

HUMIDITY IN OFFICE BUILDINGS

THE SITUATION

The underrated performance factor

Optimum humidity in office buildings is now no longer exclusively a feel-good factor – it can have a direct impact on the performance and health of employees. Energy-efficient construction methods and increasing optimisation of the use of floor space are making dry air into one of the biggest sources of disturbance in the office. Today, a third of office workers now feel frequently or continuously disturbed by dry air.



“Workplace management” and “new ways of work” are keywords that for several years now have been attracting a great deal of attention around the world in the field of facility management of office buildings. Underlying this is the realisation that the design of the working environment has a significant influence on the well-being and health of employees, and therefore on their performance. In the search for the best minds for an organisation (the “war for talent”), the workplace and the facilities it offers play an important role in people’s decision to choose an employer. This assessment is also gaining increasing acceptance in human resource management. In practice, however, things still often look somewhat different: The uncompromising goal of energy efficiency gives rise to award-winning green buildings that, from a climate control perspective,

nevertheless not infrequently require renovation within one or two years. Airtight building envelopes, large glass facades and the absence of air conditioning systems may indeed produce an excellent energy balance. But if they are poorly planned, people suffer from air that is too warm and too dry. The mucous membranes dry out, the voice becomes cracked, employees become ill. The optimisation of office space through the “open space” approach also often has a negative impact on the well-being of employees. This is often caused by the pressure to drastically reduce office space in order to reduce costs. The shrinking of office space can be compared to a crash diet. Lack of privacy has a negative impact on job satisfaction, and makes people more sensitive and more susceptible to sub-optimum climatic conditions.

Surveys show that more than a third of all office workers now feel continuously troubled by dry air in the workplace. The negative consequences for health and performance that this entails create large market opportunities and growth potential for providers of humidification systems. In particular, direct humidification systems that are suitable for retrofitting provide added value for building users, owners and office users that until now was difficult or impossible to implement.



Sales Guide

HUMIDITY IN OFFICE BUILDINGS



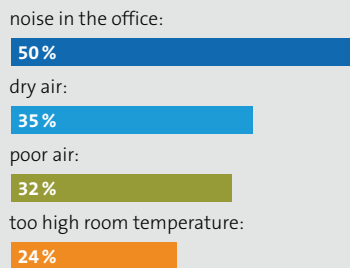
By 2030, offices will be perfectly air-conditioned

In the joint research project Office 21, the German Fraunhofer Institute for Industrial Engineering IAO (www.iao.fraunhofer.de/lang-en/) investigates the ways in which office and knowledge work are changing. The researchers want to provide precise options for action for the successful design and implementation of this future business work environment. The scenario "Working environments 4.0 – how we will work and live tomorrow" provides the basis for the forecasting process. It is based mainly on a survey of selected experts, and on the analysis of numerous sources on studies of trends and futures from a range of different authors and areas of focus. It interviewed more than 140 selected experts from the fields of industry, academia, associations and politics. 71% of respondents expected that by 2030, all offices will have an optimum indoor climate with respect to temperature, humidity and air renewal throughout the year. 47% predicted that this would be the case by 2025. The majority of experts concur with the thesis that proper lighting, good acoustics and an inspiring ambience are design and planning issues that are just as important as controlled room temperature and humidity.

"Too dry" is almost as bad as "too loud"

In April 2010, the Swiss SBiB study, a survey of offices conducted by the Lucerne University of Applied Sciences, compiled a statistical summary of the data available for the evaluation of working conditions in offices. Using an online questionnaire, the researchers collected responses on the topics of work environment (air, indoor climate, light, noise, etc.), technical equipment, furniture, ventilation, work organisation, satisfaction, requirements of the workplace, comfort, health symptoms and absences. The selection of respondents was through a random sample of a total of 540 companies from the Business and Enterprise Register of the Swiss Federal Statistical Office. 116 companies and a total of 1,230 people participated in the study. With regard to negative environmental factors, the most frequently cited were:

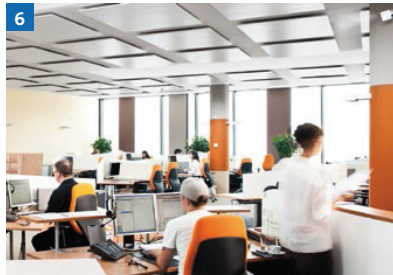
What disturbs the well-being in the office? (multiple answers possible)



(source: Swiss SBiB Study, Lucerne University, April 2010)

The situation today

The demand for optimum climatic conditions in the office will continue to rise in the future. In the opinion of most office users, dry air is already one of the biggest sources of disturbance, with a direct impact on performance and health. Direct humidification can be used in all offices, and is particularly suitable for retrofitting.



Direct room humidification today:

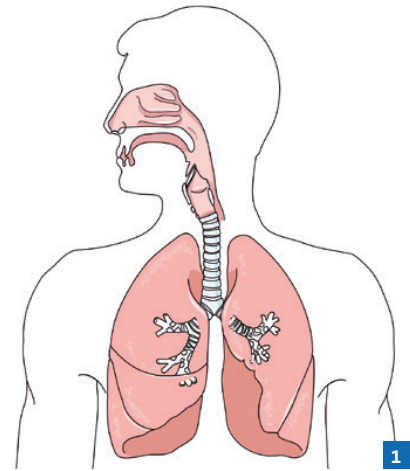
- 1 Humidity as a performance factor
- 2 The Fraunhofer Institute in Stuttgart is conducting research with DRAABE
- 3 Customer service (Thomas Cook)
- 4 DRAABE NanoFog Evolution fits in any office
- 5 Call centre (Kaffee Partner)
- 6 Open space (Jura)

HEALTH BENEFITS

MEDICAL ASPECTS OF AIR HUMIDITY

Humidity and well-being

More people probably know about the link between a dog's wet nose and health than they do about humidity and human well-being.



