

@YourSurface

HYGIENE AND SAFETY - NO COMPROMISE ALLOWED

Get inspired and informed by a variety of specialists in the design and building of food and beverage facilities



SELECTION GUIDE

A complete solution for surface finishes of a beverage facility

34

EMPLOYEE SAFETY

Factors influencing slip potential. How to manage the risk of slips?

22

DESIGN CONSIDERATIONS

Get informed about design essentials for a hygienic, safe and functional floor in food and beverage facilities

14

TRENDS

Customer preference, new technology and regulations drive the design and interior finish selection

42

HYGIENIC DRAINAGE

A critical part of floor structure in food processing areas

28



THE FINISH LINE



In this issue of @Your Surface we discuss SAFE AND HYGIENIC SURFACES in FOOD AND BEVERAGE PRODUCTION PLANTS. We're pleased to present information about important issues related to this subject, and at the same time showcase how Sika helps owners, designers and project managers select and install the right floors, walls, ceilings, and other finishes for all their food processing and distribution needs.

Both building from the ground up or renovating an existing facility provides invaluable opportunities to secure a company's future success. Just as choosing the right food processing equipment is crucial to that success, so is choosing the right flooring and installing it properly. Among many other things, it must be hygienic, functional, tough, and safe to walk on.

Flooring is arguably one of the most abused of all surfaces in a food plant, or anywhere else for that matter. Things, often heavy things, fall on it. Flooring has to take it and not crack or damage. Temperatures can change from room temperature to beyond the boiling point, all in a matter of minutes or even seconds. Flooring has to expand and contract accordingly and in concert with the substrate below to remain intact. Pathogens pose the greatest risk in a food plant. Flooring has to eliminate or minimize cracks and crannies where bacteria and viruses can hide, and at the same time be easily and thoroughly cleanable. Meanwhile, employees rely mostly on their feet to get from one part of the plant to another. Flooring has to be designed to prevent slips and falls, which can not only cause pain and injury, but can also lower productivity. Floors need to be durable and last a long time. That's because failures, even seemingly insignificant ones, can cause expensive downtime, production losses, product contamination and, in the worst case, accidents.

While researching stories for this magazine, we spoke with numerous factory owners, production managers, architects, designers, contractors and other stakeholders in the food production business to get their views. We were rewarded not only by some valuable insights about the current state of affairs, but also by a look into some important future trends.

We've attempted to condense these and other things we learned along the way into the body of this magazine and balance them with how Sika helps today's food processors select and install high-value flooring and wall surfaces that feature sound hygiene, safety, functionality, durability and sustainability.

We take great pride in being one of the world's leading manufacturers of high-quality finishes. We're pleased to introduce you to our profound commitment to the food production industry, and to our ability to serve it effectively and efficiently. Our vast offering of sustainable design options covers a wide variety of applications, and with this we provide the know-how needed to help you make the right choice for both the present and future, and install it on time and on budget.

Thank you for reading.

Sincerely,

A handwritten signature in black ink that reads "Ari Tantt". The signature is fluid and cursive, with a long horizontal stroke at the end.

Ari Tantt
Business Development Manager TM Flooring
Sika Services AG



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CONTENTS

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- | | | | |
|----|---|----|---|
| 7 | Floor and interior design for food processing and handling facilities – a checklist | 44 | Floor renovation in an operating facility – it's about speed and product safety |
| 12 | Hygiene and functionality – the main design criteria in food plant flooring design | 48 | Sika@work in food and beverage industry |
| 14 | Design considerations for hygienic floors in food & beverage environments | 50 | Hygienically sealed details |
| 21 | Keeping floors clean and food safe | 52 | Regulations and certification in food and beverage facilities |
| 22 | Employee safety and slip-resistance | 54 | Sika solutions and sustainability |
| 26 | A good choice is an informed choice | 56 | Sikafloor® solutions – a safe and durable match for your specific needs |
| 28 | Putting hygiene first | 64 | Full range solutions for a watertight and secure building envelope |
| 31 | Choosing seamless wall coatings for your plant | 66 | Sika as a reliable and innovative partner in the construction of food & beverage facilities |
| 34 | Selection guide – a complete solution for beverage facility surface finishes | | |
| 40 | System selection for beverage facility surface finishes | | |
| 42 | Powerful trends are driving floor and wall evolution in F&B | | |

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FLOOR AND INTERIOR DESIGN FOR FOOD PROCESSING AND HANDLING FACILITIES – A CHECKLIST

A dairy or beverage plant. A catering or industrial kitchen. A Winery. A slaughter house or fish packing facility. A bakery. A fruit and vegetable processing plant. A snack production facility. These are but a few examples of businesses that exist in the vast food processing industry. And each of them has its own specific requirements for flooring, walls, and other surfaces. Application examples include freezers, bottling lines, raw material processing and handling areas, packaging and storage areas, and the list goes on.

There are a large number of surface options available, particularly for flooring, which can make choosing the right system a bit challenging. The following checklist will hopefully assist you in the decision making process for your facility.

FOOD SAFETY AND HYGIENE

Food safety and hygiene have become visible on the radar screens of consumers, industry, regulators, and other stakeholders like never before. The Global Food Safety Initiative (GFSI) along with its various certification partners (FSSC 22000, BRC, SQF, etc.) has raised the bar on food safety across all segments of the industry from raw material suppliers and producers to distributors and retailers.

And for good reason. More than 200 diseases are known to be caused or carried by food. The World Health Organization (WHO) reports that every year thousands upon thousands of people die from them. A 2010 global study, for instance, showed an estimated 582 million reported cases of food illnesses spanning 22 different diseases and causing approximately 351, 000 deaths.

But there's even more at stake. Unsafe food poses major economic risks, especially in a globalized world. Take for example Germany's 2011 E.coli outbreak, which reportedly caused USD 1.3 billion in losses for farmers and industries across Europe and elsewhere.

As consumer preferences change, so must technology in order to keep up. In response to the public demand for more nutritious and better tasting food, industry has responded with a number of milder processing and preservation methods. These involve new processes and machines that increase nutritional and sensory properties while still making sure that what reaches the table is safe to eat and won't make people sick.

But innovations cannot stop there. They must also appear at the plant level. The facility itself has to be designed



and constructed in ways that prevent any possibility of food contamination. Choosing the right flooring, walls, and other surfaces can help do this. Ideally, flooring should be seamless, and easy to clean, sanitize, and rinse thoroughly to remove wash-down residues and any viruses, bacteria or pests that might be present.

PERSONAL SAFETY

Slips and falls are the most common causes of injury at work, accounting for an average 33% of total work injuries. In the EU alone, over 20,000 million Euros and 150,000 work days are lost annually from workplace mishaps. Depending on the country, resultant financial costs can be as high as 1% to 3% of GDP.

Slip and fall injuries tend to occur most often in areas where meat, fruit, vegetable, fat and other residues are present. In addition to keeping these residues from falling on the floor in the first place, companies can choose flooring that has an optimum combination of grip and wash-ability to keep employees safe and the facility nice and clean. Employees can be protected further by the shoes and boots they wear, and by observing careful working habits.

RESISTANCE TO INTENDED USE

Floor and wall finishes must be able to stand up to the demands of the space they're in. In a slaughter house, as an example, it's not uncommon for heavy hooks to accidentally fall to the floor from time to time, or for heavy equipment to get knocked over. Flooring systems with low impact resistance are the ones most likely to need frequent repair or replacement.

Aggressive cleaning agents are another potential danger. Floors with low chemical resistance not only wear down faster, but can also create "traps" where bacteria and viruses can hide.

In storage areas, such as freezers and warehouses, flooring must possess adequate mechanical resistance and substrate adhesion to handle the constant wear and abrasion from frequent forklift and other traffic. Further stresses are caused by temperature shock. Some occurrences may be accidental, such as hot grease falling to the floor during potato chip production. Other occurrences, such as washdowns, are intentional. These procedures use liquids that can often exceed 100°C, or steam that can be a lot hotter. The flooring system in place must be able

to withstand frequent, rapid, and often extremely wide temperature swings.

