

Garment concepts in the field of Technical Cleanliness

Wearing comfort combined with functionality



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Once the decision has been made to manufacture under controlled cleanliness conditions, the question often arises afterwards „And what should the employees in these areas wear?“ Contrary to expectations, this question cannot be answered so easily.

Many process parameters in terms of cleanliness requirements are clearly defined right from the start. Be it cleanliness parameters in the immediate production environment, machine parameters or specifications regarding the „residual contamination“ that the manufactured product may still have. Such specifications or limit values do not exist for garments in technical cleanliness.

Consequently, it is obvious that if there are no specifications, basically any „lint-free“ workwear can be used. This approach

could, however, in many cases lead to considerable quality losses in the own production.

Various studies have shown that the human being is still one of the biggest sources of contamination under controlled environmental conditions. Interestingly, this statement is often associated more with skin scales or hair and less with contamination originating from the actual clothes worn by people. For requirements in the field of technical cleanliness, however, in many cases the contaminations emanating from the garments are the more critical ones.

These are, on the one hand, fibres and broken fibres that can be deposited on or in the product, and on the other hand additional contamination that has previously attached to them.

These could be metallic and chemical contaminants that the employees have „picked up“ elsewhere and which are also „delivered“ as cross-contamination via an uncontrolled garment cleaning process. This also applies to the same extent to garments worn by employees under their workwear in the cleanroom as these – often private items of clothing – pose at least the same risk of contamination.



Cleanroom compatible undergarments – functionality meets design!



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The optimal garments for the respective application process © Dastex

2. High abrasion resistance

Fibres and fibre breakage should be avoided as far as possible (see above), so pure cotton and cotton blended textiles are ruled out at once, as these have an increased tendency to fibre breakage.

3. Sufficient permanent antistatic properties

In order to avoid unwanted side effects caused by the synthetic garments, appropriately conductive fibres, which must not be destroyed by cleaning the garments, should be incorporated.

Note: If the process conditions include higher ESD requirements, the workwear to be defined must of course meet these

requirements, even after a certain number of cleaning cycles.

4. Good wearing comfort properties

These include, above all, high breathability and a pleasant tactile sensation, i.e. the textile feels pleasant to the touch.

Note: Employee acceptance is a very important criterion when implementing a garment concept. This means that the wearing comfort properties have a special significance. Nevertheless, from the operator's point of view, it is important not to give employees the sole right of choice. Rather the aim should be to define a balanced compromise between the technically necessary requirements, employees' concerns and the associated costs.

Based on the preceding considerations, the following principle requirements can ultimately be derived for suitable workwear for use in the field of technical cleanliness:

1. Particle retention capacity

Defined retention capacity against critical parameters such as particles, fibres and other contaminants.

Note: In many cases, this retention capacity does not have to meet the requirements, such as in the semiconductor manufacturing or pharmaceutical industries.





Lint-free?

After the more general requirements with regard to the textiles to be used for cleanroom garments, the model definitions and design details are to be clarified in the following steps:

Lab coat or overall?

Standard model?

A model optimized for the own requirements?

What is more suitable for your production process?

The above questions cannot be answered in general. However, experience has shown that it is advisable to orientate oneself to one's own process requirements and then adjust the garment concept accordingly. This also applies to possible additional equipment on the garments, such as pockets, flaps, etc.

Furthermore, the care – the professional decontamination (washing) of the cleanroom garments – must be observed.

From the user's point of view, it makes little sense to select garments that would be additionally contaminated and/or damaged beyond the usual extent during textile reprocessing. A professional decontamination differs in some essential points from the usual industrial laundry.

During reprocessing it is necessary to solve crucial questions

How does the contaminated water get out of the washing machine without re-contaminating the cleanroom garments? What influence does the final drying process have? Does it support the decontamination process additionally? Does the service partner provide test reports that prove that the washed garments have reached the required cleanliness level „X“?

In connection with the maintenance of cleanroom garments, it must also be agreed with the service partner how often the garments are to be replaced per week, when a garment element must be replaced due to age or major damage, and where delivery and collection points are located. (keyword „locker service“).

The above explanations show that the definition of a suitable garment system for use in technical cleanliness is not quite simple and that the various aspects often interact and need to be coordinated.

The following basic steps can be roughly defined:

- ▶ Certainly the most important step: selection of a suitable textile. Here it is important to harmonise the technical requirements/necessities with the justified concerns of the employees as far as possible
- ▶ Determination on the individual models and model designs: lab coats, overalls, hoods; colours; design details (pockets etc.)
- ▶ Ensure professional decontamination (care/washing)
- ▶ Define changing cycles per week and maximum wearing cycles
- ▶ Buying or leasing garments – a solely commercial decision

Conclusion

Also in the field of Technical Cleanliness, a garment system, as the only filter between human being and process/product, is becoming increasingly important.

Although the requirements for such a garment system are not comparable one-to-one with those of the cleanroom industry, the relevant criteria for garments can be derived from the company's own production process requirements, as in all other areas of application where contamination control is involved.

Delivery programme / Products



Reusable and washable cleanroom garments

sterile / non sterile

- ▶ Cleanroom garments
 - ▶ Cleanroom undergarments
- standard or customised

Disposable cleanroom garments

sterile / non sterile

- ▶ Head, foot and body area

Face masks & cleanroom goggles

sterile / non sterile

- ▶ Disposable face masks for various applications
- ▶ Safety goggles (reusable/disposable)

Cleanroom gloves & finger cots

sterile / non sterile

- ▶ Disposable gloves
 - nitrile, latex, polypropylene and other materials
- ▶ Textile gloves
 - uncoated, coated
 - antistatic and / or ESD-compatible
- ▶ Protective gloves
 - protection against chemicals, heat or cold

Cleanroom shoes & socks

- ▶ Occupational footwear & Safety footwear
 - clogs, slippers and sandals
- ▶ Shoes with textile upper
- ▶ Cleanroom socks (reusable/disposable)

Tacky mats

- ▶ Removable dust binding foil mats
- ▶ Permanently adhesive and washable tacky mats

Disinfectants & Detergents

sterile / non sterile

- ▶ Based on alcohol (IPA / ethanol)
- ▶ Biocides, sporicidal preparations, fungicides etc.
- ▶ Hand hygiene

Cleanroom wipes

sterile / non sterile

- ▶ Polyester cellulose wipes
- ▶ Polyester wipes
- ▶ Microfibre wipes
- ▶ Wipes for special requirements
- ▶ Saturated wipes
- ▶ Cotton and cellulose wipes
- ▶ Sponge wipes

Cleaning & disposal articles

- ▶ Mop systems and handles
- ▶ Cleaning trolleys and accessories
- ▶ Cleaning swabs
- ▶ Special cleaning tools
- ▶ Cleanroom vacuum cleaners
- ▶ Disposal systems

Cleanroom furniture

- ▶ Chairs, stools, work tables, desks
- ▶ Shelving systems and wardrobes
- ▶ Ladders and steps

Cleanroom paper & pens

Adhesive tapes & labels

Dispenser systems & disposable overshoe dispensers

Particle visualisation lamps



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