

Wearing comfort



An important component of a cleanroom garment concept

Measurement of the water-vapour permeability of a textile

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From the user's point of view, the wearing comfort of a cleanroom garment system is today more than ever one of the most important aspects. What is behind this keyword? Is the wearing comfort measurable and if so, how? What influence does it actually have on the garment concept? This is an excellent topic for discussion when making decisions on a garment system. In the following, the most important points will be briefly discussed.

The haptics of a textile, i.e. the so-called handle (how does the textile feel when touched), plays a decisive role. The wearer of the textile in question often makes a kind of preliminary decision as to whether the cleanroom garments will be pleasant or whether they are more likely to be classified as unpleasant. This decision process can be classified as „very subjective“. A rather stiff/hard fabric is perceived from the outset as more negative than a very soft flowing material. Interestingly, we make the decision based on the tactile sensors in our hands/fingers, even

though these later come into almost no contact with the actual cleanroom textile. Other parts of the body, such as the neck, forearm, wrist, etc., are the parts of the body that come into permanent contact with the corresponding textile in everyday life. There, however, the perception of textile properties is often quite different.

Factors for assessing wearing comfort

Breathability is another important factor in assessing wearing comfort. Here, the water-vapour permeability is the benchmark in terms

of breathability and not, as is often assumed, the air permeability. The aim should be to offer the highest possible water-vapour permeability while reducing air permeability to an acceptable minimum.

Breathable membrane textiles from the sportswear sector are a typical example of this optimisation (outside cleanroom applications).

If the assessment of the haptics of a textile still depends more on the subjective (individual) perception of the respective wearer, the breathability

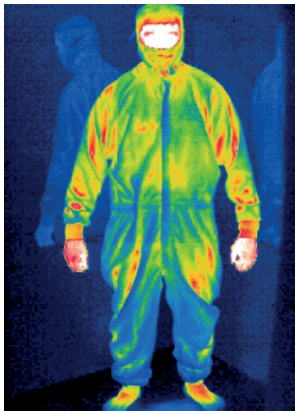


Fig. 2:

Heat development under cleanroom garments

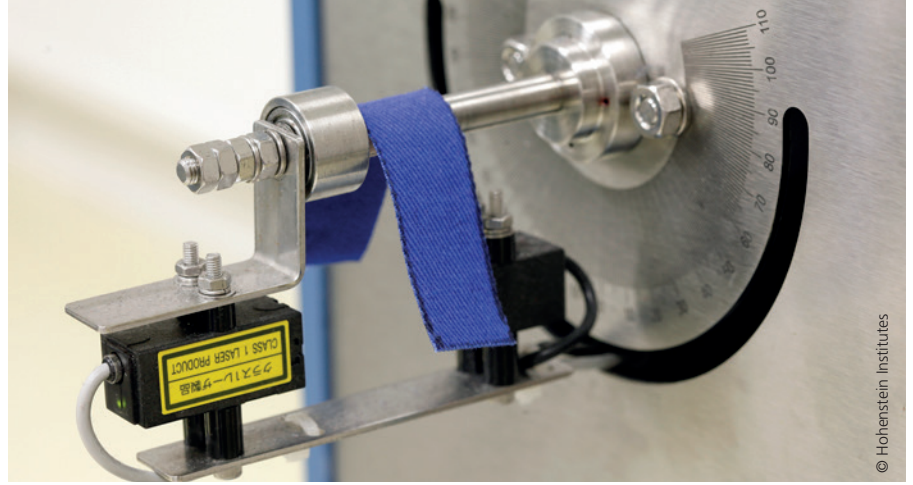


Fig. 4: Measuring the bending strength of a textile

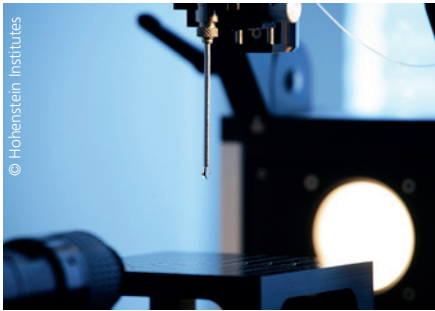


Fig. 3: Measuring the wettability of a textile



Fig. 5: Functionality meets design

breathable and possibly even appears to be particularly permeable to air is more comfortable to wear and is therefore the preferred choice. However, this must not lead to the actual cleanroom process being jeopardised by this decision in terms of contamination control. From the point of view of the decision-maker (the person responsible for the cleanroom), it is therefore necessary to find a compromise between technical necessities and the corresponding employee requirements.

lity can be determined in a metrologically good and reproducible way. Measurements using the so-called skin simulation model (DIN EN 31092 or rather DIN EN ISO 11092) on the Hohenstein Institutes are among the most internationally recognised procedures in this context. An evaluation scale for this measuring method can be found in the appendix of VDI Guideline 2083, Part 9.2 (Consumables in the cleanroom).

Design and processing

Equally important factors for the evaluation of a garment system are the design and the processing of a cleanroom system. If the garment is too tight or much too loose, it will certainly be judged more negatively than one that fits optimally from the wearer's point of view. Furthermore, the colour or rather colour combinations can also trigger both a positive and a negative effect. If all employees wear very bright red overalls and work in the cleanroom all day, it cannot be ruled out that a certain aggressiveness may arise over time. On the other hand, however, it is also possible to visually enhance the garment through suitable colour combinations and thus increase the acceptance of the respective wearer (see Fig. 5).

Special equipment / Accessories

For the wearer, the optional special equipment such as pockets, flaps, arm and/or leg cuffs etc. also determines whether a garment system is evaluated positively or negatively. While some of these so-called accessories make a good technical sense, others are not advisable from a cleanroom point of view, as they only serve the purpose of comfort. Pockets that cannot be decontaminated in a cleanroom suitable way are a good example. They are nothing but „particle traps“ in which a great deal of contamination accumulates over time. A buckle as an infinitely

variable adjustability on a hood is, on the other hand, a special equipment which is recommended both from the point of view of wearing comfort, as it makes it much easier to put on the hood, and also with regard to technical aspects. With this buckle construction individual head circumferences can be perfectly compensated and the hood fits much better. Ultimately, less contamination escapes at critical points.

When talking about wearing comfort of a cleanroom garment system, the basic climatic conditions in the operator's cleanroom must not be ignored. Even if it were desirable, cleanroom garment systems can only compensate for climatic conditions or process-related heat sources to a very limited extent. In individual cases, there is certainly the possibility of adapting to these conditions at one point or another by optimising individual components. A typical example of this is cleanroom suitable thermal protective garments for users in particularly cool cleanroom environments.

Cleanroom undergarments

The garments worn under the cleanroom garments are another decisive factor in the assessment of wearing comfort. An extensive study at the Hohenstein Institutes (published in ReinRaumTechnik 3/2011) has shown that functional undergarments or undergarments suitable for cleanrooms can considerably improve the wearing comfort of the entire garment system.

Technical requirements of the garment system

Even if wearing comfort and the associated employee acceptance are of particular importance, the technical requirements must also be considered and analysed. Of course, from the wearer's point of view, a material that is very

A study carried out in cooperation with the Hohenstein Institutes in 2011 shows the influence that the wearing comfort can have on the results of work processes. In the course of this study, it was possible to prove that employees who felt more uncomfortable in a cleanroom garment system were less concentrated and thus tended to make more mistakes. Therefore, from a business point of view, it makes perfect sense to invest in wearing comfort.

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