MAINTENANCE

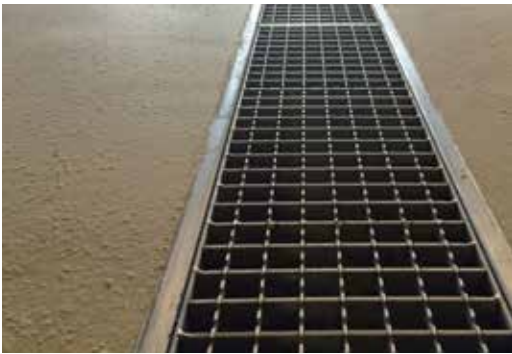
The maintenance program for any given food production facility consists of many aspects. Some involve machines. Others center on the physical premises. And others still, and among the most important, involve cleaning and sanitation.

Companies nowadays employ the HACCP (Hazard Analysis Critical Control Point) approach across all major areas of production. HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product.

Cleaning and sanitation are key parts of HACCP. The principles are common to all food processing facilities, but the method and frequency of cleaning and sanitation will differ from one manufacturer to another depending on the type of food that is produced and handled – pre-cooked chilled meals vs dry goods production, for instance.

Cleaning and sanitation of floors remains

HYGIENE AND SAFETY IN A MODERN FOOD PROCESSING FACILITY IS NOT NEGOTIABLE



a specialty unto itself and must take into account numerous variables and the occasional trade-off. Enhanced surface profile (rougher finish), for instance, will aid slip-resistance, but may also require more frequent and vigorous cleaning than a perfectly smooth surface. Meanwhile, areas subject to oil and degreasing may need detergent solutions to be applied, agitated and left in contact with the floor for a specified length of time before

being rinsed and removed, which in turn can increase downtime. High temperature and/or high pressure hose cleaning is another popular method, but not all floor finishes are able to tolerate extreme temperatures or pressure. If aggressive cleaning agents are used instead, they may cause damage to the floor, depending what type it is. While tiles are highly chemical resistant, the grout used to connect them may not be. Synthetic



resins, on the other hand, are resistant to a wide variety of chemicals, but some may suffer bleaching from prolonged exposure to certain types, such as CIP solutions.

DURABILITY

A durable floor is one that lasts a long time, and one that resists deterioration and loss of performance. Durable floors begin with quality materials, good design and sound workmanship. The whole floor structure and each of its components (sub-base, load carrying slab, screed and upper protective layer) are interdependent and work together to provide the required levels of performance and durability. If the ground and sub-base fails, for instance, the concrete slab may crack under heavy loads. Meanwhile, if the coating has limited resistance against chemicals, it may not be able to protect the slab underneath against deterioration.

The life expectancy of any surface finish is related to a combination of mechanical, chemical and thermal stresses. These must all be taken into account when designing and installing flooring that is not underbuilt or overbuilt, but built just right for the application at hand.

FUNCTIONALITY AND DETAILS

Durability, ease of cleaning, slip resistance, and chemical resistance are all important functional aspects of industrial flooring, as is floor detailing (grills, ramps, thresholds, etc.) and other attached structures.

Floor drainage systems are an example. Regardless of the cleaning method chosen, high quality and well-positioned drains are needed to remove chemicals and water from floor surfaces, and are an integral part of every cleaning and sanitation process.

Other examples include gullies and channels, which should be configured to minimize impacts on ergonomics, economics, hydraulics, and hygiene. Floor falls should



be as simple as possible, and watertight coves joining floor edges to walls are important to facilitate cleaning. In addition, floor joints, which tend to be the weakest parts of a floor, should be positioned away from high activity areas.

TOTAL COST ASSESSMENT

Comments such as, “If there is a budget crunch, core costs are the only ones that gets looked at,” or “Everyone is worried about the project being done on time and on budget,” are often heard during construction projects. Beware flooring: for the simple reason that it’s is one of the last items to be installed, it runs the risk of being downsized in value and scope in favor of other things, such as equipment, which are considered to be more critical.

Yet, of all elements in a food processing plant, flooring is arguably the most visible and one of the most vital contributors to the success of a food operation. Skimping on installing proper flooring because of unexpected budgetary restraints or overruns could cost the operation dearly in the long run in terms of slow processes, downtime, accidents, and other things.

When calculating the capital efficiency

of a floor, wall, or ceiling, it is always a good idea to separate the initial “hard” costs, including materials and installation, from ongoing maintenance costs, which over time can easily exceed original procurement and installation costs. In other words, while a less expensive floor may save a company some money at the outset, it may also result in a lot of hidden costs down the line. Flooring, just like production machinery, should be seen as an equal component of the life-cycle cost of operating a plant.

SUSTAINABILITY

Whether constructing or renovating, an important thing to be mindful of is the volume of volatile organic compounds (VOCs) emitted by various floor, wall, ceiling, and other finishes. Some emit more VOCs than others. The main advantage of choosing flooring materials that meet or exceed low VOC emission standards is it helps to keep air clean, which results in safer food production and a healthier working environment for employees.

Materials should also feature low taint transfer potential and little or no smell, especially during the application process. This requirement is more important for

some installations than others. Take, for instance, a production plant for infant dry milk powder. In addition to using HEPA filters to purify the surrounding air, flooring will likely need to be made from certified Clean Room Suitable Materials (CSM). The ISO 14040:2006 environmental management standard for Life Cycle Assessment (LCA) is a good source of further information about these and other sensitive situations.

REFERENCES

References are an invaluable part of the decision making process, and every flooring supplier should be able to provide a list of satisfied customers. Call and visit them. Nothing is a better confidence builder than getting a first-hand look at a quality installation of the floor you're considering for your facility. In addition to building trust, you may also benefit from picking up ideas that could improve your own project

QUALITY ASSURANCE AND CERTIFICATION

Floor and wall coatings, like most products, usually come with a warranty. Before purchasing, make sure you go over the warranty in detail, including all the fine print.

Warranties are there to protect the buyer against manufacturing defects. They are also an important selling tool for the manufacturer. Make sure the company you're dealing with has the ability to back up its warranty obligations. Just as important, find out what kind of quality management system the company has in place. ISO 9001, for instance, is commonly used to assure uniformity in manufacturing and adherence to a product's published specifications.

Look for relevant engineering certifications as well. Installing flooring and hygienic wall coatings is highly specialized work that requires specific

knowledge and skills. Make sure the crew you or your supplier has chosen has been properly trained and certified to install your particular system.

As for the system itself, look for labels indicating the product has been independently certified to internationally recognized quality standards, such as the CE mark and HACCP. Also, make sure the supplier has all relevant test reports available, and fulfills all statutory requirements. Further, ask if there are options available for an extended warranty for your system should you desire them.

¹ https://www.uni-due.de/~by5007/ressourcen/pdf_dokumente/30/EU_30_05.pdf

² <http://www.who.int/mediacentre/news/releases/2015/food-safety/en/>

³ http://www.slipnomore.com/slip_fall_stats





Source: Arctica Ltd.

HYGIENE AND FUNCTIONALITY – THE MAIN DESIGN CRITERIA IN FOOD PLANT FLOORING DESIGN

The design and construction of new food and beverage production facilities, or their refurbishment, are a complex process and must successfully combine two main disciplines: process engineering and architectural design.

Managing construction projects in this highly complex industry requires both experience and knowledge of the manufacturing process. In food production facilities hygiene and food safety are also critical factors that must be considered.

Sika recently had the chance to discuss these and other issues with Niall McQuitty, Director Architecture and founder, and Damian Cleveland, Architectural Project Manager of Arctica Ltd., a company based in Stamford, UK, which provides architectural, engineering

and cost consultancy services to food manufacturing clients domestically and abroad.

Architecturally, the most important issue at detail level is hygiene, says Niall. "In practice, the most critical hygiene issues are the junctions between different building components, particularly between floor finishes and stainless steel drainage components" he notes. "When designing floors one should not only consider the flooring material, but all the other aspects as well", he says, including gullies, channels, junctions,

joints, and falls. "Another key consideration is always to ensure that any water on the floor will flow quickly into appropriate drainage components", says Niall.

"Junctions and joints are the weakest parts in terms of hygiene," he notes. "The less joints, the better." The reason is that minimising the number of joints provides less hygienic risk and a reduced need for maintenance.

The second most important issue in food facility floor design is personnel safety, namely slip-resistance. Adequate grip for

shoes and boots reduces slips and injuries. In addition, good slip-resistance also increases safer and smoother operations throughout the facility.

The selection of floor texture depends on the environment and the production processes; for instance the amount of food material from the process falling onto the floor and how wet it is.

It is worth remembering that the optimal surface texture is very often a careful balance between the cleaning regime and roughness. A rougher surface requires more effort and energy to clean properly, and therefore more cost. However, this may be necessary to ensure employee safety, which of course is paramount.

