"Run For It!"

Smoke Free Escape and Rescue Routes

Fires in residential buildings, old peoples homes or apartment blocks often cause deaths and injuries - mostly due to smoke. The smoke spreads across stairwells and landings, cutting off the route for escaping persons. Also for rescue teams, stairwells often cannot be accessed until the smoke has been blown out. As stairwells and lifts connect the floors vertically, the fire smoke can spread without any obstruction. Over ten years ago, this problem caused Dr. ERMER GmbH in Cologne to introduce the pressurisation principle in escape routes. The company has already installed several thousands of smoke control systems in all types of buildings and now uses Moeller's easyControl for the demanding control tasks involved. The Cologne-based company also uses Moeller's know-how with regard to DS6 soft starters, DF51 frequency inverters, circuit-breakers, CS steel cabinet enclosures and other components.

The idea of smoke free escape routes is based on a simple physical fact: If an overpressure is generated in the stairwell opposite the fire area or burning floor, smoke cannot impede the escape of fleeing persons, and rescue teams can carry out their work without delay.

The following technical means are used to generate the overpressure: A fan blows fresh outside air into the stairwell, whilst several conditions are observed at the same time. The differential pressure with the doors closed must not go below 30 Pa, the force for opening doors must not exceed 100 N, and the air speed in the door between the stairwell and the burning area must not be below 1 m/s (DIN EN 12101 – 6). The measurement and control requirements involved are very complex. After smoke is detected, a fire alarm activates the pressurisation system. Several closed-loop control processes are initiated at the same time: An optional differential measurement is used to increase the volumetric flow rate at the fan, move the inlet and exhaust flaps to the required positions, whilst doors are opened or closed according to the design of the system and the outlets are opened on the floor with the fire. The control time from the activation phase to the full operation of the system must not exceed three minutes.

A fan module on the ground floor pressurises the stairwell in the event of fire.

DF6 frequency inverters ensure economical speed control for the fans.

For the most demanding tasks - easyControl

In apartment blocks, a fan is usually installed on the ground floor which sucks in fresh air in the event of a fire and blows it into the escape route, such as a stairwell or lift shaft, thus creating an overpressure. All closed-loop and open-loop control functions of the pressurisation system are housed in a single control cabinet, and all input and output signals are managed centrally.

For demanding measurement and control tasks, a control cabinet is installed on every floor to act as a substation which is connected to the central control cabinet. This substation manages all the inputs and outputs such as for smoke detection, flap actuation, door openers, pressure ratios etc. that are relevant to the floor in question. One easyControl handles

these control tasks on each floor. In the largest project implemented to date, 27 easyControls were installed on 27 floors and interconnected using CANopen. As the operation of these kinds of systems involves several different disturbance variables, such as suddenly opening doors or open windows, the pressure control is extremely sophisticated.

When the smoke control system is commissioned, the pressures for each floor have to be measured, set and these values then stored in the memory of the appropriate easyControl. Up to 50 different local parameters can be required, depending on the floor. easyControl's integrated display with additional operator buttons is extremely useful in this respect, as it simplifies the entry and checking of data. The device display can be used to show texts and screens for different parameters such as pressure values, control settings for frequency inverters as well as safety checks.

easyControl was chosen due to its high performance and extensive range of features. The easyControl controller family combines the simple easy concept with the benefits of EN61131-3 programming. easyControl uses the CoDeSys programming system and offers an even

greater functionality than that required by the EN61131-3 standard. easyControl also offers CFC (Continuous Function Chart) as an additional programming language. EC4P controllers use the already existing extensive easy range. Their 16-bit processor ensures a high CPU performance and thus shorter cycle times. Program and data memory are also generously sized with 256/224 KB. EC4P controllers are available in 16 different versions. The industrial devices are maintenance free and do not require any batteries. A standard CANopen fieldbus master is integrated on all EC4P devices in addition to the well-established easyNet network. The EC4P versions with an integrated Ethernet interface are a special technical highlight.

The software benefits of the CoDeSys programming system are fully utilised. The Cologne-based company created its own function block libraries based on the large range of function blocks provided in the closed-loop control and motion control toolbox of easySoftCoDeSys. These can be expanded as required. These function blocks can be locked so that the source code cannot be seen in the runtime program in order to protect proprietary software know-how.

Mistral smoke control system
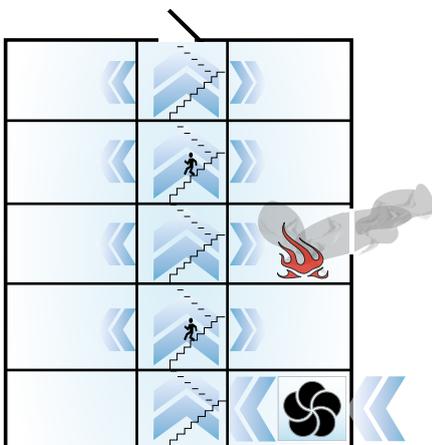
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"The EC4P with CANopen bus, the CoDeSys software and the association with the TreeSoft E-CAD program are for us the future way ahead. This enables us to be optimally equipped for new applications which can be implemented economically. We use Moeller components because of the fast onsite service in Germany and overseas," Ralf Pötzsch, head of development at Dr. ERMER, explains.

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