The Core of Expertise – SKAN Competence Centre

Sophisticated Research & Development Combined With Microbiological Experience

Together always one step ahead

SKAN

SKAN, founded in 1968, is one of the pioneer companies in the field of cleanroom equipment and construction of isolators for the pharmaceutical industry.

Innovative products, client specific solutions as well as an efficient service organization have made SKAN a market leader and important partner of industry and research laboratories worldwide.

SKAN Competence Center

The development of the integrated hydrogen peroxide H_2O_2 decontamination system, has made SKAN the world market leader in the special field of pharmaceutical isolators for product and personnel protection. Therefore SKAN is not just a manufacturer of barrier isolators – the entire contamination process is also a major task.

In close cooperation with stakeholders in the pharmaceutical industry and universities, the Competence Center of SKAN continuously improves knowledge [1] and expertise.

Experienced specialists in the Competence Center are completely dedicated to processing validation microbiology, applied science, and research and development. For this reason, all innovative products are fully GMP-compliant in order to meet the challenging requirements of clients in the pharmaceutical industry.

To reach this goal, the interdisciplinary team of the SKAN Competence Center puts all its efforts into:

- cycle development methods
- H_2O_2 decontamination process and analytics
- product development

[1] Sigwarth V., Huber T., Trends and Advances in Isolator Technology. Pharm Eng. March/April 2011; 31(2).

Competence Center Team

Cycle Development of H_2O_2 Processes

Cycle development is a statistical method to define the amount of vaporized hydrogen peroxide and the duration of the decontamination process required for process success.

Range of services

- D-value estimation and D-value determination
- Worst case studies
- Determination of aeration time to optimize the decontamination cycle
- Temperature and humidity mappings and chemical indicator mappings
- Customer specific cycle optimization

With a qualified workforce and substantial experience in isolator designs, SKAN is also able to offer cycle development for third party barrier isolators with external decontamination systems.

Limited Spearman-Karber Method first applied by SKAN, recommended by the FDA [2]

[2] Sigwarth V., Moirandat C., Development and Quantification of H_2O_2 Decontamination Cycles. PDA Journal of Pharmaceutical Science and Technology. Vol. 54, No. 4, July/August 2000. pp. 286–304.

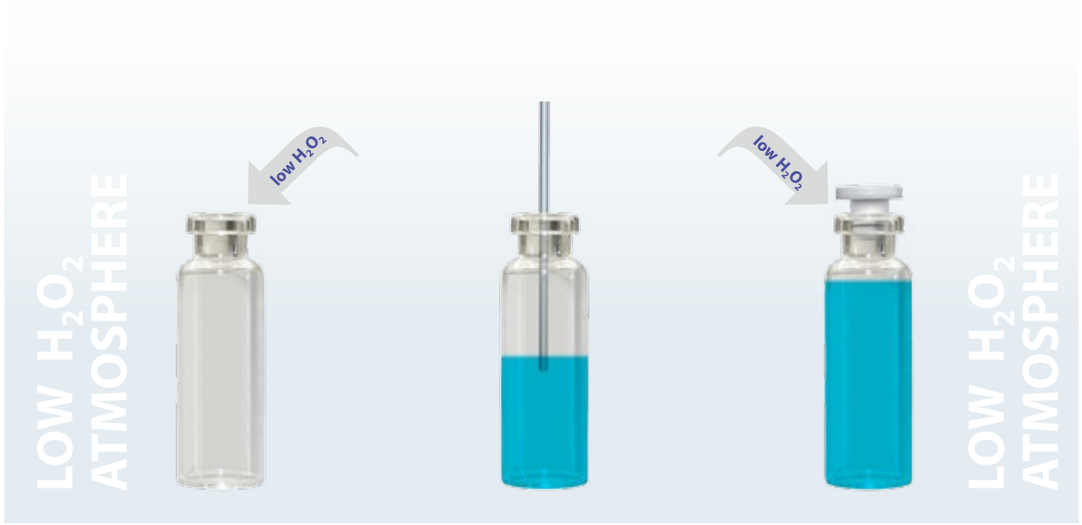
Low level H_2O_2 Concentration Analysis

After the decontamination and aeration phase, traces of residual H_2O_2 remain in the isolator's atmosphere. Customer materials and product samples are exposed to these low level H_2O_2 amounts, which can alter chemical properties of the product. Residual H_2O_2 levels may have an impact on:

