baking+biscuit
INTERNATIONAL

www.bakingbiscuit.com

In the spotlight
KAAK: “There is an ambition for growth”

Production
Donut, muffin and cupcake systems

Bakeries
Baker & Baker, now full-time baker

03
21

Case studies from bakeries

How alternative technologies can ensure hygiene in sliced bread and whole loaf production and improve shelf life.

For sliced bread and whole bread production, especially after baking (cooling, slicing/packaging) up until the product is packaged/sealed, the requirements for reliable hygiene are extremely high.

For hygiene protection (disinfection), alternative hygiene processes are increasingly used in the baked goods industry today. These are based on ingredients that form naturally in food. Functional plant extracts also provide a large number of bioactive substances, which also play an important role in the effectiveness of sustainable hygiene processes. The ingredients are therefore predominantly nature-identical and come from renewable raw materials.

Due to the composition and the physically supported mode of action of sustainable hygiene technologies, all microorganisms (bacteria, yeasts, molds) and viruses are eliminated. The formation of resistance is thus excluded.

Confirmed efficacy food protect® according to VAH and EN standards Extract of the most important inactivated germs / viruses (+)	
Aspergillus brasiliensis	+
Candida albicans	+
Bacillus subtilis	+
Enterococcus hirae	+
Escherichia coli K12	+
Campylobacter jejuni	+
Cronobacter sakazakii	+
Legionella pneumophila	+
Listeria monocytogenes	+
Salmonella enterica subsp. enterica	+
Staphylococcus aureus	+
Pseudomonas aeruginosa	+
Corona Virus (according to EN 14476)	+
Vaccina Virus (according to EN 14476)	+

Source: Ohlmann

Further advantages of sustainable hygiene technologies are the declaration-free application, human-toxicological harmlessness and good material compatibility. Sustainable hygiene technologies therefore represent not only an ecological alternative to chemical disinfectants, but also alcohol.

In addition to food law and occupational health requirements, the method must be designed strictly according to physical-microbiological aspects. This allows targeted use (as cold aseptic on equipment) to also be carried out during the ongoing pro-duction process and with personnel present, if necessary, while complying with the applicable MAK/BAT values.

The requirements listed above add up to the properties of sustainable active ingredients such as food-protect® from the German supplier ProPure-Protect.

Case studies in sliced bread

To demonstrate the sustainable assurance of hygienic food safety and safe reduction of mold failure in sliced bread, application studies were conducted in several bakeries under practical conditions.

The sustainable active ingredient food-protect® is converted into a microfine mist by means of simple two-substance nozzle technology (dry) and released into the environment without thermal impact, thus reaching all surfaces in the room (conveyor belts, machines, but also room fixtures such as cable ducts, pipelines, circulating air coolers, etc.).

©Ohlmann

Fig. 1: Technical design of the cover nozzle – detailed view

Sanitization:

It can be performed in two steps, either individually or consecutively:

1) Application as a substitute for classical disinfection with chemical disinfectants or alcohol, without permanently present personnel. Shock disinfection: Application quantity of approx. 10 ml/m³ air/enclosed space. A fogging time and a subsequent decay time must be taken into account.
2) Targeted application for continuous hygiene protection of equipment and room fixtures.

Maintenance sanitization:

- Targeted application on equipment, room fixtures for sustainable hygiene protection of e.g. hygiene-sensitive surfaces. An application rate of approx. 0.3 ml/m³ air/h performed continuously (e.g. cold aseptic) during production with open product and personnel present.
- As a linear process description and result representation, some production lines in the bakery industry were process-analyzed.

In the practical study, the room to be treated in each case is sanitized after cleaning (shock disinfection) and the hygiene status is then maintained by means of a continuously targeted application (maintenance sanitization) to ensure the hygiene of surfaces (e.g. cutting machine, conveyor belts, ventilation

Source: Ohlmann

systems) and room air throughout the entire production period (Room III).

1 Installations

1.1 Shock sterilization: cooling area/spiral cooler (toast) [Room I]

A total of 4 lid nozzles were installed in the spiral cooler for disinfection after basic cleaning. The room and the fixtures were roughly pre-cleaned, but not disinfected.

Room size: approx. 2,250m³
Pressure: approx. 4.5 bar
Nebulization time: approx. 40min. total duration
Sedimentation time: approx. 30min. total duration
Consumption: approx. 22kg food-protect®

©Ohlmann

Fig. 2: Treated cooling area [Room I]

1.2 Shock sterilization: cutting/packing (toast) [Room II]

A total of 3 lid nozzles were installed in the cutting/packaging area [Room II] for disinfection after basic cleaning.

