Highly exciting news: A new standard for the “airtightness testing of clean rooms”

The builder-owners or users of clean rooms generally assume that the rooms they are using are airtight. Until conducting an airtightness test, the principals believe to have ordered and received an “airtight” clean room. After all, how could it be any different? The strict requirements for hygienically clean indoor air require the room envelope to be airtight. In combination with constantly sufficient positive pressure in operating theaters or negative pressure in laboratories, this prevents the flow of contaminants and germ-carrying air through leakages. The impact on energy-efficiency is also considerable. Unnecessary airflow costs energy and consequently a lot of money for ventilation, filters, heating, or cooling.

Now imagine the surprise, when finding out that the testing fan used to conduct an airtightness test of a clean room does not suffice to create the necessary room pressure! Or the following effect may even occur: The airtightness of an operating theater in a hospital is to be tested and during this test, the room is pressurized with artificial fog, leading to the adjacent emergency staircase of the building also being flooded with fog. Hard to believe that there is actually an air connection, but in practice, this is unfortunately quite common. Detecting the leakage requires expensive and painstaking work. Since they are often no longer accessible, many faulty installations can later no longer be found or sealed or if so, only by investing a significant amount of time and money.


Testing the airtightness with the measurement system Minneapolis BlowerDoor

This is particularly problematic, if you consider that pathogens are also transmitted by air and in spite of comprehensive measures of hygiene lead to infestations. These hospital germs are developing into an ever increasing threat to public health. According to the Federal Statistical Office, relevant surveys, as well as clinical studies, almost a million patients per year out of approximately 14 million visitors and employees of German hospitals and clinics suffer from hospital-acquired infections.

Mainly hospitals and medical doctors in the field of hygiene, but also operators of such facilities, will consequently have to look into this issue even more intensively than before. In this context, the airtightness of the rooms, where such pathogens appear or where patients are to be protected against them, plays a significant role.

The clean rooms tested to date showed completely insufficient airtightness. The almost 300 BlowerDoor tests already conducted (The author of this article has been engaged in the airtightness testing of clean rooms for years.) resulted in an average air change rate n50 of 11.3 (1/h). However, the long-known and established limits from building construction (The air change rate n50 for a residential building with a ventilation system is at a maximum of 1.5 (1/h)!) seem to be unknown or are simply neglected, when it comes to planning hospitals, labs, or other medical facilities. Almost all measurements showed that the airtight layer in the respective rooms was either not useful or had been planned insufficiently and in most cases also been implemented badly.

Leakage detection during the BlowerDoor test

The unsatisfactory results of these airtightness measurements and the fact that there had been no suitable guidelines for their application in clean rooms to date, as early as in 2007, led a small group of experts including the author of this article to publishing a proposal for a standard with the strict requirements for clean rooms. Subsequently, a committee of leading European experts in this field was founded under the auspices of the Association of German Engineers (VDI) and worked on the issue at hand. This resulted in a new standard, VDI 2083/19, which will be published by the end of the year. It includes classifications of airtightness, indications on installing airtight clean rooms, and also stipulates measuring and testing procedures. This guideline and the procedures described can also be applied to rooms, where the airtightness is to be tested because of the increasing use of hydrogen peroxide as a decontaminant or the application of toxic substances.

At long last, there is a clear and precise guideline for all those involved in building and operating clean rooms. It significantly facilitates dealing with a great number of the issues concerning airtightness in these rooms and also provides practical help for testing and operating them.

About the author

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