Lamilux AntiBac

Maximum hygiene thanks to steril surfaces









Introdcution

- Initial situation
  - Besides useful bacteria that inhabit our bodies in billions, there are also lots of unwanted germs that we encounter in nearly all walks of life
  - Whether in the food industry or in medicine – contact with these pathogens typically has unpleasant and sometimes even fatal consequences
  - Above all, multi-resistant germs, against which antibiotics are powerless, cause major health and financial damage around the world every day
  - specific cleaning regulations and recommendations attempt preventing infections with germs in medicine and food industry



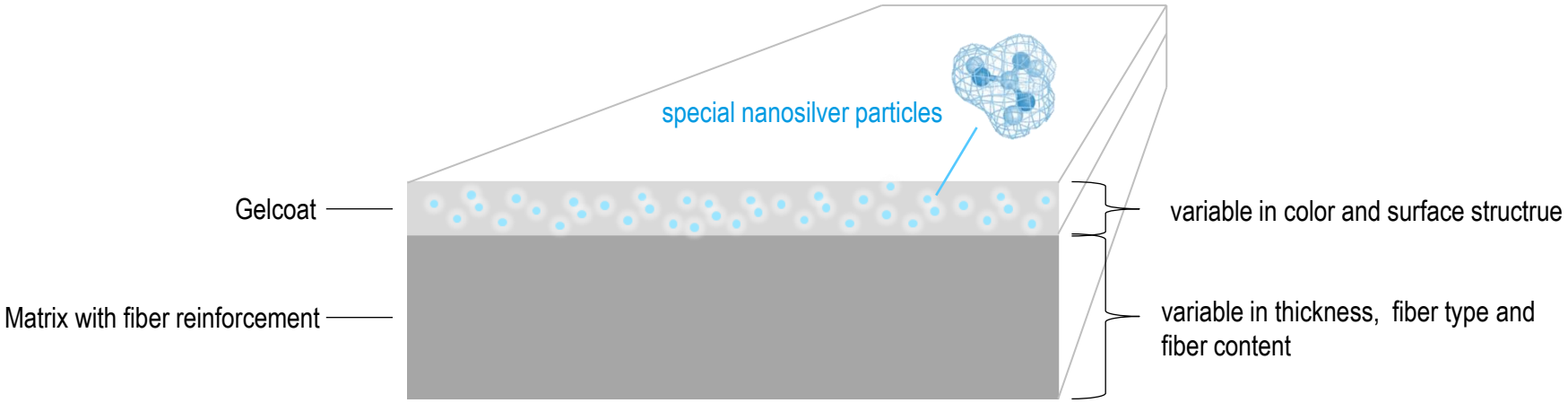
Introdcution

- LAMILUX AntiBac
  - LAMILUX AntiBac is an innovative composite material for medical and hygienic applications
  - AntiBac helps to improve global hygiene standards
  - AntiBac sustainably and efficiently neutralises more than 99.9% of all bacteria on its surface
  - AntiBac, in contrast to normal desinfection, acts on each spot of the surfcae
  - AntiBac, in contrast to normal desinfection, acts relentlessly – 24h per day and 365 days per year
  - AntiBac is available as wall coating for hospitals, as lightweight material for the food transportation, or as hygienic wall panels in the food processing