- bacterial growth (false negative results) in sterility testing
- product stability
- product integrity

With different methods and the latest technical equipment the H_2O_2 concentration in the atmosphere and/or the product can be quantified (measurement in %, ppm and ppb). [3]

[3] Analysis of H_2O_2 Low Concentrations, Methods and Results
Dr. sc. nat. Daniel Eichenberger
Presentation in Washington D.C., October 2009



empty vial waiting after hot heat tunnel

liquid filling

vial waiting inside lyo until end of loading and lyophilization start (stopper half closed)

Laboratory Research and Services

Highly qualified experts work in the laboratory, equipped with the latest lab equipment.

Range of services

- Validation of third-party biological indicators
- Effect of different materials on the decontamination process [4]
- Material outgassing for customer specific load or construction material
- Compatibility tests of material regarding vaporized H_2O_2
- Design of catalytic converters for H_2O_2 processes

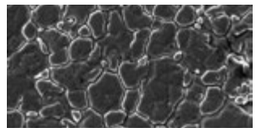
[4] Sigwarth V., Stärk A., Effect of Carrier Materials on the Resistance of Spores of *Bacillus stearothermophilus* to Gaseous Hydrogen Peroxide. PDA Journal of Pharmaceutical Science and Technology. Vol. 57, No. 1, January/February 2003. pp. 286–304.

Example: Material study with H_2O_2

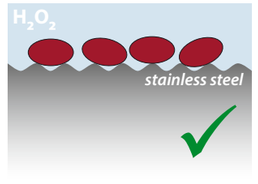
Stainless steel:

- spores are aligned side by side
- spores are well exposed to H_2O_2
- quick decontamination
- low D-value

800µm



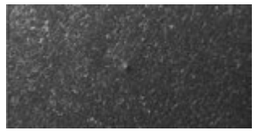
20µm



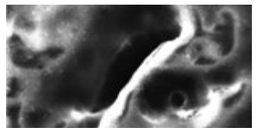
0.8µm

Anodized aluminium:

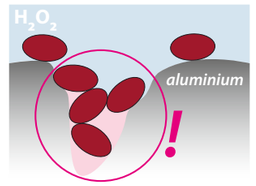
- spores are piling up
- spores are not exposed to H_2O_2 equally
- slow decontamination
- high D-value



800µm



20µm



0.8µm

SKAN BI®

The SKAN BI® is a **B**iological **I**ndicator (BI) for H_2O_2 decontamination processes. It was developed in close cooperation with operators, process engineers, and QA personnel. Optimal and secure handling is guaranteed by the novel design of the carrier and primary packaging. The reproduceable quality and performance of the SKAN BI® will meet the highest customer demands and cGMP requirements.

- Quick, reliable testing and qualification of H_2O_2 decontamination processes
- Easy handling and smooth application
- Shortest down time of the manufacturing facility for testing and qualification
- Consistent, solid quality of BIs for highest production requirements
- High availability and fast delivery

Features

Highest quality of SKAN BI® is the key element of a consistent and reliable cycle that can be qualified in the field [5].

- Repeatable and reliable performance
- Functionality
- Developed for highest customer requirements

[5] Sigwarth V., Suitability of Biological Indicators for Vaporized Hydrogen Peroxide Decontamination. Gomez M., Moldenhauer J., Biological Indicators for Sterilisation Process. ISBN 1-933722-27-4, 2009, chap. 12.

Development of Decontamination Processes

Different types of decontamination technologies are used in the pharmaceutical industry. The SKAN Competence Center developes and optimizes decontamination processes:

- Vaporization of H_2O_2
- Catalytic converters
- Micro-nebulization of H_2O_2 (SKANFOG®)
- Electron beams (E-Beam)

Vaporization of H_2O_2

A common decontamination method is the vaporization of H_2O_2. Drops of the liquid are led to a hot plate, where they vaporize immediately. The equal distribution of the steam is guaranteed by the circulating airflow.