Durability and the resistance against stress are essential properties for flooring. However, in many food factory investments the real life-cycle cost assessment for floors, namely maintenance over time, is not considered to be as important as the initial capital cost of installation, and it should be.

A further consideration, and one where increasing emphasis is now being put, is aesthetics, most particularly colors, for both functional and safety reasons. "From a technical point of view, colors other than the traditional red, such as yellow and beige, are often now preferred because food waste, dirt and other contaminants can be more easily seen", says Niall. Colour can also have a big influence on the perceived quality of the space too, with lighter and brighter colors creating a much more positive working environment than darker, flatter colors.

Meat plants, for instance, often now use yellow instead of red so that food waste can be very quickly seen and cleaned up; salad and vegetable facilities now prefer to use green or yellow.

"Hygiene will continue to be the most important concern in food facility floor design," says Niall. "The junctions and

details are the most important issues now and will continue to be into the future. Reducing the number of joints is vital so the ability to construct joint-free floor slabs is a welcomed development."

Another important factor is shortening the amount of time needed for a renovation or new flooring installation; time is money. If a new installation could be done over a weekend, all the better. According to Niall, Arctica welcomes suppliers, such as Sika, who provide not only sound products, but also a consultative, time-sensitive, and service-based approach in their activities.

ABOUT ARCTICA:

Originally founded in 2001 as an architectural practice specializing in the food industry, Arctica subsequently extended into process engineering design and later into cost and project management. Now they offer a multi-disciplinary "one stop shop" for design and construction of management of buildings for food processing and industry. The company's services range from surveys and feasibility studies through to building and process design, project management and building contract management. With more than 15 years of experience Arctica has developed a "can do" attitude and a passion for accuracy and thoroughness.



DESIGN CONSIDERATIONS FOR HYGIENIC FLOORS IN FOOD & BEVERAGE ENVIRONMENTS



A functional and purpose-built floor is key to a safe and hygienic production environment. Floors that are hygienic, non-slip, easy to clean, and durable provide a safe and attractive place to work.

Choosing and installing the right floor are critical to every work environment. This article looks at getting it right the first time – achieving satisfactory and long-term flooring in a food processing environment.

SUBSTRATE DESIGN

Designing the substrate of a floor—just like all the other elements of a production area including columns, walls, equipment, and drains—depends a lot on the overall layout of the building. All elements together will affect how the substrate is installed, and where floor joints will be placed.

JOINTS

One of the reasons joints are needed in a floor surface is to compensate for the movement of the concrete slab below. In general, the size and flexibility of a joint are determined by the amount the building moves.

Joints are typically one of the weaker points in a floor. Take chemical resistance, for instance. It's often considerably lower in flexible joint sealants than it is in the surrounding floor finish.

Joints can't be eliminated completely, but their number can and should be kept to a minimum. They should be placed away from areas that are subject to high traffic but close to areas where there are high temperature variations (so as to allow for resultant floor movement) and close to high elevation points to avoid moisture. They should also be detailed properly to stand up against stresses caused by small hard-plastic wheels and passing traffic, preferably by using prefabricated joint profiles.

CONCRETE SCREED AND SLAB

Most substrates installed under a hygienic floor are cement-based. These are "in-situ" concrete structures installed directly on the ground or suspended from above.

Screeds aren't as thick as slabs and are normally used to provide falls, or to create a new floor base in a renovation project. Fully-bonded screeds follow the joint structure in the concrete substrate and are generally 75 mm thick or less. Non-bonded screeds are thicker.

Substrate slabs of good design are characterized by the least number of joints possible, and placing them in low-risk areas.

FALLS, DRAINAGE AND JUNCTIONS

Channels and gullies should be placed close to, but never under, processing equipment. This will ensure they do their job while still remaining accessible to cleaning and maintenance. Moving liquid across the floor to a drain is best done using gravity created by floor falls – a gradual slope as the term suggests. There are no set gradient standards for falls in food plants, but they generally range between 1:100 and 1:80.

Falls, drains, and junctions will affect the number of joints and how they're positioned. A junction to a circular gulley, for instance, does not need a joint, while a junction between a long, wide channel and the floor—especially if exposed to high traffic, hot liquids, and movement – will. Movement can be minimized through correct placement of concrete reinforcement under the channel. Meanwhile, falls can be simplified by using longer channel drains.

FLOOR FINISH

Floors in food and beverage manufacturing facilities must meet several different requirements. The surface has to be easy to clean and must not support bacteria growth. The surface should prevent slips and falls, and look appealing as well. It should be robust enough to handle all possible assaults from forklift traffic, harsh cleaning chemicals, bumps and bruises, and thermal shocks.

The regulation for floor surfaces in the European Food Safety Directive 852/2004 states the following:

"Floor surfaces are to be maintained in a sound condition and they must be easy to clean and, where necessary, disinfect. This will require the use of impervious, non-absorbent, washable and non-toxic materials unless food business operators can satisfy the competent authority that other material uses are appropriate. Where appropriate, floors are to allow adequate surface drainage."

A key concept behind this and the rest of the regulation is simple: unless floors are properly maintained and sanitized, they can become a breeding ground for harmful microorganisms. A common pathogen found on floors in food premises, for instance, is *Listeria Monocytogenes*, which studies have shown can actually become persistent if not managed properly.

This occurred in a tragic case in 2009 in Canada, where this pathogen remained undetected in production machinery and other parts of a meat processing facility until it killed 22 consumers and injured dozens of others.

There are other examples. Granted, flooring surfaces are not food contact surfaces, and some may argue that for this reason not a lot of attention needs to be paid to them. This attitude is very risky, simply because microorganisms, if present on the floor, can potentially be transported through water droplets, air particles, or other means onto food products and the packaging materials that contain them.

IMPERMEABILITY

It is critical that hygienic floors are easy to clean and free from bacteria growth. An important characteristic of a hygienic floor is impermeability, or lack of porosity. This feature is often best provided by dense resin-rich systems.

Some resin system build-ups include aggregate in the binder liquid. Caution is required, however, in how much aggregate is used. That's because if the ratio of aggregate weight to binder exceeds 8:1, pores in the resin surrounding the aggregate particles won't close properly. Topcoat sealants can be used to compensate for this, but these tend to wear out rapidly from normal traffic and abrasion resulting in a decrease in floor performance and food safety, not to mention a likely increase in maintenance and plant downtime.

ANTI-SLIP PROPERTIES

The most common method of providing grip to new flooring is to broadcast aggregate onto the top of the wet surface before it hardens. Aggregate varies in size and type and can create numerous profiles. The most common types are silica, quartz, flint, and aluminum oxide.

Transparent or pigmented topcoats are applied over the aggregate to lock it in. They prevent premature breakout, thereby extending the life of the anti-slip surface. Some resin-rich mortar systems come with aggregate already included, but they're generally not as rough as broadcast systems.

Better slip resistance requires greater surface roughness. This, however, makes the floor more difficult to clean. The trade-off between the two is determined by what's taking place on the floor, the cleaning regime, and the type of contaminants that are present.

The degree of slip resistance needed will likely vary from one part of the facility to another. For instance, processing and cooking areas laden with oil and moisture will have greater demands than drier packaging and dispatch areas. There are numbers of tools available that can help producers define the level of slip

resistance they need. Some of the best known are the Pendulum Tester (EN 13036-4) and the Ramp Test (DIN 51130).

Flooring manufacturers have independent test results based on these and other testing norms. Ask to see them. While all measures on paper are useful, it's still always a good idea to do a real-life roughness test in a small out-of-the-way area of the floor you want to install before going ahead with outfitting the entire space.

ODOR

Bad smell can result in loss of products during production, and loss of sales at retail. Odors inside the plant can include strong solvents, such as styrene and other highly volatile materials, which if inhaled can seriously affect employee health.

Solvents and other volatile organic compounds (VOC's) can leave a strong odor, some more than others, and the best safeguard against being exposed to them is simply to not have them present at all. In fact, most food plants have prohibited use of any coating systems containing solvents or ones that create hazardous odors.

There are some coatings and surface materials on the market that emit odors while being applied, but becoming "non-taint" after they've cured. In these cases, it's important to track the time it takes for the product to set and become non-tainting. Use only those materials that have been independently lab tested for their non-taint potential.

