THE SMART LAB PROGRAM AND LAB VENTILATION RISK ASSESSMENTS

EHS has been involved in the Smart Lab program since 2019. This program is designed for reducing energy expenditure and increasing safety in our laboratories. 3Flow is a fume hood manufacturing company that co-created the Smart Lab Program. EHS partnered with 3Flow Inc. to conduct a lab ventilation risk assessment (LVRA) in the Petit Biotechnology Building, Whitaker, and Ford ES&T. Conducting an LVRA is a crucial part of the Smart Lab Program. An LVRA is done to address airborne hazards that may be generated while working in the lab and ways to mitigate them via the ventilation systems within the lab space. Some of the airborne hazards may be chemical, biological, and/or nanoparticle in origin. Ventilation systems are the primary engineering control to capture these hazards. The primary mechanism of control is source capture by use of exposure control devices (ECDs) and secondarily through dilution and removal of the contaminants by the ventilation systems. The primary reason an LRVA takes place is to collect risk information that will be used to form recommendations regarding design and operation of ECDs and ventilation systems to further mitigate risk and/or address any short comings.

The criteria being addressed is:

- The types of hazards and procedures including use of highly toxic chemicals
- Hazard generation characteristics (i.e. gases, vapors, mists, dusts)
- Quantity of materials used or generated during lab procedures
- Frequency and duration of hazard generation
- Exposure control devices (ECDs) in the lab, their use and appropriateness

Environmental Health & Safety (EHS)

Earth Day 2022

EHS, Sustainability, and Research

IMPORTANCE

Safer Work Environment

By conducting an LVRA it allows us to identify any areas that may pose an unduly amount of risk. After the risk assessment was completed GT was able to address the concerns. There was a sliding scale from 0 – 4, 0 being negligible to 4 being extreme. Criteria evaluated included the hazards associated with the chemicals being used, what types of ECDs these materials were being used in, if the ECDs were appropriate, and how ventilation within the lab space aided in protecting the researcher against airborne particles. This may mean that chemical fume hoods may have to be moved or installed to ensure that other factors (such as open doors causing drafts or fresh air intake being too close to ventilation outputs) aren't interfering with the ECD. This also may mean that highly hazardous chemicals may need to be replaced with chemicals that are less hazardous or the experimental process may need to be changed to ensure adequate safety.

Carbon Footprint, Energy Savings, and Sustainability

One of the main ECDs used on campus are chemical fume hoods. Fume hoods operate by circulating air through the hood and pulling that air out through the lab's ventilation system. This requires a lot of energy. A fume hoods face velocity is measured in feet per minute (fpm). The suggested range is 80 – 120 fpm. However, being able to keep the face velocity at 80 fpm offers the highest in utilities savings. Because of these savings, the smart lab chemical fume hoods on campus are now programed to operate at 80 fpm.

The fume hood sash is also vitally important in regards to energy expenditure. A typical six-foot hood exhausting air at 100fpm with a sash open to 18 inches can exhaust a lab space approximately 1.5 million cubic feet of conditioned air every day. By keeping the sash closed when you are not actively using the hood, the energy expenditure is cut significantly. Some ways you can ensure this is by installing automatic fume hood sash closure systems. This system will detect when the researcher has stepped away from the hood, and automatically close the sash. By shutting the sash of one fume hood, you could roughly save approximately 21,000 lbs of carbon dioxide (CO_2) gas emissions per year and you could save around $3,000 in electricity costs per hood. Currently at GT, we have approximately 1,086 chemical fume hoods. This would be a total savings of $3,258,000 in electricity costs and 22,806,000 lbs of CO_2 gas emissions per year.

The type of fume hood also plays a role on energy savings. Two types that are typically used on the GT campus is constant volume (CV) fume hoods and variable air volume (VAV) fume hoods. CV hoods, like the name implies, uses a constant volume of air through the hood, whereas VAV hoods do not. They adjust the volume of air being used based on the sash position. By making the switch to VAV hoods, it again lowers energy costs.

In conclusion, by keeping chemical fume hoods operating at 80fpm, keeping sashes closed when hoods are not in use, and using VAV hoods instead of CV hoods, all make for a more energy efficient and sustainable work environment. All of these steps combined reduces an individual labs carbon footprint and decreases greenhouse gas emissions significantly.