

CLEANROOM MAGAZINE

Life & Science Information for Cleanroom Technology

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Summer, Beach and Suncream

Nano-particles are found in cosmetics and many other everyday products. Just how dangerous are they?

Cleanroom Art as per ISO 5

In 2005, artists built a cleanroom and since this time it has never been used.

These Chips get under your Skin

Intelligent implants are able to provide people with new, clever capabilities.

Into a clean future

Modular, flexible and mobile – these are only trends which will characterize the cleanroom in the future.

The latest innovations in cleanroom technology show that their development is still running at full speed, although the first cleanroom was established over 50 years ago. The growing demands for clean conditions in more and more industries will be influencing the development in the coming decades.

A study by the New York market research company Persistence Market Research is predicting that the worldwide market for cleanroom technology will have a growth in revenues of 4.3 billion US dollars (2014: 3.1 billion US dollars) by the year 2020. The drivers of this growth according to the study are the stricter norms for the

manufacture, processing and packaging of products, an increasing demand for sterile pharmaceutical products as well as the development of new biological compounds and their increasing application in the medical industry.

These trends make for not only a quantitative increase in cleanrooms

but also are requiring more diverse possibilities of use in the diverse industries using the technology. The number of companies is steadily increasing. Among others the automobile industry has meanwhile joined the classic industries such as the semiconductor, microelectronic and pharmaceutical industries. Intelligent, networked and driverless vehicles require absolutely reliable, functioning systems. Such systems can only be produced with zero defects in cleanrooms



A cleanroom comes into being. The classic construction will become supplemented possibly even replaced by more flexible and modular systems in the future. Future cleanrooms will consist of building kits or be delivered pre-fabricated. Modular designs will allow the size of a cleanroom to be easily adapted. The ideas range up to mobile, transportable solutions. Photo: Montpellier



Hand disinfection in the past: At one time, the washing of hands and arms in a basin was considered advanced. Today exists an elaborate „choreography“ technique of disinfecting. Photo: Horst Sturm



Hand disinfection today: Dispensers operated by using the elbow allow practical, non-contact disinfecting. Photo: Nils Bröer

Dusting done by air showers

A topic for the future is also the classification and quality of cleanrooms. Besides the high-end cleanroom used in the pharmaceutical and semiconductor industries, Controlled Not Classified environments (CNC) are increasingly emerging. These cleanrooms are non-classified but still are rooms with controlled conditions for example with filtered ventilation and access controls.

This trend shows that the industry has recognized the advantage of controlled environmental conditions – also outside the cleanroom. For example, using automatic, driverless transport systems, material out of the supply room will be dusted down before it is brought into production areas. For cleanrooms, there are mobile trolleys with built-in ventilators and HEPA filters for the transport between the various areas or between cleanrooms.

In order to minimize the influence of people in critical areas, automation and robotics are becoming

increasingly important. Robots make it possible to carry out work and processes such as filling more exactly and free from human intervention.

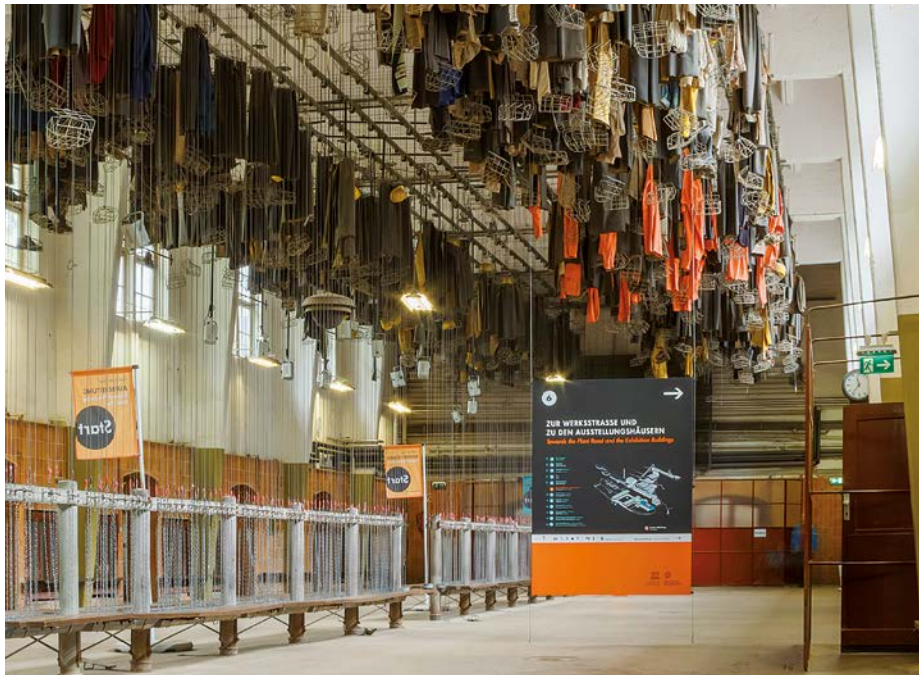
Change is the only constant in a cleanroom

When one considers the history of cleanrooms, change is the only constant. This will not be different in the future. The increasing demand from ever more industries for cleanroom technology is requiring that cleanrooms become even more variable in order to meet the ever broader application possibilities. It is very likely that new materials and building techniques will be developed in order to conform to the new demands.