DURABILITY

Mechanical shocks and impacts, wear, abrasion, exposure to chemical agents, thermal shocks, high point loads, and dragging and shifting pallets are examples of the many stresses affecting floors in a food processing plant. Falls of heavy objects, knives, hooks or other sharp objects can lead to crack in the floor.



A DETAILED FLOOR SPECIFICATION IS A PREREQUISITE FOR A SUCCESSFUL PROJECT





The greater the thickness of the floor, the greater its ability to provide good resistance to these and other assaults. Recommended thickness will depend on a detailed assessment of the type and magnitude of specific stresses the floor will encounter. For resin-based flooring in a food processing facility, 3 mm thickness is a minimum, but a thickness of 6 mm or more is better, especially in wet areas. For tile, thickness typically ranges anywhere from approximately 8.5 to 20 mm, but a minimum of 12 mm will protect any high load areas.

When it comes to chemical resistance, different floor coatings react differently to type, concentration, temperature, and exposure duration, and should be assessed individually. Among the most challenging are phosphoric or nitric acids, and caustic or chlorine solutions used to clean production equipment, floors, and walls.

Other hazards are elements that are part of normal production, including lactic, citric, and acetic acids, blood, wet sugar, oils, fats, greases, and others. It's important to note that even if the relative amounts of these compounds are relatively low, evaporation can increase their concentration and corrosive properties. Temperature in a plant can affect evaporation. It can also exert significant stresses on its own. That's because temperatures in a food or beverage plant can often vary widely and rapidly.



For instance, the temperature of the floor adjacent to a freezer may range from 0°C or below to an ambient 21°C or higher. The flooring system must be able to function in both conditions. What is more difficult to deal is the thermal shock, which is caused by a sudden and large change in temperature, up to 100°C or more and then back again, in a few minutes or even seconds. Thermal shocks can be caused by high temperature spills from cooking, washing and cleaning of vessels and pans. They can also occur from hot CIP (cleaning-in-place) fluids and hot water rinses that are drained from production equipment and onto the floor after high temperature cleaning and sanitation.

Thermal shock can cause the flooring system to crack and in some cases de-laminate. To prevent this, the floor should have a thermal expansion coefficient close to that of the concrete substrate below, good cohesive strength, and a low modulus of elasticity. Thickness of the floor also plays an important part. The top layer should be no less than 9 mm thick for water or

chemical discharges from +90°C and for temperatures that are higher.

INSTALLATION

In food processing environments, especially when renovating, installing a new floor can be a bit challenging. One reason is the substrate may have a high moisture content, which can affect adhesion. Another reason is the substrate may be contaminated with detergents and other residues from production.

Dealing with higher than average moisture conditions is usually a matter of choice. Some flooring systems allow higher moisture levels in the concrete substrate than others, along with lower curing temperatures and shorter curing times of only a few hours.

It's important to choose a contractor who has experience in dealing with these and other variables, and whose workers are certified by the flooring manufacturer to install the products you choose. A good result depends on good planning and good cooperation of all parties involved in the project.

CONCLUSION

There are a number of reasons that floors fail. One has to do with poor design and construction of the substrate, another is that the floor finish is not suitable for its planned use, a third is a poorly executed installation and poor detailing.

It may seem ironic, but often it's the most expensive floors that fail the most. And when floors fail, it's no small matter. Refurbishing and repairing a floor means downtime, which in turn means lost revenue. On average, count on at least one week for a typical refurbishment of a floor, depending on the size and complexity of the repair.

An important feature of resin floors is they are continuous. And with a good substrate design, the whole floor area can be made seamless, which greatly improves hygiene. Minimizing joints



GUIDELINES FOR A SUCCESSFUL FLOORING SELECTION AND INSTALLATION

The following are a few guidelines for project managers and engineers responsible for specifying and installing floor and wall coating systems:

1. Consult with the floor manufacturer and other suppliers early in the design process and again throughout the project. Coordination between the manufacturer, concrete contractor, and other suppliers can eliminate problems in the overall project.
2. Select the surface texture for anti-slip purposes by considering worker safety as well as cleanup and sanitation aspects. Test potential solutions in a small test area first before deciding on the whole floor.
3. Provide detailed specification for your flooring supplier, including exact material performance expectations, installer qualifications, and sample area selections and workplace limitations.
4. Specification and selection criteria should include:
 - How to position drains
 - How to handle joints, i.e., How to limit their numbers and how to place them in non-critical areas
 - How to design concrete substrates and screeds to handle stresses
 - How to make slopes drain effectively
 - How to construct details at junctions, drains, coves, and walls
 - How to ensure resistance of the floor finish to chemicals, temperature and thermal shocks
 - How to maximize long-term mechanical resistance, especially under high wear and impacts
 - How to minimize equipment vibration through use of elastic sealants
 - How to use elastic sealants to connect metal drains and the floor slab
 - How to build effective equipment bases
 - How to maximize the hygiene of the flooring, i.e., Non-taint, easy to clean, and unable to support bacteria growth
 - How to access independent tests that verify your requirements:
5. Make sure that the flooring contractor has experience with similar jobs, preferably in food industry, and has relevant installation certifications
6. Ensure and promote clear lines of responsibility and communication between the main contractor, installer, floor manufacturer, and other stakeholders.

further lessens hygienic issues while improving durability and life of the floor.

At Sika, we can help you get the right floor installed properly from the start. Please don't hesitate to contact us. In addition to making your project happen on time and on budget, we're available at any time to answer any questions you may have.

Sika wishes to acknowledge and thank Mr. Timmerman for the excellent

consultation he has provided to the company on the subjects of cleaning and other matters regarding the hygienic management of floors and wall systems.

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KEEPING FLOORS CLEAN AND FOOD SAFE

Hein A. Timmerman, Global Sector Specialist Food Care at Sealed Air, and EHEDG* Board Member, comments on protocols and procedures for keeping floors in food and beverage plants as sanitary and safe as possible.

The cleaning of floors in the food industry differs from site to site, and from process to process. Regardless, the goal is the same: to maximize hygiene and minimize food infection risks.

According to Hein A. Timmerman, water is one of the main culprits in a plant, particularly in a dry processing scenario. "It is known that water is a potential vector for spreading *Listeria* and creating the possibility of it being transferred onto product," he notes. "For this reason, it's important to keep the environment as dry as possible."

He goes on to say that maintenance workers should avoid using hoses, but this is not always possible given how certain plants are laid out and how they function. "Break time cleaning should be carried out manually using buckets and cloths and sanitary wipes, rather than by pouring water over the production lines." In dry food processing environments, floor cleaning is usually carried out by brushing and vacuum cleaning. Periodically, wet cleaning is needed but should be done with great care to ensure all residual cleaning water is fully drained and the floor allowed to air dry.

"Often in facilities that produce high risk foods, there are no drains at all. In these cases, powerful disinfectants are used that can evaporate quickly and that have a specified non-rinse claim. An example

is the alcohol-based Diversey™ Divodes FG VT29."

WET FOOD

Timmerman explains that in wet food processing areas, cleaning will be affected by the available cleaning equipment and how the process equipment is configured. "That's because most of the time, floors are cleaned together with the external surfaces of the machines," he says. "Foam is often used and is applied to all external surfaces. At the same time, adjacent floors are cleaned with the same chemistry."

The chemistry he's talking about is usually an alkaline foam with sequestrants or a chlorinated alkaline product. Periodically, workers apply formulations based on phosphoric acids. "The contact time lasts around 10 to 20 minutes, giving workers time to use brushes to scrub away stubborn soils. The foams are then rinsed with pressurized water at around 20 bar and with a flow rate of 30 – 35 l/m for each rinse hose."

Drains, notes Timmerman, are not cleaned at intervals like the rest of the plant, but are cleaned continuously using available equipment and cleaning products. Disinfectants based on quaternary ammonium and amphoteric are particularly noteworthy, because they greatly help prevent *Listeria*.

CIP

Timmerman says some areas, such as the CIP room, place the greatest demand on resistant flooring. "That's because a CIP installation uses strong chemistry as a basic material – products contain concentrated sodium hydroxide or potassium hydroxide up to 50%, nitric acid up to 62%, and the list goes on." That list includes oxidative chemicals such as neat peracetic acid and sodium hypochlorite.