Catalytic Converter

To clean the exhaust air, catalytic converters are used, which decompose H_2O_2 completely. HEPA filters give additional security. This plays an important role, especially if the air returns to the room.

Micro-nebulization of H_2O_2 with SKANFOG®

Controlling the microbial load on surfaces in research and animal labs as well as in hospital and production rooms is a daily challenge. Surface decontamination of the equipment is a time-consuming procedure and validation is often complex.

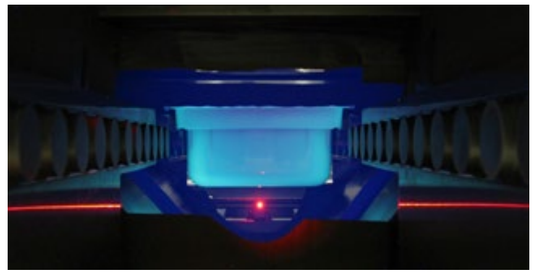
SKANFOG® is a decontamination technology based on the micro-nebulization of hydrogen peroxide (H_2O_2). Compared with conventional wiping, it simplifies and enhances both procedure and validation. Moreover, nebulized H_2O_2 in moderate concentrations can be used without concern regarding toxicity, corrosion and persistence. Scientific studies have shown that a total kill of a 10^6 population of the test organism *Geobacillus stearothermophilus* can be achieved reproducibly. [6]

[6] Sigwarth et al.: "A potent and Safe H2O2 Fumigation Approach". PDA J Pharm Sci and Tech 2012, 66 354-370

E-Beam Technology

E-Beam is a technology used to decontaminate surfaces before they enter the barrier isolator. A specific emitter distributes the electrons over the surface of the product being transferred for a defined time and current. The process quality is fully controllable with these two parameters.

This technology needs to be well applied and controlled to avoid alteration of the product. [7]



View into the E-Beam tunnel with emitters in operation

Range of services

- Construction and verification of lead shielding
- Qualification of radiation source and intensity
- Validation of the radiation level by standardized dosimetry
- Measurement of toxic pollution in the air during decontamination of surfaces

[7] Sigwarth V, Lehmann F, Bösiger A. Dekontaminationsprozesse und –Systeme bei der Abfüllung genesteter Fertigspritzen. Pharm. Ind. 70, Nr. 10, 1277-1288 (2008).

Innovative Product Development

The main goal of the R&D department is the invention and engineering of products close to market needs and highest customer requirements. [8]

- Integrated H_2O_2 vaporizers for different applications (isolators, rooms, airlocks)
- Mobile decontamination devices (SKANFOG®)
- Custom-designed catalytic converters
- WirelessGT for standardized and fast glove testing
- Contract research projects with state-of-the-art equipment
- Decontamination process developments

[8] Sigwarth V, Huber T. Trends bei der Entwicklung von Isolatoren für die pharmazeutische Industrie. Pharm. Ind. 71, Nr. 2, 234-344 (2009).

Example: Wireless Glove Leak Tester

In the field of barrier isolator technology the gloves are still the most challenging issue when it comes to of contamination. [9] WirelessGT is the most advanced and fully automated glove leak testing system with pressure decay measurement for isolators and RABS in the pharmaceutical industry. All these results have been consolidated and have helped to design the latest WirelessGT Glove Tester and to continuously improve processes and product safety:

- Development of specific recipes for different glove sizes, type and material
- Analysis of the impact of typical holes in gloves on the integrity of decontamination
- Improvement of the SKAN glove testing device by considering demands in everyday use, specific customer surveys and studies
- The total testing time is reduced by increasing the efficiency in daily use

[9] Gessler A., Stärk A., Sigwarth V., Moirandat C., How Risky Are Pinholes in Gloves? A Rational Appeal for the Integrity of Gloves for Isolators. PDA Journal of Pharmaceutical Science and Technology. May/June 2011 Vol. 65 No. 3 227-241.