Room size: approx. 1,370m³
Pressure: approx. 4.5 bar
Nebulization time: approx. 4min. total duration
Sedimentation time: approx. 30min. total duration
Consumption: approx. 14kg food-protect®

©Ohlmann

Fig. 3: Treated cooling area [Room II]

1.3 Maintenance sanitization: slicing/packaging [Room II]

A cover nozzle was installed in the ventilation system of Room II was disinfected for permanent sanitization with personnel occupancy and product in the room in the form of maintenance sanitization in a low application rate (approx. 0.2- 0.5ml/m³/h), e.g., via the ventilation system's air volume.

Volume flow of supply air: approx. 3,600m³
Number of nozzles: 2
Pressure: approx. 3 bar
Consumption: 0.2 ml/m³/h food-protect®

An application in compliance with the applicable MAK/BAT values can also be car-ried out via the mobile lid nozzles and specifically on the surface of the respective plant (cold aseptic on cutting plants).

2 Results

In Rooms I and II, surface germ measurements were carried out before and after the application of the sustainable hygiene technology in the form of swab samples, namely on the surfaces in contact with the product (Room II) as well as on the built-in periphery (Rooms I & II; cable duct, lamp, conveyor belts, etc.). Airborne germ measurements were also carried out.

Due to the fine, uniform application of food-protect® as a 'dry' fog in the room, the air in the room as well as all surfaces were reached/disinfected after a short time during the shock disinfection with only very low humidity.

©Ohlmann

Fig. 4: Uniform distribution of the active ingredient during shock sterilization

It is not necessary to rinse or clean food-protect® after application.

In the slicing/packaging area [Room II], after shock sterilization, permanent maintenance sanitization with food-protect®

was carried out as a targeted application within the ventilation system and also directly at the bread slicer during production with product and personnel. Through this hygiene measure, the surfaces as well as the room air and thus the products were continuously further hygienically secured.
With linear continuous sustainable hygiene technology, the process of pasteurization may be eliminated while maintaining the given shelf life, which offers a distinct advantage.
When used as a maintenance hygiene solution, compliance with the MAK/BAT values was monitored by measurement. Positive hygiene protection (air and surfaces) was also measurable in the adjacent areas (hygiene airlock, material airlock) due to the air overflow.

2.1 Results of shock sterilization [Rooms I and II]

The results show a significant reduction to complete elimination of the status of bacteria as well as yeasts and molds on the sampled product-contacting surfaces.
Another hygienic effect of fogging is the simultaneous hygienic protection of room fixtures such as cable ducts, pipelines, strip lighting, control cabinets, etc.

© Ohlmann

Fig. 5: Sampling of the surface in contact with product inlet packaging of whole loaves in Room II

The results show a significant reduction in the presence of bacteria as well as yeasts and molds on all sampled hard-to-reach (uncleaned) surfaces of the fixture periphery. These measurement positions were not cleaned and in some cases had heavy dust deposits.

Table 1: Surface germination measurements shock sterilization – Surfaces coming into contact with product

		Total germ count		Yeasts and molds	
Measurement	Measuring point	Before treatment	After treatment with food-protect®	Before treatment	After treatment with food-protect®
		[cfu/25cm²]	[cfu/25cm²]	[cfu/25cm²]	[cfu/25cm²]
1	Packing/slicing Room II – transfer belt	27	0	12	0
2	Packaging/slicing Room II – product infeed slicer 1	32	0	14	0
3	Packaging/slicing Room II – product infeed slicer 2	30	0	12	0
4	Packing/slicing Room II – guiding slats slicing machine 1	43	0	19	1
5	Packaging/slicing Room II – outfeed conveyor slicer 2	38	0	14	0
6	Packaging/slicing Room II – product infeed packaging	23	0	17	0

Source: Ohlmann

Table 2: Surface germination measurements shock sterilization – peripheral fixtures