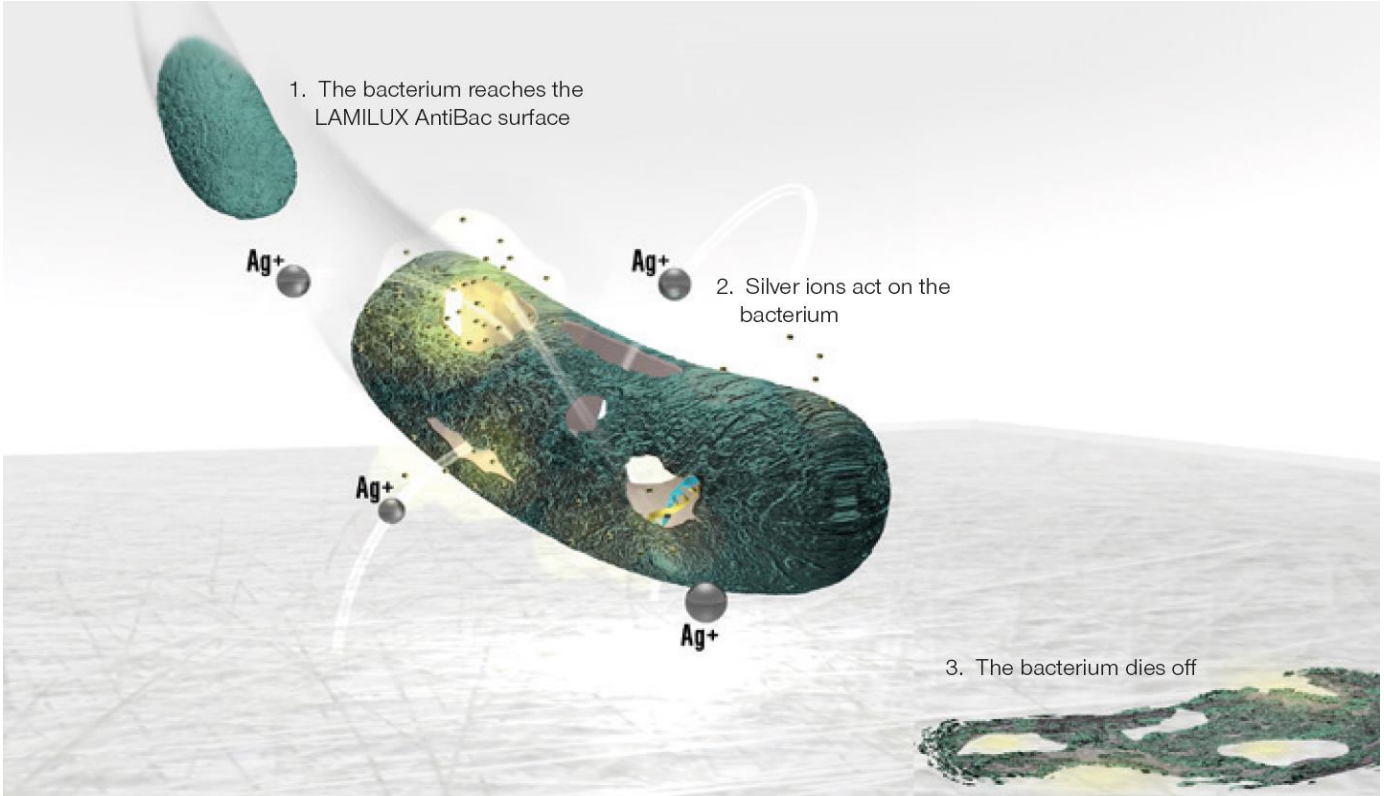
Function of AntiBac

- build up of LAMILUX FRP with AntiBac Gelcoat



Function of AntiBac

- effect on bacteria

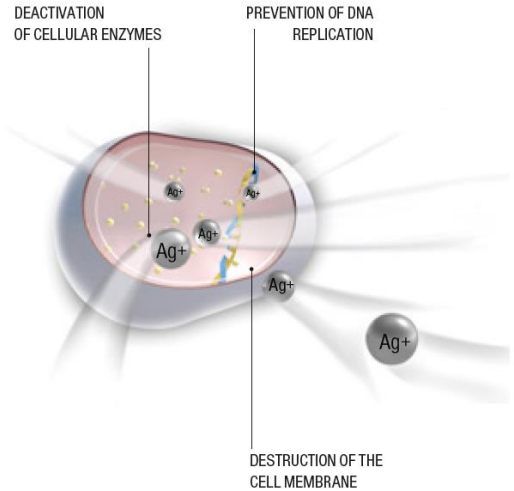


Function of AntiBac

- effect on bacteria

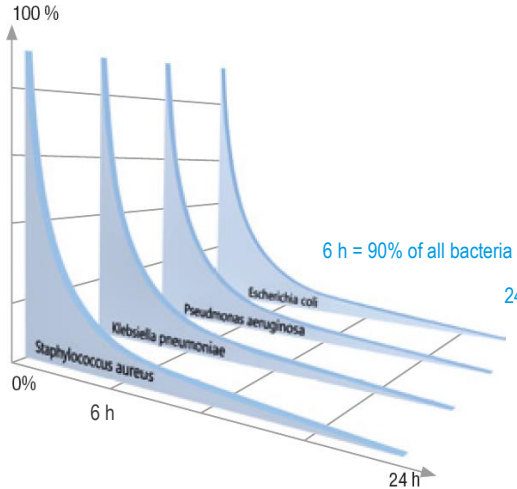
TRIPLE EFFECT ON BACTERIA:

- Destruction of metabolism due to deactivation of cellular enzymes
- Destruction of the cell membrane
- Prevention of DNA replication



EFFECTIVENESS AS PER DIN EN ISO 22196 BASED ON FOUR REPRESENTATIVE BACTERIA

More than 99.9% of all bacteria are killed within 24 hours.



6 h = 90% of all bacteria are killed

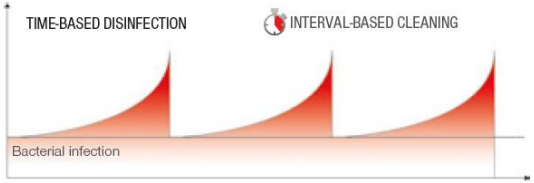
24 h = 99.9% of all bacteria are killed

Function of AntiBac

- Added safety

without AntiBac

With its permanent effect, LAMILUX AntiBac helps to compensate for natural fluctuations in cleaning and disinfection at every point of the wall and ceiling surfaces. This creates a redundant system of maximum hygienic safety.



Starting from the time of disinfection, bacteria reproduction again increases exponentially. Often, a critical level is already reached here, before the population growth is stopped by the next cleaning action.

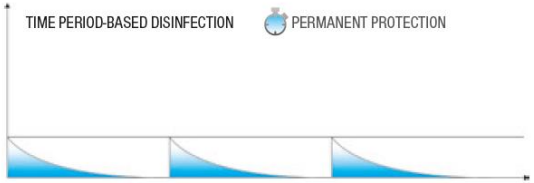
However, time period-based disinfection through LAMILUX AntiBac



Cleaning and disinfection are not always equally effective at all locations.

with AntiBac

What disinfection means here is reducing germs by a factor of at least 10^5; in other words, thanks to LAMILUX AntiBac fewer than 10 of 1,000,000 replicable germs survive.



immediately suppresses the propagation of bacteria. Uninterrupted disinfection of the surface occurs 24 hours a day, 7 days a week, 365 days a year.



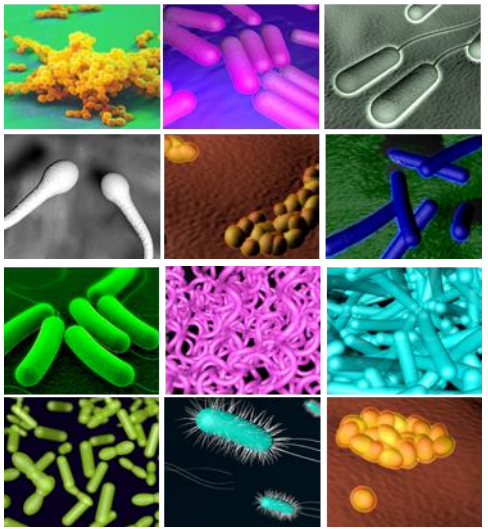
LAMILUX AntiBac offers continuous disinfection at any point of the surface, even in hard to reach areas.

Function of AntiBac

- effective against following pathogens according to standards JIS Z 2801 / DIN EN ISO 22196, ASTM 2180, ASTM 2149:

Bacillus subtilis
Burkholderia cepacia
Clavibacter michiganensis
Enterococcus faecium
Erwinia amylovora
Escherichia coli
Klebsiella pneumoniae
Methicillin-resistant Staphylococcus aureus (MRSA)
Pseudomonas aeruginosa
Pseudomonas fluorescens
Pseudomonas syringae
Rhizobium radiobacter (Agrobacterium tumefaciens)
Staphylococcus aureus
Staphylococcus epidermidis
Streptococcus mutans

Aspergillus niger
Aureobasidium pullulans
Aureobasidium pullulans
Candida albicans
Fusarium solani
Microdochium nivale
Penicillium funiculosum
Scopulariopsis brevicaulis
Streptomyces abikoensis
Trichophyton mentagrophytes
Bacteriophage MS2 virus



Durability of AntiBac

- Temperature exposure (80 °C, 6 weeks) ✓
  - There is no evidence of a deterioration in ageing characteristics due to high temperature exposure



- Temperature change test (8 h at 80 °C, 16 h at -25 °C for 6 weeks) ✓
  - There is no negative effect on material properties during the temperature change test. The test is designed to simulate mechanical failure (stress ruptures or similar) due to thermal load.