In CIP environments, temperatures can reach up to 80°C in storage vessels. "The risk of spills is high," explains Timmerman, "but generally controlled cleaning floods are released over the flooring materials and then exit through available drains. In automated process areas, certain valves will have specific sequences to release high flows of diluted cleaning liquids onto the production floor during designated cleaning cycles." He says other non-production areas are often cleaned with scrubber driers. Though cleaning of floors may differ from one plant to the next, the one thing that remains common is the suitability and effectiveness of the cleaning chemistry. This even goes down to the level of dyes and odorizing elements – they're not allowed.

*The European Hygienic Engineering & Design Group (EHEDG) is a consortium of equipment manufacturers, food industries, research institutes, and public health authorities. It was founded in 1989 with the aim to promote hygiene during the processing and packing of food products.

The principal goal of EHEDG is the promotion of safe food by improving hygienic engineering and design in all aspects of food manufacture. EHEDG has recently published Guideline 44 called "Hygienic Principles for Food Factories (2014)," which contains a chapter on hygienic flooring. Guideline 44 puts forward a number of critical points that are crucial in assuring a high hygiene level in all areas of a plant, particularly high care areas, such as clean rooms.



EMPLOYEE SAFETY AND SLIP-RESISTANCE

Employee safety is one of the most important requirements for any workplace. Slips and falls are among the most common injuries at work. They account for about 86% of total injuries, and 90% of these happen because the floor is wet

These injuries are particularly prevalent in the food industry, where they occur four times more often than the average in other industries. Injuries can create significant impacts to all involved. The most significant is the suffering and possible disabling of the person injured. The next is impact on the company – financial, loss of key staff, loss of productivity, and liability.

MINIMIZING TRIPS AND FALLS

There are four main contributing factors that can cause a worker to slip and fall down. These include: environment, organization, individual, and footwear (Table 1).

It goes without saying that to reduce

slips and falls the floor should be kept clean and dry. In food and beverage production environments, this may not always be possible. Striking the optimum balance between safety and production realities is not always an easy task.

Often, for instance, there is a conflict between cleaning and surface roughness of a floor. While the supervisor of the facility may be looking for a rough, anti-slip floor for safety's sake, the maintenance manager may prefer a smooth surface that is easy to clean instead. The solution usually involves a trade-off between the two.

REGULATIONS AND MEASUREMENT

Regulations regarding slip-resistance

vary widely between countries. In the EU, for instance, some regulations exist, but there are no common requirements that companies have to follow. In countries such as the UK, USA, and Australia, there are, and these may be linked to a higher incidence of litigation.

The most widely used method of measuring the slip resistance of a floor worldwide is the Pendulum Tester, also known as the Portable Skid Resistance Tester, the British Pendulum (Picture 1), and the TRRL Pendulum. It is currently a standard in 49 countries on five continents.

The American ASTM E303-93 and UK BS EN 13036-4-2011 slip-resistance

THE MOST WIDELY USED METHOD OF MEASURING THE SLIP RESISTANCE OF A FLOOR WORLDWIDE IS THE PENDULUM TESTER

standards are what define the Pendulum Tester as a measuring device. Australia uses it as well and its HB 197:1999 standard is known to provide the most detailed information for wet Pendulum Tester values in different situations.

The TRRL test method uses a dummy foot that swings down and makes glancing contact with the floor surface being tested. The unit measures the coefficient of friction (CoF) between the two surfaces (the floor and the bottom of the foot) at the moment of impact. The test equipment is portable allowing “in situ” use while a facility is in full operation. The test can be executed on wet or dry floors, and slip-resistance results are expressed as low, moderate or high.

And other widely used test method is a variable-angle ramp test that is based on the DIN 50197 and DIN 51130 anti-slip standards. In this test, flooring strips are mounted on a movable ramp, and an operator wearing safety boots walks on them in one direction, and then back again in the other. The ramp is then slightly inclined in stages until the operator slips. The angle at which slippage occurs is recorded as the “R value” of the floor. Variable-angle ramp tests done in the food and beverage industry often include oil contaminants added to the floor strips to simulate real-life conditions. These types of tests are well suited to heavily textured or profiled surfaces.

Two other dynamic “in-situ” test methods use the Tribometer and SlipAlert testers. Each provides a practical and fast method of defining the surface coefficient of friction. These methods can be used on both wet and dry floors. SlipAlert is also adopted by the British BS 8204-6: Synthetic Resin Flooring standard, and is used mainly in the UK as a more practical method than the TRRL Pendulum.

Indication of slip potential in water-contaminated conditions can be obtained by using a micro-roughness meter to measure the peak-to-valley roughness of the floor surface. Results are expressed as a floor’s “RZ” value, which does not directly state slip-resistance but does provide an indication of slip potential. The

TABLE 1. FACTORS CONTRIBUTING SLIPS

	Causative factor	Control measure
Environment	Contamination of the floor (spillages, debris, wet cleaning)	Eliminate the contaminants
	Slip resistance of the floor not maintained properly (incorrect or inadequate cleaning)	Remove debris and clean more thoroughly
	Slip resistance of the floor is too low (inadequate floor roughness)	Increase slip resistance or lay a more slip resistant floor
	Steps and slopes – steps are too sudden and not well marked; slopes are too steep	Ensure that steps and slopes are well marked and provide adequate foot and hand hold and stability
	Adverse conditions hiding floor conditions	Remove hidden obstacles; provide adequate lighting
	The nature of the task and movement on the floor (need to carry heavy loads, turn and move quickly, pull loads)	Encourage more care walking in slip areas
Organization	Layout of work premises and general traffic flow	Identify slip potential areas and encourage safer behavior and vigilance
	Safety culture	Education and promote positive, proactive attitudes to safety in general; measure and communicate safety progress on continual basis
	Supervision	Monitor risks and behavior and correct accordingly
Footwear	Shoes and slip resistance must match	Suitable shoes. Right kind of sole material and texture for the floor surface
Individual	Safety is everyone’s responsibility	Provide adequate training; reward individuals who introduce better, safer ways of working



Picture 1: TRRL Pendulum Tester.

micro-roughness hand-held meter is easy to use and is often employed to double check Pendulum Tester data. A limitation of the unit, however, is it cannot be used for exceedingly rough floors.

MANAGING THE RISK OF SLIP RESISTANCE

When selecting the texture of the floor surface for required slip-resistance, the four most important issues to consider are degree of contamination, applied cleaning regime, slopes, and the shoes or boots that personnel are wearing.

Contamination

Floors can be contaminated by a wide variety of things, such as water, fats, oils, food debris, and a combination of them. The greater the contaminant viscosity, the greater the texture required to achieve the desired slip-resistance. Table 2 indicates the typical minimum values of peak-to-valley roughness levels, as measured by the micro-roughness meter, required to give satisfactory slip-resistance for different contaminants.

This is a good supplementary way of

determining slip-resistance in combination with the Pendulum Tester or other dynamic method.

TABLE 2: NEEDED MICRO-ROUGHNESS FOR CONTAMINATION

Minimum roughness, μm	Contaminant
20	Clean water, coffee, soft drinks
45	Milk, soap solution
60	Cooking stock
70	Olive oil
>70	Margarine

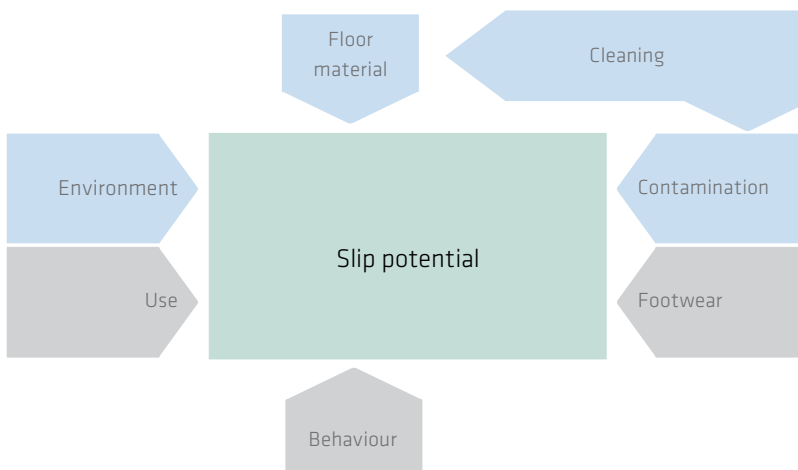
CLEANING AND MAINTENANCE

Cleaning methods must always be adjusted to the environment and operations. Higher surface roughness, for instance, requires more scrubbing and mechanical work, and a rough floor needs to be flushed with higher amounts of water than a smooth one. On the other hand, constant application of intense and frequent mechanical cleaning may wear down the floor surface and result in lower slip resistance over time than what was originally specified.

