VENTILATION AIR INTAKE – FIRST LINE OF DEFENCE AGAINST AN UNFAVOURABLE OUTDOOR CLIMATE

O Kristiansen[1], S O Hanssen[1], J Stang[2] and H N Lysne[2]

[1] Norwegian University of Science and Technology, Trondheim, Norway
[2] SINTEF Energy Research, Trondheim, Norway

ABSTRACT

The ventilation air intake (louver) is the first line of defence against an unfavourable outdoor climate. Unfortunately, the importance of this component is often an underestimated issue in the design process of many heating, ventilation and air conditioning (HVAC) systems. Field studies and inspections of a representative number of HVAC plants carried out between 1995 and 1998 in and around the city of Trondheim revealed that snow, and in several cases rain, easily passes through the air intake louver. Such intrusion of humidity can lead to unwanted microbial growth in the HVAC system.

INTRODUCTION

The importance of the ventilation air intake is often overlooked during planning, construction and maintenance of many HVAC systems. Some consequences of this neglection are illuminated in this technical note which is based on findings in research projects carried out between 1995 and 1997 [1,2] and supplemented with recent findings in 1998.

METHODS

The methods used in the field studies and inspections of mostly 3-10 years old HVAC plants in the Trondheim area are presented in [2]. The inspections were carried out between 1995 and 1998. Checklists were used to evaluate each component in the system with respect to presence of organic material (leaves, insects etc.), moisture and dust. Relevant information regarding the maintenance personnel's experiences during operation and maintenance of the systems were collected by means of personal interviews.

RESULTS

Almost every air intake louver in the study had horizontal blades, and very few of them gave protection against wind driven rain. The intake ducts were seldom drained, and consequently moisture brought in by the outdoor air had to vaporise, leak out of cracks or joints in the ductwork or continue into the filter unit. Especially light, dry snow gave rise to serious problems. Depending on the duration of the snowfall, the filters could be completely clogged with snow so they had to be replaced. In one of the HVAC plants the problems were so severe that the maintenance personnel had to remove the filters during the winter because they did not have the possibility to replace the filters after each snowfall. This resulted in outside air passing unfiltered through the HVAC system with increased risk of soiling of components, ductwork and the interior space of the building.

In some of the systems, the intake duct upstream of the filter was insulated on the inside with porous fibreglass insulation or fabric-covered porous insulation to avoid condensation and reduce noise. When outdoor air is drawn through the duct, dust and debris are accumulated on the duct walls. When the porous insulation becomes wet due to intrusion of humidity it is an ideal breeding ground for microorganisms. Additionally, fibrous filters in HVAC-systems that are loaded with dust and debris from the outdoor air give increased risk of unwanted microbial growth especially when moistened.

DISCUSSION

To reduce or avoid problems caused by intrusion of rain and snow, it is of vital importance that the air intake louver is placed and designed to reduce the amount of unwanted humidity that penetrates the air intake. In building projects, the architect and the HVAC consultant have to work together to find the best solution regarding location of the air intakes, preferably with the help of experts on building aerodynamics and the effects of air flows around buildings. The solution must satisfy both aesthetic and technical requirements.

CEN standards for testing of louvers subjected to simulated sand (prEN 13181) and rain (prEN 13030) are being developed, but none of the proposals includes snow which is a major problem in Norway and other countries with similar winter conditions. Further, the standards are based on laboratory measurements. Due to the fact that it is hard to represent the real world situation in a laboratory, louvers should also be tested in situ to verify their performance. On this background we have designed a combined laboratory and full scale testing procedure that enables us to rank commercially available louvers with regard to real life performance.

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