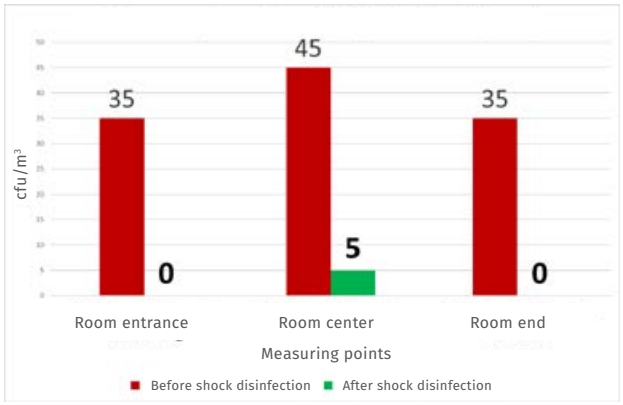
		Total germ count		Yeasts and molds	
Measurement	Measuring point	Before treatment	After treatment with food-protect®	Before treatment	After treatment with food-protect®
		[cfu/25cm²]	[cfu/25cm²]	[cfu/25cm²]	[cfu/25cm²]
1	Cooling area Room I – On drive motor	109	0	32	0
2	Cooling area Room I – On cable tray	115	8	62	6
3	Cooling area Room I – On pipe strut	133	2	75	3
4	Cooling area Room I – On door frame	91	4	35	0
5	Cooling area Room I – On the floor	195	0	97	7
6	Slicing/Packing Room II – On the machine 1	46	0	29	0
7	Slicing/Packing Room II – On the lamp	114	1	23	0

Source: Ohlmann

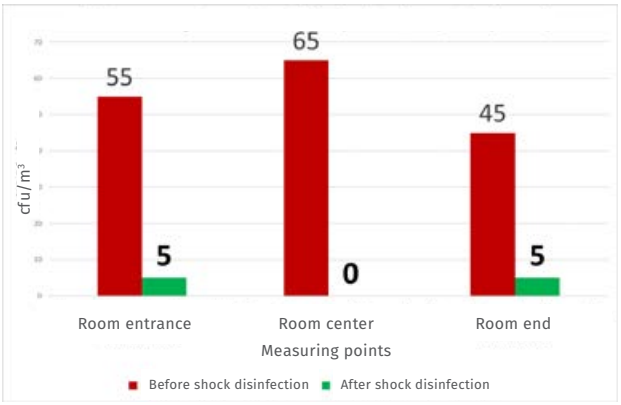
Table 3: Airborne germ measurements shock disinfection rooms I and II

Total germ count

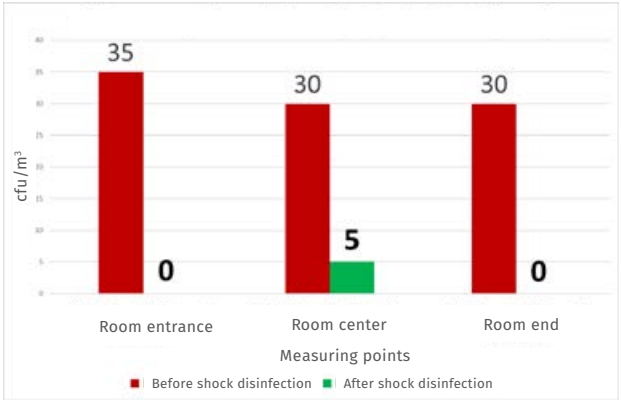
Cooling area [Room I]



Slicing/Packing [Room II]



Yeasts and molds



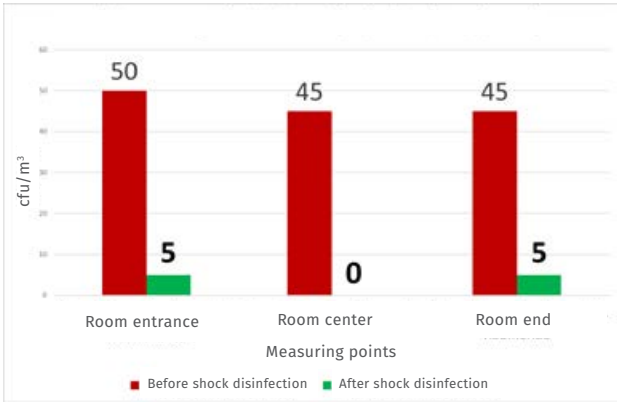
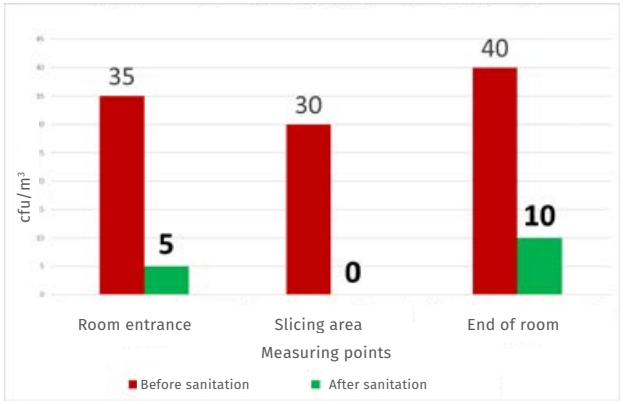


