

Validating Ventilation

Jet fan placement ensures optimal air quality and flow



With over 20 years of experience, Bativac is a leading building mechanics company located in Montreal, Quebec, Canada. The Bativac team helps their clients make efficient and cost-effective decisions, whether they are undertaking the complete planning of a project or analyzing modifications to an existing system. Bativac recently contributed their expertise in ventilation to the Centre Hospitalier de l'Université de Montréal (CHUM) project.

CHUM

The CHUM project has been called the largest healthcare construction project in North America.

The new CHUM hospital replaces three existing hospitals in the heart of Montreal, Quebec, and connects six buildings over two blocks. The project is slated to be completed over ten years and in three phases:

- 1 The research center was completed in 2013.
- 2 The hospital opened the doors to its first patients in 2017.
- 3 The complementary buildings are expected to be completed by 2021.

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Success at a Glance

- Significant reduction in all costs, from installation to maintenance
- Comfortable and safe environment for occupants
- Optimized configuration balances air quality and costs

Challenge

For a center such as the CHUM, the health and safety of its clientele is a clear priority. Its buildings must meet the highest standards for occupant safety and air quality, and do so as efficiently as possible.

Although the CHUM is easily accessible by public transit, it nonetheless required a sizeable parking area for staff, patients and visitors. Given the urban location and limited available space, this entailed building an underground parking garage. In any underground parking garage, optimal air quality is a challenge of significant concern, as air contaminated with toxic gases, such as carbon monoxide and nitrogen oxide, from exhaust fumes poses a distinct health hazard and danger to occupants. Similarly, in the event of a fire in an underground garage, smoke accumulation poses a serious threat. The capability of the ventilation system to ensure safe air quality levels is of extreme importance.

Ventilation concerns extend beyond simply meeting the minimal air quality and safety standards set out in government regulations. The sizing, placement and number of ventilation units affect the relative comfort of the space (for example, with noise) and, especially, have a considerable impact on the costs related to purchase, installation, operations and maintenance. An ideal ventilation system would be optimized to both provide safe air quality and minimize costs.

Bativac applied its expertise to ensuring the optimal design and configuration of CHUM's underground parking ventilation system to balance safety and air quality with cost.

Solution

Bativac proposed a modern jet fan ventilation system instead of a traditional ducted system.

Traditional ventilation systems use ducting to connect multiple extraction points and fresh air inlets. These systems suck out dirty air and bring in clean air. However, they can be inefficient and may not ensure adequate air quality, causing “dead zones” – pockets where highly toxic fumes accumulate. Ducting also takes up valuable space, limiting the number of possible parking spaces and reducing the height of the parking area. The extensive ducting comes with considerable material, installation and maintenance costs.

The jet fan system Bativac proposed uses high velocity induction fans to push air through the parking space toward key extraction points. It requires no ducting, so it takes up less space, and is less noisy. Importantly, the associated installation costs can be up to 30% less than for a traditional ventilation system.

For obvious reasons, optimizing and testing a ventilation system's configuration is best done before purchase and installation. With computational fluid dynamics (CFD) and simulation software, engineers can assess the effectiveness of a ventilation system's design and run simulations on a variety of iterations to arrive at the best solution for the site. Bativac sought Maya HTT's expertise in simulation and computational fluid dynamics (CFD) and took advantage of the capabilities of Simcenter 3D. Maya HTT helped to validate that the fan configuration proposed by Bativac would balance air quality needs with a low-cost, energy-efficient solution appropriate for the parking garage of a modern healthcare facility.

Using Simcenter 3D, Maya HTT's engineers found that with three jet fans, the ventilation system would be able to maintain a safe and appropriate air quality, both with low and high fan flow regimes.

Benefits

By using a jet fan system over a traditional model, Bativac contributed to creating a quieter, tidier, and healthier parking environment for the CHUM's clientele. The jet fan's low profile provides several advantages. It made it possible to keep the parking level height low, thereby minimizing construction costs, and allowed engineers to situate the fans in the best location for optimal function, without having to avoid placement over parking spaces and driving lanes. This modern ventilation system required less installation time and provides ongoing reductions in maintenance costs, energy costs, and operating costs.

Maya HTT's expertise and analysis helped Bativac to validate the ventilation system, bringing the required number of fans down to four. Maya HTT is proud to have collaborated with Bativac on contributing to a truly safe and modern urban health facility.

“ Maya HTT's expertise proved invaluable in validating the ventilation system configuration. Their analysis provided the confirmation and confidence needed to pursue and achieve significant energy- and cost-efficiency improvements. ”

Marc-André Sabourin

Vice-President, Bativac

About Maya HTT

- Industry leading software developer and provider of engineering services in CAE, Product Lifecycle Management (PLM) and Datacenter Infrastructure Management (DCIM)
- Extensive experience in design, analysis, systems integration and deployment
- Specializing in mechatronics, thermal, fluid and structural analysis, and composites
- Technological partner, software editor, and provider of Siemens CAD/CAE/PLM solutions for more than 30 years
- Worldwide customer technical specialist support