- Condensation accumulation ✓
  - Colour remains stable; no significant deterioration



Durability and safety of AntiBac

- Long-term effect and durability

- Silver ion release (worst case conditions) under substance-specific limit for food contact as per EU regulations on biocidal products (50 ng/g)
- Theoretical durability: 55 years (= max. duration of silver ion release and consequent anti-microbial effect when cleaned twice a day) with maximum aggressive cleaning method with nitric acid (HNO3 at 40°C)
- Laboratory weathering as per DIN ISO 4892-A-2 1,000 h
- Condensation test 40 °C 100% R.H. (no change in the material and surface properties)
- Temperature cycle test 8 h 80 °C/16 h 25 °C 6 weeks (no change in material and surface properties)
- Temperature aging at 80 °C for 6 weeks (no change in material and surface properties)



EFFICACY AGAINST FOLLOWING PATHOGENS AS PER STANDARDS JIS Z 2801 / DIN EN ISO 22196, ASTM 2180, ASTM 2149

Bacillus subtilis, Burkholderia cepacia, Clavibacter michiganensis, Enterococcus faecium, Erwinia amylovora, Escherichia coli, Klebsiella pneumoniae, methicillin-resistant Staphylococcus aureus (MRSA), Pseudomonas aeruginosa, Pseudomonas fluorescens, Pseudomonas syringae, Rhizobium radiobacter (Agrobacterium tumefaciens), Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus mutans, Aspergillus niger, Aureobasidium pullulans, Aureobasidium pullulans, Candida albicans, Fusarium solani, Microdochium nivale, Penicillium funiculosum, Scopulariopsis Brevicaulis, Streptomyces abikoensis, Trichophyton mentagrophytes, Virus bacteriophage MS2 and others

Durability and safety of AntiBac

- Safety and non-toxcitiy of the nanosilver particles

BIOCOMPATIBILITY	
In-vitro cytotoxicity:	ISO 10993-5
Mutagenicity:	OECD TG 471
Allergy test:	Local lymph node assay (LLNA)
Skin tolerance:	OECD TG 402
	OECD TG 404
	OECD TG 406
Eye inflammation:	HET-CAM test
	OECD TG 406
Inhalation studies:	OECD TG 413
Oral toxicity:	OECD TG 408
Development toxicology & teratogenicity:	OECD TG 413
	OECD TG 422
ECOTOXICOLOGY	
	OECD TG 201, 202, 203, 210, 211, 221
Water organisms:	OECD TG 217, 201, ISO 15685, DIN 38412 L 48, DIN
Micro-organisms:	ISO 17155
	OECD TG 232, 226, 222, 219, 207, ISO/DIS 17512-1
Soil organisms:	OECD TG 303, 209
Activated sludge:	Nitrification is not affected; also, efficient and high re-
Waste water treatment plant:	moval rate of nano silver (worst case scenario: 1 ppm nano silver)



Applications of AntiBac













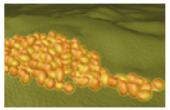
AntiBac in the medicine



AVOIDING INFECTIONS SAVES LIVES

Multidrug-resistant bacteria and nosocomial infections account for 400,000 to 600,000 infections and 15,000 deaths per year in Germany alone: a hazard in healthcare that means additional treatment costs amounting to an average of 20,000 euros per patient.

Innovative LAMILUX AntiBac surfaces help to prevent this and save lives. In addition to many useful germs, like those on our skin or in our intestinal flora, there are a number of germs that cause illness and can have devastating consequences for a patient if they infect the wrong place, for example, a wound. Among other things, antibiotics are used to eliminate these germs, but the limits are being reached because of resistant pathogens.
Hospitals are therefore facing the permanent challenge of mitigating or even preventing the occurrence of hazardous hospital germs through targeted preventive and acute measures. Especially on the largest surfaces of a hospital complex, the walls and ceilings, LAMILUX AntiBac can ensure more effective and permanent protection against pathogens and interrupt the propagation chain.



