Press Release
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SE Controls Explains Window Automation Options

With building facades now being used to offer sustainable solutions for the need for well ventilated working and living spaces, SE Controls explains the options for window automation:

Adaptive Natural Ventilation is a simple solution offering the best air circulation with the minimum of energy input. In its basic form it is the installation of vents or windows in a building facade that open and shut automatically according to set parameters for the space within the building.

These set parameters can be either based on levels of $C0^2$ for example in a classroom or conference centre, temperature, or in the instance of fire, smoke detectors which open vents to allow for a safe and smoke free exit for building occupiers.

Adaptive Natural Ventilation is often coupled with smoke detection systems in modern buildings, using the same vents and windows offers a positive saving on building costs. It is also very important to remember that Adaptive Natural Ventilation systems are not just for new buildings. Many existing facades can easily be automated with little modification offering huge savings in energy costs whilst improving building comfort.

How it Works
Warm air rises in a building, by offering low level and high level vents or window openings, fresh air can enter from outside whilst stale air escapes at a higher level. This is how it works in its most basic form, ventilation specialists will also look at typical wind direction for the location, micro-climate, building height and building orientation. Once all this data has been gathered the correct design can be agreed for the building.

How do we Achieve '<u>Window Automation'</u>?
'Window automation' is achieved by fitting a remote 'actuator' to a window, linked to a control point. It is a device which enables a window to be opened and closed from another location. Operation is achieved manually, either by levers or rotary handles, or by an energy source, such as electricity.

Windows are normally installed to offer supplemental ventilation in a building, in large buildings there are often multiple windows which offer this facility. These windows may also be hard to reach. By simply linking the windows together by the use of actuators a bank of windows can easily be operated from one place with one operation.

To get the best possible natural ventilation solutions it is advantageous to design window automation during the facade design either as a full natural ventilation system or as a combined smoke and natural ventilation solution. Using an automated window solution can offer significant energy savings and therefore reduce carbon footprint.

Natural smoke ventilation utilises the inherent buoyancy of hot smoke, letting it rise and escape from the building whilst allowing cooler, heavier air, to enter at low level into escape routes to allow safe exit for occupants. This is simply achieved by introducing automatic vents at high level that open upon detection of smoke, allowing the smoke to escape into the atmosphere.

Automatic opening inlet vents / windows at low level maintain the smoke reservoir at a safe level above head height to increase occupant's visibility during escape.

Manual Operation

Manual opening vents are used in applications where a number of high level out of reach windows or roof light systems require remote operation safely and securely. Manual opening systems can be used for most window systems, either in new or existing buildings, and can be applied to all forms of windows, such as bottom hung, top hung, side hung and central pivotal orientations.

Actuator Types

Actuators come in two basic forms, the 'chain actuator' and the 'linear actuator'. These are typically fitted to the window frame at the widest point of the opening vent with the moving mechanism of the actuator fitted to the window frame. The use of pivoting fittings ensures that the actuators can move to follow the variable geometry of the opening window.

The 'chain actuator' comprises a single chain which is designed to bend in a single direction only. Once operated and coming out of its housing perpendicular to the body of the housing, the chain locks to push the window open.

The advantage of a chain actuator is it can offer a long throw opening whilst allowing the mechanism to remain relatively compact and unobtrusive.

The 'linear actuator' has a simple push and pull action and is fitted perpendicular to the vent and consists of a fixed rod. If the window needs to be opened by, for example 500mm, then the linear actuator is going to project at least 500mm into the internal space.

Linear actuators are more commonly used at high level, such as in atria where aesthetic impact is not as great. Furthermore the typical size and weight of these types of vents lend themselves to linear actuators which can achieve higher thrust forces than chain actuators.

Control Options

In order to ensure the effectiveness of automated windows within the building design, it is essential to follow the design brief. In its simplest form, window automation can be achieved by using a simple open / close switch to control a single actuator or banks of actuators.

An automated window system may be required to open in case of a fire; here the window control device can be overridden via a separate smoke detector or fire alarm signal. Where fire and smoke ventilation systems are required, operating voltages are typically set at 24V DC. This allows for 24V DC battery back-ups to be installed to operate these systems in case of power failure in an emergency.

On bottom hung open out, hopper style, and parallel opening vents, rain sensors can be integrated into the system which forms a logic sequence into the control strategy. Furthermore it may be beneficial within a school to limit the opening of the windows within specific time constraints that could simply be achieved by using a seven-day timer.

Logic sequences require some form of controller to be present within the system to address the requirements in differing situations. Taking measurements of various conditions within the building, such as CO^2 and heat, the controller can be programmed to open vents at various positions to suit specific conditions. These additional sensors are cost effective as a single sensor can offer feedback that controls a number of vents. An automated window system can be affected by external environmental conditions, such as wind speed and wind direction. By introducing simple algorithms, the efficiency of the system can be improved.

All aspects of the building's overall heating and ventilation strategy should be integrated to maximise energy savings. How often do we see radiators are left on with windows open, or windows open with

internal blinds closed to prevent solar gain? It is important in the design process to recognise that these elements are complementary and shouldn't be looked at in isolation.

The Design Process
The issues raised above throw up some very interesting discussion over the degree of user interface, experience has shown that occupants like to have control of their local environment; therefore systems can be designed to offer both automatic control with local override. In order to evaluate potential schemes a degree of simulation and modelling is advisable. This will help to identify the best locations and sizes of ventilation openings.

SE Controls is one of the largest providers of natural ventilation and smoke control systems in the UK. Rapidly becoming a global player in such systems, the company provides a complete service from design through to, installation, commissioning and maintenance. With such a broad range of services and aftercare, SE Controls can offer correct guidance in these systems based on almost 30 years experience in the industry.

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