Example: FIPA Filter System

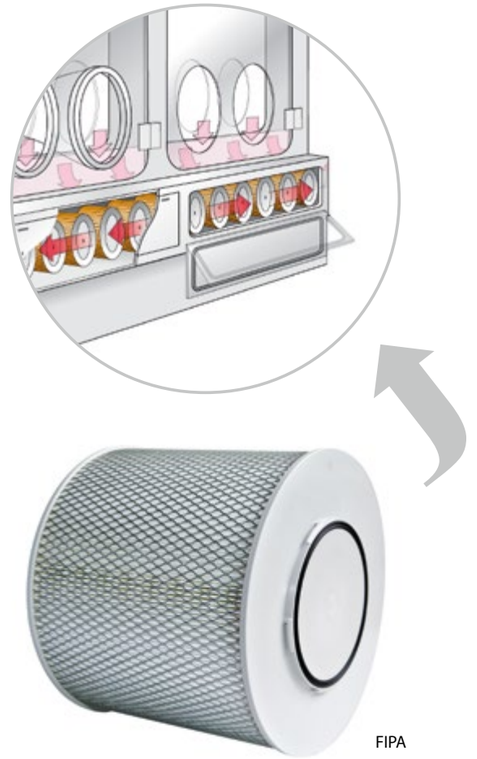
For the pharmaceutical industry highly toxic products in barrier isolators are becoming increasingly important. [10] Safe product handling and operator protection are essential. State-of-the-art safe change filter systems are needed to fulfill these requirements.

FIPA is a safe and comfortable changeable filter cartridge for toxic aseptic barrier isolators, based on continuous design improvements.

Main advantages:

- Small contaminated area inside the containment
- No need of WIP (wash in place) and therefore no need of WIP qualification
- Significant lower installation costs
- Lower cleaning costs
- Faster overall process for customers

[10] Lehmann F., Lümkemann J. Safe Change Filter Systems for Containments in the Pharmaceutical Industry. Pharm. Ind. 73, No. 9, 1683–1694 (2011).

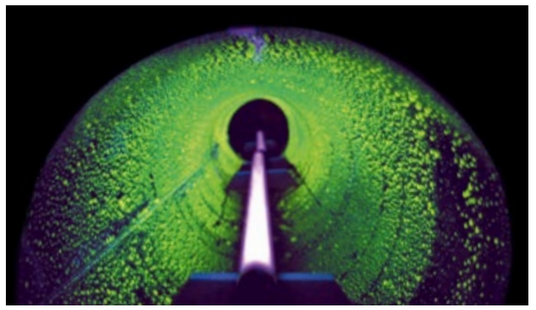


FIPA

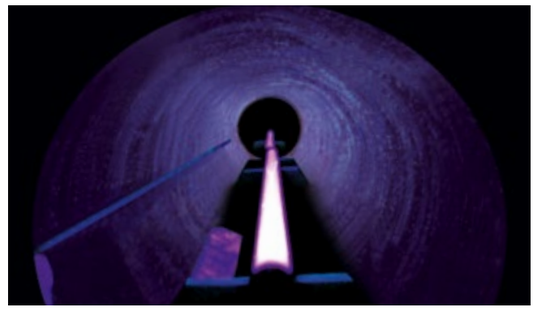
Visualization of the Cleaning Process

If no FIPAs are used within the isolator, the pipes in ducts have to be washed after each batch. The success of this process can be controlled by the fluorescent riboflavin test.

1. Ducts are sprayed with riboflavin. The condition of the ducts is documented.
2. The cleaning cycle is launched.
3. Efficiency and reproducibility are documented.
4. The results are analyzed and discussed with the customer.



Ducting sprayed with riboflavin and lighted with UV light



After washdown the cleaning result is documented by endoscopic camera

Isolator Technology

The experts in our Industrial Division manage the engineering, design, fabrication and validation of your pharmaceutical isolator process solution.

Lab Equipment

Our Lab Division is specialised in ensuring the safety of the user, the product and the surrounding environment in your laboratory and cleanroom.

Together always one step ahead

Together with our team of employees, our partners, our suppliers, and together with you.

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Competence Center Brochure EN
Material No. 1211705
Version 199693_A / 20131023