We are surrounded by pathogenic microorganisms all the time. Among the reasons they can do us no harm are the protective mechanisms of the mucous membranes. We are protected by a continuous self-cleaning function in the respiratory tract. Our bronchial tubes, trachea, larynx, nose, and wide sections of the pharynx contain ciliated cells, on the surface of which are found hair-like structures, the cilia. Between the cilia are goblet cells that continuously produce a viscous gel. This accumulates like a sticky film on the cilia, to which foreign particles and microorganisms adhere. The cilia perform coordinated, whip-like movements in the direction of the throat, conveying the thick mucus layer and its cargo towards the mouth.

Weakened self-cleaning effect

Prof. Dr. J. Peter Guggenbichler of the

Universitätsklinikum Erlangen demonstrated that this cleaning process is crucially dependent on indoor air humidity. If the mucous layer dries up from the outside due to insufficient humidity, the viscosity of the gel layer increases, weakening the flexibility and hence the beat rate of the cilia. Guggenbichler sees a humidity level of at least 30% as the minimum requirement. The fastest transport speed is achieved at a relative humidity of 45%. At a relative humidity below 20%, the cilia are fully inhibited, leaving the body defenceless against pathogenic microorganisms.

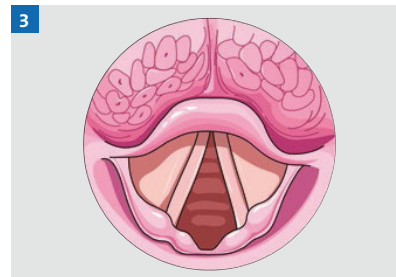
Transmission of influenza viruses

American scientists at the Mount Sinai School of Medicine in New York have investigated the influence of humidity on the transmission of influenza viruses. At a relative humidity between 20 and

35%, they assess the risk of becoming infected with an influenza A virus as about three times as high as at 50%. The humidity level influences not only the self-cleaning function of the mucous membranes, but also the size of the droplets that carry the viruses through the air. The exhaled droplets are most stable at a humidity between 20 and 40%. At this low humidity level, the aerosols evaporate faster. Since smaller droplets remain longer in the air, the probability of transmission rises. As the humidity level increases, the exhaled droplets absorb more water, causing them to fall to the ground faster.

Hoarseness and laryngitis

For people whose work involves a lot of talking (for example in call centres, service departments or customer support), humidity also plays a serious role. A humidity level that is too low



HEALTH BENEFITS



can lead to problems with the voice. Common symptoms of this are dryness of the throat and larynx, increased clearing of the throat, and hoarseness. Other consequences include coughing, the need to swallow frequently and, in the worst case, voice loss. This occurs if the vocal cords become too dry. If the humidity level is too low, the mucous membranes of the vocal cords lose their elasticity. If the glottis can no longer be completely enclosed by the vocal cords after breathing in, additional air finds its way into the vocal tract, producing the strain indications described above. For professions that involve much speaking, experts therefore recommend a minimum humidity level of 40%.

The dry eye effect

The function of the tear film in the eye is to protect the surface of the eye from the impact of the surrounding environment. Excessively dry air leads to increased evaporation. In extreme cases, the tear film can tear. This danger is amplified by long hours of staring at the screen, with a reduced rate of blinking. Ophthalmologists warn against underestimating what they term “dry eye” as a harmless sense of feeling unwell, seeing it instead as a complex disease pattern. The symptoms include swollen eyelids, redness, foreign body

sensation, burning, and excessive sensitivity to light, resulting in increased irritation, burning eyes and, in severe cases, inflammation and serious damage to the eyes.

Weakened skin protection

Even the protective function of the skin can suffer from excessively dry air in the office. At a humidity level below 20%, the skin becomes chapped and cracked, exhibiting symptoms such as itching, especially between the fingers. Chronic skin conditions such as neurodermatitis or psoriasis may be aggravated by dry room air.

Harmful particulate matter

The presence of fine particles in room air is a frequently underestimated health risk. Particulate matter, or respiratory dust, is made up of minute, invisible particles that penetrate deep into the human respiratory tract, where they can cause serious lung irritation and diseases. An inadequate humidity level facilitates the development of dust and the intensity of swirl in indoor spaces. A humidity level between 40 and 60% causes the dust particles to fall more quickly to the ground.

Dry air and health

Intensive work with computer screens, jobs that require much speaking and overheated offices combined with an inadequate humidity level can lead to significant health risks. Common symptoms, especially in the winter months, include respiratory infections, difficulty in swallowing, sore throat and burning eyes. An optimum humidity level throughout the year helps to reduce the rate of absence through sickness, which means that direct humidification systems pay for themselves very quickly.



Effects of humidity:

- 1 Protection of the respiratory tract
- 2 Reduction of the risk of infection
- 3 Protection of the vocal tract
- 4 Prevention of dry eyes
- 5 Vitalising and healthy
- 6 Ideal in call centres