For this reason, some owners have introduced the “Sustainable Slip-Resistance” approach for their production facilities. In this case, long-term slip-resistance is checked by a test in which the coefficient of friction is measured at the outset for a new floor surface and then again after numerous cleaning cycles.

The most effective cleaning method normally requires the use of mechanical floor cleaning machines in conjunction with appropriate cleaning chemicals. An important part of managing slip resistance is to ensure the cleaning regime complies with the flooring manufacturer’s recommendations.

GRAPH 3: FACTORS INFLUENCING ON SLIP POTENTIAL



SELECTING FLOOR ROUGHNESS IS OFTEN A TRADE OFF BETWEEN CLEANIBILITY AND SLIP RESISTANCE

SLOPES AND SURFACE REGULARITY

Slopes are needed to move liquid across the floor to a drain by gravity. Meanwhile, slip-resistance requires surface roughness, which can impede the flow of liquid toward a drain. Steeper falls increase the gravitation effect but may create problems underfoot. There are no standards for falls, but food industry norms suggest ratios between 1:100 and 1:80, and as much as 1:50 in free draining floors. Notwithstanding, a textured surface may require a higher fall to allow fluids to drain naturally.

The degree of fall and the surface regularity i.e., flatness of screeds, largely determine the tendency for water and other contaminants to “pond” on the floor. Ponding can result in higher contaminant film thickness, which can reduce slip-resistance. For synthetic resin flooring, the BS8024-1 standard specifies the degree of regularity required to minimize ponding.

Flaws in surface regularity can cause trip hazards, increased wear, problems with vehicle wheels, and difficulties installing equipment. Surface regularity is generally measured by a 2 m straightedge laid flat against the screed and measuring any deviation between the two with a slip gauge or other device. According to British Standards specifications, surface regularity for screeds are classified as in the Table 3.

FOOTWEAR

In industrial flooring situations where floors are wet and contamination is unavoidable, workers should use footwear specially designed for those conditions. Not all “safety” shoes are necessarily safe in all situations. The material that a sole is made from and its texture will determine its slip-resistance against a given floor surface. After matching up variables, shoes and boots should be regularly inspected for wear, as should floors for any significant surface changes.

Safety is everyone’s responsibility, from the very top of a company to people working at all levels. Safety should be a fundamental part of every company’s corporate culture. Workers who feel the company cares about them care about the company.

At Sika, we have the products and services to help make your workplace safer and more productive. We can help you choose the right flooring with the right functionality, the right ease of cleaning, and the right level of surface roughness for all parts of your facility. When you think floors, think Sika.

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TABLE 3: SPECIFICATION FOR SURFACE REGULARITY

Class	Maximum Permissible Departure from a 2 m Straight Edge - mm	Application
SR1	3 mm	High Standard: Special floors
SR2	5 mm	Normal Standard: Normal use in commercial and industrial buildings
SR3	10 mm	Utility Standard: Other floors where surface regularity is critical





A GOOD CHOICE IS AN INFORMED CHOICE

CLEANROOM MEASUREMENT TECHNOLOGY AS APPLIED TO FLOOR AND WALL SYSTEMS

There are a lot of things that different industries have learned from one another over time. One example is the food and beverage industry and what it's learned from pharmaceuticals, particularly how those companies conduct their research and run their production operations.

Markus Keller, Gabriela Baum, and Udo Gommel of the Fraunhofer Institute for Manufacturing Engineering and Automation IPA in Stuttgart, Germany developed a white paper entitled "Research on hygienic coating systems: particle emission, outgassing, chemical resistance, biological resistance and cleanability."

The paper is based on extensive research done by Fraunhofer IPA. The research reflects a pharmaceutical approach to measuring the various properties and environmental effects of floor and wall coating materials inside a food plant. The result is the creation of additional tools which owners and specifiers can use to make informed choices regarding the best materials suited for their specific operational needs. As the paper's title implies, it's far ranging in scope. It also sets the pharmaceutical industry as a benchmark for the food industry. There's a strong correlation between the two, one reason being they have to combat the same enemies: particles and microorganisms.

PARTICLE EMISSION

The white paper begins with an overview of the importance of a hygienic manufacturing environment. "In order to minimize

contamination risks during manufacturing processes, production environments need to be carefully planned to ensure that no sources of contamination will be present in the final product," say the authors. "Due to the large exposed surface area in production settings, coating materials that are used to make walls and floors need especially to be taken into consideration." This relates largely to the particles they emit, but also includes chemicals, outgassing and other factors as well.

One of these factors is air quality as described in the EU-GMP Guideline Annex 1 for the manufacture of sterile pharmaceutical products. In a typical production environment, for instance, particles between 10 and 20 μm in size make up the majority of airborne microorganisms. Reducing them by 5 μm or more automatically reduces the count.

Wear and tear are other factors – stresses caused by transport trolleys, forklifts, and other equipment and the potential they have in releasing particles from floor abrasion into the air. Further, if a material corrodes or becomes brittle and cracks as the result of an aggressive cleaning agent, it not only loses its material properties, but may also become

a dangerous source of particulate emissions. Fraunhofer IPA developed a prototype "Cleanroom-suitable tribiological test bench IPA" to measure particulate emissions from material surfaces.

BIOLOGICAL RESISTANCE

Biological resistance has to do with whether materials are inert to molds and bacteria, or if microorganisms are able to interact with them. For example, if process water accumulates in the joint of a poorly sealed flooring system, mold spores if present could flourish because of the good local growing conditions (humidity, temperature, nutrients) and become a major source of infection.

How resistant are various materials to harboring mold and bacteria growth? Right now, the only measurement method used is simple visual observation made after a material allowed to incubate at a certain temperature for a certain time with results plotted on a chart for comparison against other materials. Currently, there's a push to replace subjective visual assessment with more reliable objective mechanical assessment instead.

VOC OUTGASSING

In case of reactive systems (e.g., organic



resin floors versus tiles or ceramics), care must be taken to ensure that the outgassing of organic contaminants (VOCs) is kept to a minimum in order to protect employees and if sensitive processes are concerned the products as well. The quantity of organic compounds released into the air depends on surface area, outgassing time, age and temperature of the materials in question.

The process Fraunhofer IPA used to determine outgassing of various floor and wall coatings in this research involved a number of sophisticated measuring instruments and a micro chamber heating device that hold the test material pieces at 22° +/-1°C for one hour before gases were siphoned off for analysis.

CHEMICAL RESISTANCE

Different materials react differently to the same chemicals and there are several internationally recognized methods for assessing their resistance to them. Flooring materials, particularly in food and beverage plants, should have the highest level of resistance. Case in point: as a rule of thumb the under-surface of a flooring system should be permanently sealed and liquid-proof. If it isn't, liquid residues from a previous cleaning or disinfection process can linger for long periods. If the flooring has poor chemical resistance it will likely start corroding as a result.

The procedure for assessing chemical resistance is called 'Immersion Test'. The flooring samples measured are placed in a receptacle filled with the chemical in question. The receptacle is then hermetically sealed. After being exposed for periods of one, three, six and 24 hours, the materials are examined under a microscope for blistering, discoloring, swelling, softening, reduced scratch resistance, and other effects,

with results recorded in comparison. The chemicals used in the test present a representative spectrum of chemicals used in cleaning and disinfection agents.

CLEANABILITY

A clean floor makes for a healthy working environment and safe, healthy food. Different floor and wall systems have different cleanability characteristics. Which one is best suited for your operation? A well-known and widely-used method of finding out is called the Riboflavin Test.

It consists of preparing a contamination solution made of 0.2 g riboflavin, 1000 ml ultra-pure water and 5 g hydroxyethyl cellulose and spraying it onto the test piece. Once it's dry, it simulates a worst-case contamination scenario including the most stubborn soils possible. To clean it off, a cleanroom cloth is moistened with ultra-pure water and wiped over the surface using a linear wiping simulator with standardized surface pressure and wiping speed. There are machines set up to do this in a controlled and consistent manner. After wiping, residual fluorescence from the solution is

measured, photographed and plotted for comparison against other test samples.

CONCLUSIONS

A comprehensive understanding of the many aspects of cleanliness in hygienic manufacturing is the key to selecting suitable flooring systems for hygienic production in every industry including food and beverage. Reliable and consistent procedures for measuring particle emissions, biological resistance, VOC outgassing, chemical resistance, and cleanability make it possible to compare materials objectively. Many of the test procedures in this research are either already part of an ISO standard or in the process of becoming one.