The future of cleanrooms will be therefore characterized by flexibility and modularity. Future cleanrooms will consist of building or assembly kits or be delivered as pre-assembled modules. Modular designs make

it possible to relatively simplify changes in cleanroom size without having to suffer facility investment losses. The ideas range up to mobile, transportable cleanrooms which can be installed anywhere and thus save costs in re- or new construction. They will provide the most flexibility ever. The possibly dominating factor for future innovations could be the air. Air is conducted turbulently or unidirectionally, it is cooled, warmed, dried, distributed and re-distributed, blown in and pumped out ... in short, the efficiency of heating, ventilation and conditioning equipment and systems will play a key role.

The reduction of air volumes, more efficient energy consumption, accurate reporting and more thorough evaluation of the effects of differing system processes together with the development of new materials and construction techniques will significantly influence future solutions.



Cleanroom airlocks for separating clean and dirty areas get their role model from the mining industry, (see picture to the right). Photo: Stan Zurek

Here in comparison, it can be very well recognized: A bench for separating work and changing areas in mining (above) and a cross-over bench in a cleanroom (see picture left). Photo: Slaunger

Black-White principle from the mining industry is taking over cleanrooms

Measures for contamination control go back to the 19th century. They have their roots in the practice whereby certain operational areas are separated from each other. Out of this, the Black-White principle was developed which

in Germany is designated by the separation of dirty, black areas and clean, white areas.

The Black-White principle has its origins in the mining industry. From the 1920's, the dirty work area with the filthy mining clothing was separated through shower rooms from the area with the clean private clothing. The latter was hung under

the ceiling in nets or baskets. Doctors also oriented themselves on this Black-White principle and developed the classic operation room which was separated from the common areas by personnel sluices. In the meantime, the Black-White principle is used by civil and disaster control authorities in order to prevent the transmission of pathogens and contaminated objects into clean areas.



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Based on the Black-White principle, terms have emerged for cleanrooms, black zone for outside areas, white zones for the cleanroom and grey zone for the area leading into the cleanroom. In order to keep the inside areas really clean, efficient methods such as filtered air supplies, protective clothing for personnel, and cleaning equipment such as air showers have been developed. In the air showers, employees stand with the arms held high and turn themselves slowly around 360° while the air cleans them off. Future air showers will be built into the air locks and be outfitted with alarms which go off when an employee leaves the containment before the cleaning process has ended.

Even here, interesting developments have cast their shadows ahead. It is thinkable that in the future a material will be developed for cleanroom clothing that cannot be contaminated. Another solution which is currently being examined is photo-dynamic disinfection – a procedure which uses laser technology to destroy micro-organisms.

Cleanrooms as image-raising showrooms

A further trend is coming from laboratory operators. In the past 12 months they have been intensely

Future cleanrooms will put a focus also on profitability and economic efficiency. New technologies will increase efficiency, reduce the work involved and bring down the costs. The demands on cleanrooms go be-

It is imaginable that in the future a material for cleanroom clothing will be developed which cannot be contaminated.

demanding cleanroom designs which not only fulfill the current standards but also are equipped for the future. Therefore, the future design and configuration of cleanrooms will be as important as their function. There is a growing interest to configure cleanrooms as image-raising showrooms whereby the reliability and durability of the technical systems and equipment will continue to be the central focus.

yond pure contamination control. The highest level of flexibility, minimized investment expenditures and the lowest possible operating costs, these are the demands on tomorrow's developers. ■

*Author: Michael Rodd,
Sales Manager at M+W Products*



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Werkstattszentrum für behinderte
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**Reinraum-
bekleidung
Dekontamination
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Am Beckerwald 31
66583 Spiesen-Elversberg
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Executive Management
Frank Duvernell, v.i. S.d.P.

Cleanroom Media Management
Maja Franke
Tel. +49 341 98989 404
maja.franke@cleanroom-media.com

Editor in Chief
Frank Baecke
Tel. +49 341 98989 405
frank.baecke@cleanroom-media.com

Authors
Frank Baecke
Frank Duvernell
Maja Franke
Dr. Rüdiger Laub
Michael Rodd

Translation
Bill Hillman

Advertising Management
Maja Franke
Tel. +49 341 98989 404
maja.franke@cleanroom-media.com

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Nils Bröer

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