, including a unique fan selection program to help provide practical, common sense solutions for pollution abatement and odor control applications. Strobic Air Tri-Stack systems help prevent re-entrainment into existing or neighboring facilities, eliminate odor, reduce noise at the property line (through its fan silencers), and comply with architectural and aesthetic standards.

About the author:

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