As for the pharmaceutical industry, it's always been cleanroom-friendly and recognized for having pioneered a scientific approach to measuring the cleanliness of a plant, its processes, and the materials in a consistent and objective manner. It's encouraging to see the food industry catching up. This research program led by Fraunhofer IPA and supported by SIKA is an important step in this direction.

THE RESULT OF A CLEANABILITY TEST OF THREE DIFFERENT SURFACE FINISHES

	Smooth surface	Broadcasted surface	Textured surface
Prior to cleaning			
After cleaning			
Result	Excellent	None	Excellent

Source: Fraunhofer IPA.



PUTTING HYGIENE FIRST

Food hygiene, public health and ultimately the success of any food manufacturing business is influenced by a number of important factors, one of which is drainage. Here, Mr **Vaclav Kralicek**, ACO Group Segment Manager Food and Beverage, gives us an overview of some of the key areas to consider when it comes to specification.

Thanks to recent research and improvements in best practice guidance issued by various bodies, the food and beverage industry increasingly recognises that poor hygiene can be caused as a direct result of bacteria that's present in a processing facility's drainage. As a result, it's now widely accepted that hygienic drainage is critical to any food manufacturing or processing facility whether you're an international brewer or your business manufactures ready meals for a major supermarket.

So what specification factors are critical to the optimisation of hygiene?

One of the key things to understand is that if you want to ensure good hygienic

performance, you can't afford to consider drainage in isolation. You need to take three core areas into consideration: Drainage, flooring and cleaning. To quote the European Hygienic Engineering and Design Group (EHEDG), a leading source of independent best practice advice, "Drainage should be considered holistically from a site perspective as the site and each subsequent level of analysis has potential impact on hygienic operation."

It's essential that the drainage, flooring and cleaning regimes are compatible. The drainage design needs to connect properly with the surrounding flooring, an appropriate sealant needs to be used and the mechanical loads, thermal loads and

shrinkage of the floor substrate all need to be considered. This approach helps to minimise the risk of cracks forming where the flooring and the drainage connect, and removes the associated risk of bacterial harborage.

The flooring itself also needs to be fit for purpose with regards to slip resistant, durability and its load-bearing capabilities, and both the drainage and flooring need to work practically with the cleaning protocol for a facility.

Failure to consider the compatibility as well as the suitability of flooring and drainage designs can result in long term durability issues, higher than necessary

ACO HYGIENIC DRAINAGE



1 Edge in-fill

Design ensures stable and durable transmission between the gully and surrounding floor.

2 Effective slope

Build in slope +1% eliminates standing water and increases cleaning effectiveness.

3 Corners ≥ 3 mm

Internal radii measure ≥ 3 mm which increases cleaning effectiveness.

4 Dry sump

Completely drainable design which eliminates standing water.

cleaning costs, bacterial contamination and the ineffective collection of water and other liquids which then present a risk to both hygiene and via the creation of a slip hazard, health and safety.

When it comes to the drainage design itself, it needs to be fit for the purpose. Key questions to ask include: What type of drainage – line or point – is most appropriate; what falls are required in the floor; does the drainage system layout work in the context of the equipment you plan to use; what hydraulic capacity will you need, and what load and therefore what grating design will be required? The choice of drainage will also depend on whether it's required for use in a high, medium or low risk area. A number of even more detailed specification criteria then come into consideration.

1. CHOOSING THE RIGHT STEEL

Where hygiene is concerned stainless steel to EN 10088 with a roughness factor of 0.3 to 0.8 micro-metres should be used. An engineer or hygienic technologist also needs to consider operating conditions such as acidity and temperature, and to fully understand

the cleaning methodology and chemicals that will be used during the cleaning process before deciding which grade of steel to use. Refer to EHEDG Doc 8, section 6 for more information.

2. WELDING PROCESS

The manufacturing process with regard to welds and welding should follow the best practice recommendations of EHEDG Doc 9 and Doc 13, Section 7. Amongst other things, Doc 13 advises “welds must be continuous, round, smooth, ground and/or polished”, overlapping joints must not be used (if you weld a lap joint you create a void and that void will harbour bacteria) and welds should not be made in corners (if the drainage you specify is welded on a flat area, the manufacturer can ensure the weld is smooth and smooth contours eliminate crevices that can harbour bacteria).

3. PICKLE PASSIVATION

If it's not fully pickle passivated (FPP), stainless steel will suffer from corrosion and pitting which will lead to a risk that it can't be properly cleaned. It's essential that the drainage system is FPP (EHEDG Doc 18). Processors which use localised

pickling or pickle paste run the risk of failing to meet longer term durability requirements.

4. PRODUCT DESIGN CONSIDERATIONS

This affects both functionality and 'cleanability'. At the most basic level, ask yourself these questions: Is your design fully drainable, does your drainage have rounded corners with minimum radii of 3 mm and can your drainage be cleaned without power-washing?

If your drainage isn't fully drainable its hygienic performance will be compromised. Drainage channels need to have completely drainable dry sumps with engineered positive drainage features which prevent the build-up of stagnant water, odours, microbial growth and potential chemical hazards.

Sharp corners are harder to clean, particularly if they're situated at a right angle or bend which means there's a very real risk that the corner won't get cleaned effectively. To meet EHEDG best practice guidelines, drainage should have rounded component features and corners with minimum radii of 3mm.

And in spite of what some companies will tell you, one of the worst things you can do is power-wash drainage. Power-washing creates a high velocity spray that spreads the bacteria living in the drainage around the facility. Drainage should be designed in a way that ensures power-washing is not required.

5. INTEGRATION OF DRAINAGE INTO THE FLOOR

As stated earlier in this feature, the quality of drainage/floor connection is as important as drainage and flooring quality itself. Improper drainage/floor connection can compromise hygiene and lead to downtimes with costs attached to it. Best practice advice given in EHEDG document no. 44 - Hygienic design of food factories - states that drainage channels and gullies must be designed with usage of U-shaped visible edge profile of not less than 1.5 mm thickness. Any edge profile should be filled by

the drainage supplier with a waterproof material which can resist the vertical and horizontal stresses placed upon it and so eliminate areas for bacterial growth.

6. OPERATIONAL CONSIDERATIONS

Good health and safety plus cost management are key to any successful business. To optimise the safety of employees, some very basic requirements include the specification of slip resistant products and easy handling grates to avoid injuries and cuts.

With regards to cost, ask yourself how cost efficient will the drainage system be in the longer term? Is it easy to clean, reducing labor costs and downtime, is it durable so it requires the minimum amount of maintenance and how easy is it to work with on a day-to-day basis? Asking these questions at the design stage saves valuable time and money.

Finally and importantly, is the choice of drainage design and flooring future proofed? Food trends change continuously but, construction and refurbishment of food manufacturing facilities is a long term investment and areas such as floors and drainage are costly and disruptive to change. By considering long-term requirements at the start instead of the end of the design process, food factory operators can save themselves a great deal of money and inconvenience in the longer term.

In conclusion, drainage and flooring have a significant impact on the successful operation of any food or beverage manufacturing facility. There are many other standards and guidelines you can refer to but even if you only meet these criteria, you will have taken some significant steps to putting hygiene first.





CHOOSING SEAMLESS WALL COATINGS FOR YOUR PLANT

Hygienic wall finishes are an important aspect of every food plant. Walls inside a production facility cannot fail – surfaces shall not flake, the walls cannot emit particles or gasses that could affect the quality and safety of the food being processed, they have to have easy and effective cleaning capabilities at any temperature, they must be resistant to the cleaning and disinfection regime in place, they need to expand and contract without cracking, they should provide a smooth surface, have a good impact resistance and, last but not least, be affordable.

And that's done by coating absorbent surfaces like blockwork, concrete, and renders with the right specialized finishes.

Considering their construction and the fact they are largely out of the way of

normal production, walls present many more options in material choice and design than floors, which have to put up with forklifts and other traffic, heavy machine weight, chemicals, intense heat, and other stresses.

The only part of a wall that isn't naturally protected is the area closest to the floor. It can suffer damage from forklifts, pallets, falling tools, and other things. For this reason, in addition to choosing the right coating, base details have to be taken into account and safeguards

put into place, such as barriers made of material that's strong enough to absorb any impacts.