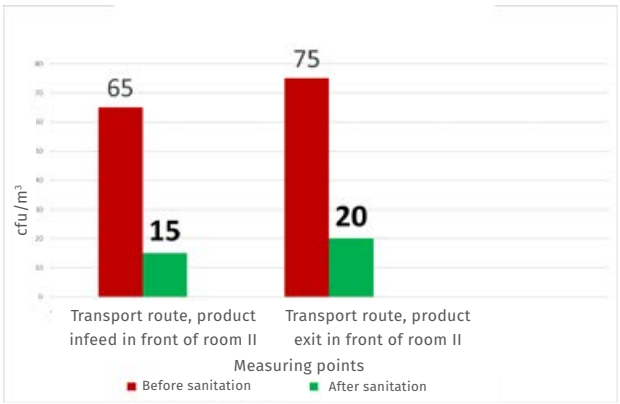
Table 4: Airborne germ measurements maintenance sanitation room II and adjacent areas

Total germ count

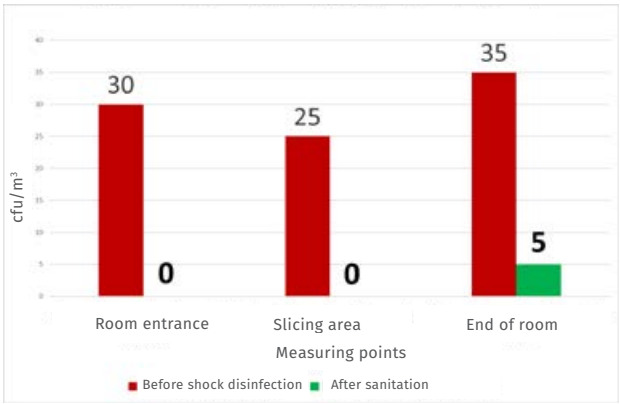
Slicing/Packing [RoomII]

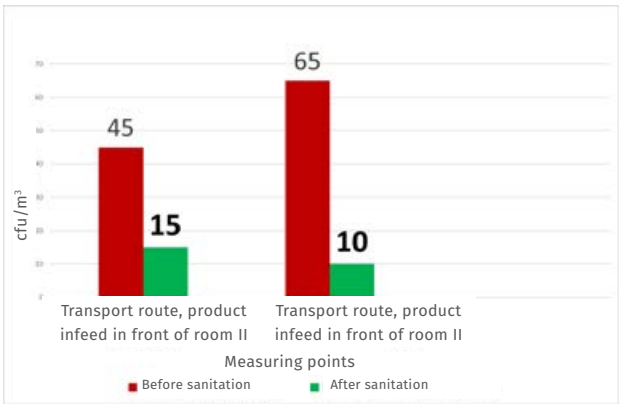


Adjacent rooms



Yeasts and molds





Source: Ohlmann

Airborne germ measurements – Shock Disinfection Rooms I and II

The results show a immediate significant reduction in the status of bacteria as well as yeasts and molds in the indoor air in both rooms after shock disinfection with the alternative ProPure-Protect hygiene technology.

2.2 Results maintenance sanitization [Room II]

Over the entire production period, airborne microbial counts were determined in the cutting/packaging room for toast [Room II] and in the adjacent rooms (hygienic air-lock/transport aisle for product infeed, material airlock/transport aisle for product out-feed) before the ProPure-Protect technology was used and during its use. The results are shown in Table 4.

The results show a significant reduction as well as constant maintenance of the status of mold as well as bacteria in the slicer specifically treated with food-protect® on the surfaces and packing materials as well as in the indoor air pollution.

2.3 MAK/BAT values for maintenance hygiene

The H_2O_2 [ppm] content in the air is below the occupational exposure limit when food-protect® is used properly and professionally after shock disinfection as well as when it is used specifically for equipment and room fixtures as maintenance sanitization. The workplace limit value H_2O_2 [ppm] applicable in Germany can be seen in the MAK and BAT values list 2020. +++

Figs. 6 and 7: Peripheral fixtures after baking/cooling/confectioning

About the author

Ralf Ohlmann is scientific research director of the Just in Air Luft- & Hygienefachinstitut in Bremen/Germany and Chairman of the German commission food safety & retail, Berlin.