



Variable Flow Balancing Technology\*  
for Air Distribution Systems

Kyllor Variable Flow Balancing Technology achieves both a balanced Variable Air Flow distribution and the lowest possible Fan energy consumption

Continuously, throughout the day, air flow balance is re-established as thermal loads change with weather and occupancy

Existing buildings and New building projects will benefit from the highest energy efficient distribution and occupant comfort with delivery of 100% Demand air flow to all thermal loads

### Features

**Kyllor Variable Flow Balancing Technology, "VFBT", a break through patent** achieves both a balanced variable air flow system and the lowest possible fan energy consumption.

Kyllor Variable Flow Balancing Technology generates 100% of all possible energy reductions. Significant reductions in energy consumption result from minimization of distribution differential pressure losses.

Kyllor Variable Flow Balancing Technology provides balancing reports on line, in real time, and on demand. Reports identify opportunities to achieve significant additional reductions in energy consumption.

BAS network compatibility is available with the BAC.net interface. The Kyllor Air Variable Flow Balancing Technology may be provided as a separate network within a BAC.net BAS, or as components operating within a BAC.net environment. These options are available with existing and new projects.

Patented Kyllor Loop Control Algorithm is used throughout VFBT, providing a more efficient and a very stable control, outperforming the industry standard PID algorithm.

The accuracy of Kyllor AIR-VFBT is in the order of +/- 1.0% compared to the +/- 5.0% at best, only at Design flow with manual balancing.

In response to occupancy and weather changes, Demand air flows change at coils, terminal units, etc., and the Kyllor AIR-VFBT responds with fine adjustment re-balancing.

### Background

Currently Variable Air Flow distribution systems are balanced manually, as Constant air flow systems, and Fan speed is adjusted to a fixed speed setting. Often Fan speed is later readjusted manually by the building operator, to a level consistent with "**zero tenant complaints**",

or, in some cases Fan speed adjustment is based on maintaining a Differential Pressure setting at 1 or more duct locations in the Air distribution system. Since the setting for Differential Pressure control is not easily defined initially, nor later, this pressure setting often defaults to the operator adjustment level consistent with "**zero tenant complaints**".

Since duct pressure loss and fan pressure performance are both nonlinear functions of air flow rates, Design **air flow balance will not exist** at all speed levels other than the speed setting used in the constant Design flow manual balance process.

The industry does not have a balancing technology for Variable Air Flow distribution systems. **Kyllor "Variable Flow Balancing Technology" provides the solution.**

The Kyllor Variable Flow Balancing Technology balances the Air distribution system incrementally during each hour of each

day. During this process compatible adjustments of Fan speed are made to minimize Fan energy consumption. Both a balanced Variable Air Flow system and the lowest possible Fan energy consumption are achieved with a single technology.

### Applications

Kyllor Variable Air Flow Balancing Technology applies to new and existing variable Air Flow distribution systems.

For example, Kyllor AIR- VFBT applies to VAV box distribution systems. A node unit operation of the VAV box may be termed a Node Unit -Variable Air Flow. " NU-VAF". A NU-VAF operates to control tenant space temperature by resetting Demand air flow target setting. The air flow is maintained at target by modulation of the box damper.

Other upstream Node Units may operate as a NU-VAF maintaining the sum of target Air Flow settings of the immediate downstream NU-VAFs. Other upstream Node Units may operate to maintain air flow Demand setting by adjusting Fan speed.

A node unit will operate to adjust the speed of the Primary Make-up Air Fan based on the Demand Air Flow Targets of all downstream Node Units.

Also, for example, Kyllor AIR-VFBT applies to conversion of an Air distribution system from Constant flow to Variable flow, accommodating hourly Demand flow changes with re-balancing and energy cost reductions.

In short, Kyllor Variable Flow Balancing Technology **will change the Air Balancing Industry** and drastically improve the energy efficiency of air distribution.

### Performance of Kyllor VFBT

A Node Balancing Unit is operational at each node in the Air distribution systems while also being operational in the Variable Flow Balancing communication Network. Each Node Balancing Unit monitors conditions at the Air distribution system node and communicates with other neighboring Node Balancing Units to achieve a flow balance at the Air distribution node.

This process begins at the tertiary Node Balancing Units and adjustment data flows upstream in the Variable Flow Balancing Communication Network to the Node Balancing Unit servicing the VFD(s) at the Fan(s).

**The 1st system priority is balancing the varied air flow demand(s), during each hour of the day, then adjusting the Fan speed to the minimum level consistent with the 1st priority.**