ROOM BALANCING

Hochschule Rhein-Waal, Kamp-Lintfort, Deutschland

From the point of view of an air conditioning system, the fume cupboards in a lab are rooms within a room; this complicates communication and the maintenance of setpoints. A reliable air management system is important because volume flow rate balances in various room scenarios must be controlled quickly and precisely as volume flow rates in fume cupboards and other extraction units may suddenly change. This requires that the actual volume flow rates are not only precisely measured, but also rapidly signalled such that the setpoint values can be achieved.

Room balancing.
In a lab, the extract air consumers such as fume cupboards, fume hoods or extraction units determine how much supply air is required. EASYLAB adds all extract air values and controls the supply air based on an absolute difference between supply air and extract air, which prevents contaminated air from
leaving the lab.

Efficient interplay of fan speed and damper blade position.
Ideally, air conditioning systems should include variable volume flow control and speed-controlled fans such that they can adjust efficiently to

changes of usage. EASYLAB and fast actuators ensure that the damper blades of TROX volume flow rate controllers react swiftly to any changes and maintain the required air balance, e.g. by reducing the supply air flow rate. The correct and quick functioning of EASYLAB requires that there is always a sufficient pressure in the duct system. This can be achieved efficiently and safely in two ways:
1. Measurement of the duct pressure where an undersupply occurs first: maintaining the duct pressure setpoint value. The point where an undersupply occurs first is difficult to find, however, since it tends to wander in the duct system with changing operating conditions.
2. Evaluation of the combined damper blade positions of all VAV terminal units: It is possible with sophisticated logic to vary the speed of supply air and extract air fans in such a way that the dampers work with the blades in the position that results in the least pressure loss (almost completely open). The logic is part of the X-CUBE control package. This ensures that the 'accelerator' (high fan speed) and the 'brake' (damper blade almost closed) are not actuated at the same time.

Selective diversity control
To reduce investment costs, centralised systems are often not designed for 100 % capacity. If all extract air consumers ran with full capacity, the fume cupboards in a more unfavourable position in the duct system would suffer from a lack of air. EASYLAB allows for a refined control strategy to maintain work safety at as many workstations as possible when the design total extract air is exceeded. Any reduction of the volume flow rate for a fume cupboard is displayed (alarm), reminding users to close fume cupboards that should not be open. Diversity control makes it possible to design smaller plant rooms and a smaller duct system, thereby reducing investment and operating costs.