

ChemFLOW Multifunction Fume Cupboard Controller

- 1) Fume cupboards are very expensive on running costs. The main running cost is the amount of air extracted from a laboratory which has been heated or cooled to achieve a comfortable working environment. To heat / cool 1 cubic metre of air through 1°C requires 2kw/h of power. Our most popular fume cupboard which is 1500mm wide unit, consumes 1,100 cubic meters of air per hour. Based on the current ESB rate of €0.19 per kwh this has a substantial running cost dependent on outside ambient temperatures.

Installing our energy efficient system on a fume cupboard can reduce the running cost by up to 70%.

- 2) There are three requirements when designing a fume cupboards operating system
 - a) The fume cupboard must have a sufficient airflow to maintain good containment levels when the fume cupboard sash is open
 - b) The fume cupboard must have sufficient air changes within the fume cupboard to maintain a purge to ensure that the chemicals are removed continuously from the working chamber.
 - c) The fume exhaust system attached to the fume cupboard must maintain an exhaust velocity at the very top of the exhaust stack. This is to ensure that all fumes clear the building fully and do not re enter the building via open windows or supply air system.
- 3) Several methods have been employed through time to attempt to achieve energy savings including variable speed exhaust fans, however while reducing airflow usage in the fume cupboard it does not meet or maintain the other two requirements of purge and exhaust velocity.

At Chemical Systems Control Ltd we have developed our own energy saving system which meets all three requirements to ensure safe operating fume cupboards with the added energy efficient operation. This system can be retro-fitted to virtually any make of fume cupboard.

The principal of operation is as follows:

- 1 The **Chemflow air velocity monitor** reads the air velocity entering the **fume cupboard** to within 1% accuracy
- 2 The airflow monitor communicates this data by means of a **0-10 volt** signal to the **actuator** on the **motorised damper**.
- 3 The actuator responds to this information by modulating the damper to the position corresponding to the voltage signal level.
- 4 The airflow monitor has a preset target velocity typically 0.7m/sec
- 5 When the **sash** is raised or lowered the Chemflow monitor reads the changing velocity of the air passing through the sash opening.
- 6 The chemflow monitor sends a voltage signal to the actuator to adjust the damper to a position that corresponds to a velocity across the sash opening of the preset target velocity.
- 7 The requirement however for a minimum **purge** of air through the fume cupboard prevents the reduction of air through the fume cupboard from falling below 33% of its initial air volume. This initial volume is calculated as being the volume through the fume cupboard at a sash opening of 0.5m at a velocity of 0.5m/sec by the internal width of the fume cupboard. I.e. $0.5 \times 0.5 \times$ internal width of the fume cupboard. The minimum volume therefore is $0.33 \times 0.5 \times 0.5 \times$ internal width of the fume cupboard.
- 8 The Chemflow monitor prevents the volume from going below the minimum required by presetting a minimum volume within the tracking program.
- 9 This ensures that the containment and purge levels of the fume cupboards are maintained at a safe operating level at all times.
- 10 The energy cost saving in operating this system is dependent on the vigilance of the operator in lowering the sash to its minimum position when the fume cupboard is in operation as best practice advises.
- 11 The energy savings can be further improved by the use of an automatic sash operating system
- 12 This system uses a PIR indicator to detect movement at the fume cupboard work area. If no movement is detected after a preset period of time (30 seconds) the sash will automatically close and the fume cupboard extract will set back to its minimum volume condition.