STAPHYLOCOCCUS AUREUS
An inflammatory pathogen that can trigger abscesses and wound infections, among other problems, and which can additionally aggravate the symptoms in the case of hybrid infections with other pathogens. Anti-biotic-resistant strains (MRSA) are well known.



KLEBSIELLA PNEUMONIAE
Ubiquitous occurrence, also in the human intestinal flora. 10% of nosocomial infections are attributed to this germ. Natural resistance to benzyl penicillin and aminopenicillin.



PSEUDOMONAS AERUGINOSA
Widespread soil and water germ characterised by pronounced frugality in terms of its habitat. Pronounced resistance to antibiotics, particularly to most penicillins and cephalosporins.



ESCHERICHIA COLI
Normally helps to ensure healthy intestinal flora. However, it may lead to infectious diseases outside the intestinal tract. The dangerous EHEC bacterium belongs to this group.

S. Oswald

AntiBac in the food industry



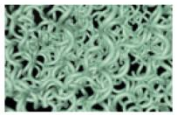
FOOD PROCESSING AND STORAGE

In livestock farming, and especially in meat processing downstream, it is important to comply with what are often strict national or international standards. In many cases, these strict hygienic requirements also need to be ensured under tough conditions.

Here too, LAMILUX AntiBac continuously contributes towards eliminating all germs that come into contact with the surface – 24 hours a day, and 365 days a year.

Assured food safety and non-toxicity of the materials used, is also essential for storage rooms, refrigerated shelves and deep-freeze counters.
Many LAMILUX material qualities are thus tested for indirect contact with food, and the newly developed nano silver is considered absolutely safe for humans and the environment.

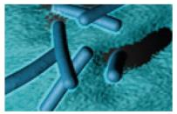
In livestock farming, too, cleanliness and freedom from germs are ensured by periodic cleaning as the most important means in the fight against bacteria. LAMILUX AntiBac impresses here with easy and residue-free cleaning thanks to the pore-free surface, which does not lose its antibacterial properties even under the toughest conditions.



CAMPYLOBACTER JEJUNI
One of the most common causes of diarrhoea in humans besides salmonella. They are transmitted through unpasteurised milk, raw poultry meat and drinking water. Symptoms include severe abdominal pain, diarrhoea, fever and, in rare cases, neurological damage such as the Guillain-Barré syndrome with paralysis.



ESCHERICHIA COLI (SPECIAL FORM OF EHEC)
EHECs are disease-causing strains of E. coli that produce certain toxins and destroy the cells of the intestinal wall and blood vessels. EHEC can be transmitted through raw meat. The disease can lead to serious consequences, such as the development of the life-threatening HUS (haemolytic uremic syndrome).



PSEUDOMONAS AERUGINOSA
Anaerobic, gram positive bacteria, which can often be found in vacuum-packed, raw meat and lead to the food spoiling. The metabolism of the bacteria causes various foul-smelling gases and acids, which become visible as bloating of the packaging ("blown pack spoilage").

AntiBac in the transportation industry



FOOD TRANSPORT

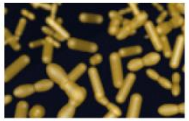
In addition to its low thermal conductivity, and high strength despite a light weight, LAMILUX AntiBac above all impresses with the constant disinfectant effect of its surface in temperature-controlled transportation of foods that require refrigeration throughout the delivery chain

Refrigerated containers and semitrailers are exposed to severe mechanical stress, temperature changes and harsh cleaning cycles – often with aggressive media – during loading and along the transport route. LAMILUX AntiBac is demonstrably resilient to these stresses and reliably disinfects for at least 55 years – even under the toughest conditions.



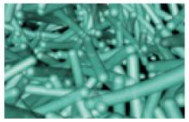
SALMONELLAE

Salmonellae are common in raw eggs, poultry meat, unpasteurised milk and chocolate and can infect both humans and animals. Infections with salmonellae can trigger illnesses such as diarrhoea or typhoid fever. Depending on the course of the sickness and the treatment, these diseases can be fatal.



YERSINIA ENTEROCOLITICA

Yersinia enterocolitica is a widespread bacterium that mainly occurs in pigs. Due to its optimum temperature of 4 °C, the bacterium can even survive in the refrigerator. Infections are manifested in diarrhoea, swollen joints and inflammation of the abdominal fat.



LISTERIA MONOCYTOGENES

Listeriosis pathogens can cause meningitis and are very dangerous for pregnant women, new-born children and persons with immune deficiencies. The pathogens are transmitted through contaminated food, such as fruit and vegetables. Because the bacterium is psychrophilic, it can also propagate well in refrigerated conditions.

AntiBac in other applications



EMERGENCY SHELTERS IN CRISIS AREAS

The versatile LAMILUX AntiBac is available with variety of fibre reinforcements and surfaces and thus lends itself to flexible use. Among other things the material contributes towards improving basic hygiene and containing epidemics in crisis areas or slums.

Germs and pathogens can, in particular, colonise the large wall and ceiling surfaces of emergency shelters and thus generate unnecessary disease potential in schools, kindergartens, medical facilities or in private accommodation.
Known germs in areas with a lack of hygiene infrastructure include: Vibrio cholerae (cholera), Mycobacterium tuberculosis (tuberculosis), Neisseria meningitis (meningitis), Enterohaemorrhagic Escherichia coli (EHEC).



USE IN ANIMAL BREEDING AND AGRICULTURAL BUILDINGS

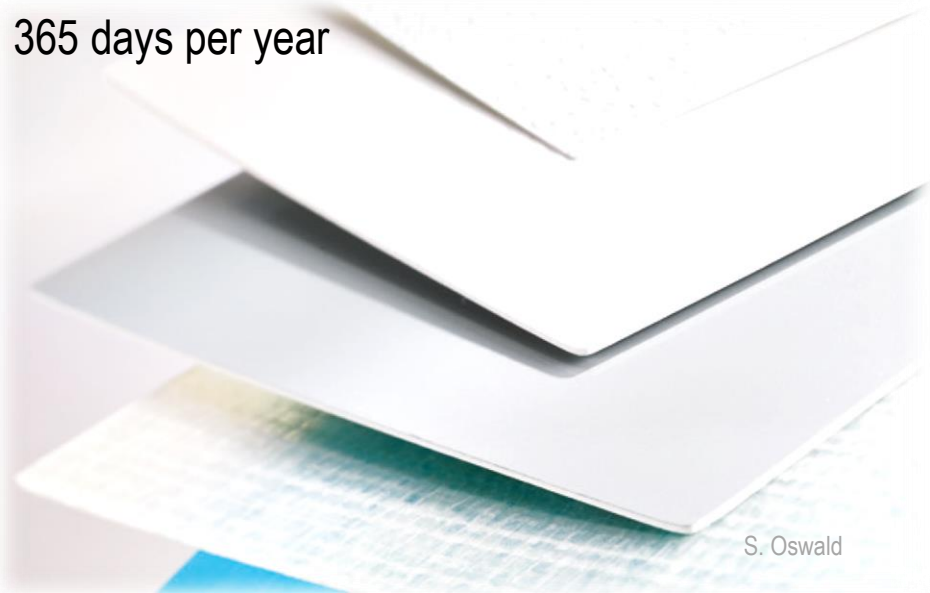


USE IN MOBILE ROOMS AND CONTAINERISED SHELTERS

S. Oswald

Summary

- AntiBac is available for all LAMILUX products with Gelcoat
- over 99.9% of bacteria get killed within 24 hours
- the AntiBac effect remains for 55 years even under harsh conditions
- AntiBac acts on each spot of the surfcae
- AntiBac acts relentlessly – 24 hours per day and 365 days per year
- AntiBac is non-toxic and environment friendly



Thank you for your attention









Customized Intelligence

Disclaimer

The aforementioned recommendations and information provided in this internal investigation/elaboration are given in good faith and are based on state-of-the-art technology. The aforementioned recommendations do not represent a guarantee of specific process and product characteristics. The processor assumes sole responsibility for safeguarding their processes (e.g. work safety, production processes, environmental protection) and the quality and properties of their product.