UNREINFORCED, REINFORCED

Coatings are applied in liquid form and there are two main types: unreinforced paint coatings, and reinforced resin coatings.

Each has its own special characteristics and both are used in new installations as well as in the renovation of existing wall surfaces, such as glazed tile, plaster, brick, concrete and others.

Among the most common coatings found in typical food processing facilities are reinforced two-component epoxy and polyurethane resin-based products.

Meanwhile, less critical areas often use unreinforced systems, namely paint coatings. These tend to be rather thin (less than 500 microns) and lose their stability if they become detached from the substrate.

These systems are normally used in areas such as corridors, warehouses, staff rooms, and other areas. If used in open food processing rooms, they have a potential for flaking off and contaminating the food being produced.

Some of the reasons why coating systems fail, no matter if they are unreinforced or reinforced, include:

- Deterioration of the substrate
- Water vapor permeation through the thin film

- Harmful process conditions such as steam vapor
- Lack of resistance to hygienic processes such as chemicals, disinfectant used and low pressure steam cleaning
- Change in the original use of the building

High performance coating materials perform best in food processing areas when used with a reinforcement mat. The glass fiber laminate bonds the resin and reinforces the coating. This eliminates the potential for flaking and forms a self-supporting structural layer.

Reinforced resin laminates are an excellent choice for refurbishing existing wall finishes such as old tile, or for providing a new hygienic finish to unsuitable wall,



WITH RESIN COATING SYSTEMS THE JUNCTIONS CAN BE MADE TOTALLY SEAMLESS

column or ceiling constructions such as concrete, brick, plaster, and rendered finishes.

SEAMLESS

Reinforced resin laminate systems are seamless. In the application process, laminate sheets are merged or staggered with adjacent sheets "wet on wet." The adhesion between the laminate and the cured layers is excellent, and the joints in the finishing layers are also staggered providing not only a seamless appearance, but more importantly seamless performance.

The final thickness of the system depends on the number of layers applied. Normally for wall finishes, the layer thickness is appr. 1 mm. However, laminate mats can be found in any thickness.

When applying the laminate, the substrate must be clean and solid. Whether the substrate needs to be primed or not depends on its condition. In case the moisture content is high, which often occurs in refurbishment projects, it's best to choose a system, such as

the Sikagard® Wallcoat AS-13 or AS-53, which can tolerate dampness.

Often the surface profile of the existing wall will show through the wall coating. This will not affect hygienic performance, but if it's not desired the solution is to render the wall to achieve a flat surface. Most coating systems for food environments are based on acrylic, water-based epoxy and polyurethane resins, which produce little odor or taint during the curing process. Good colors to choose are lighter shades for functional and hygienic reasons.

WHY RESIN?

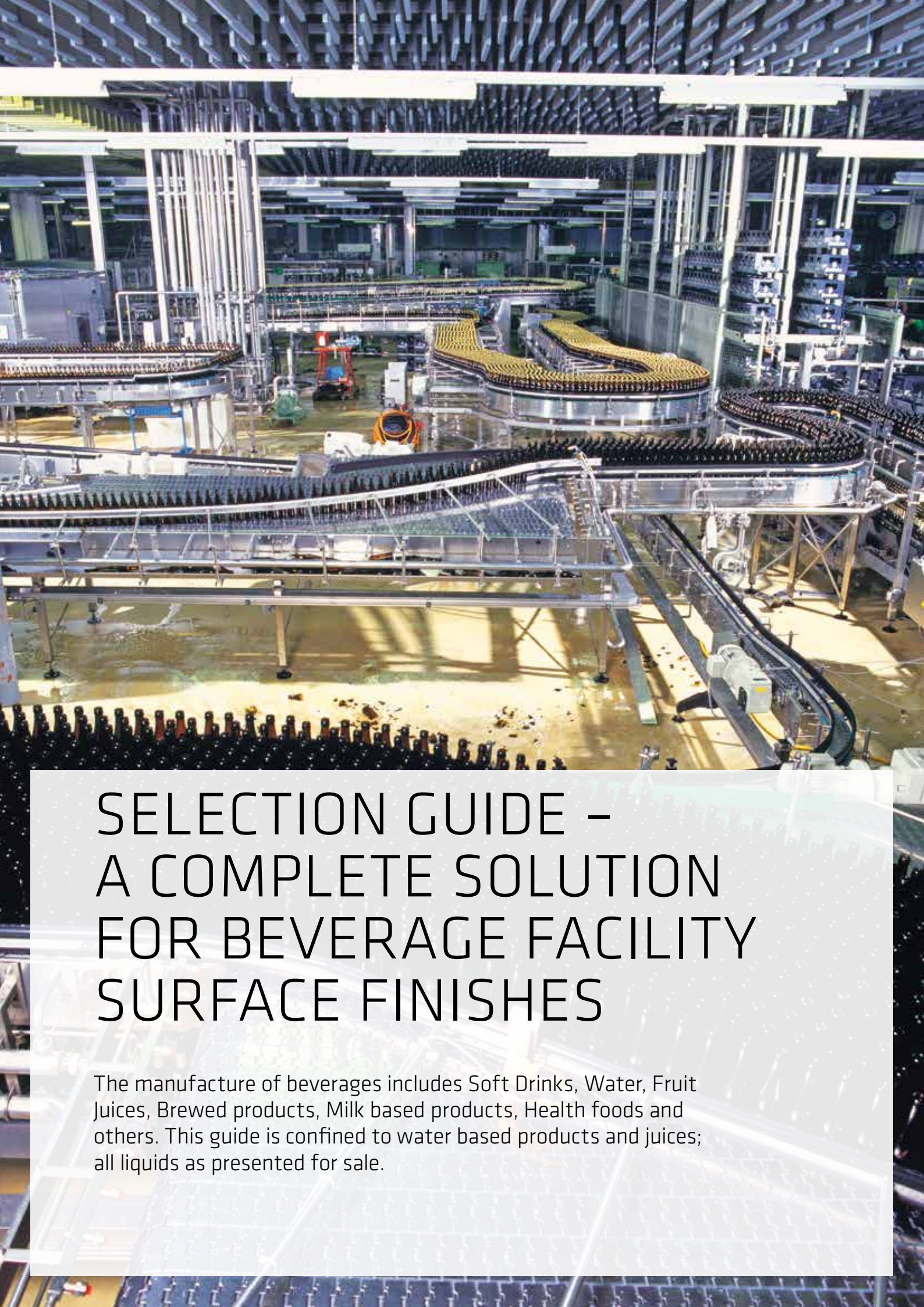
The big advantage in using resin laminate coating systems for walls and ceilings is that junctions are totally sealed and provide no easy environment for bacteria and mold to grow. Sikafloor® and Sikagard® solutions provide a simple and highly effective method for achieving surfaces that are smooth and easy to clean, hard wearing, and free from joints and other features that can create a hiding place for dirt and bacteria.

The wide range of Sikagard® Hygienic Coating systems are ideally suited for all areas of a food and beverage facility – from the office to warehouse, and from process area, to packaging rooms and to clean rooms. They are resistant to moisture and are elastomeric, which means they can adjust to thermal and structural movement without flaking or cracking and bridge cracks up to 1 mm width, depending on the chosen reinforcement. Because the systems are liquid applied, they are easy to repair simply with more liquid if needed, which increases system life expectancy and minimizes maintenance.

Sika coating have been fully tested in accordance with many European standards, including EN13501 (behavior to fire), ISO 846 (biological resistance), EN 18033 (wet scrub resistance and opacity) and ISO 22196 (Antimicrobial activity).

To ensure low emitting properties Sikagard® Hygienic Wall coatings are also equipped with A+ certificate, related to French requirements for indoor air quality.



A high-angle, wide shot of a modern beverage manufacturing plant. The facility is filled with complex machinery, including multiple levels of conveyor belts. In the foreground, a long conveyor belt carries a large number of dark glass bottles. Further back, other conveyor belts are visible, some carrying golden-colored liquid in containers. The ceiling is high and features a grid of structural beams and numerous industrial lights. The overall atmosphere is one of a busy, large-scale industrial operation.

SELECTION GUIDE – A COMPLETE SOLUTION FOR BEVERAGE FACILITY SURFACE FINISHES

The manufacture of beverages includes Soft Drinks, Water, Fruit Juices, Brewed products, Milk based products, Health foods and others. This guide is confined to water based products and juices; all liquids as presented for sale.

Unit processes in such plants are not complex and, depending upon product, include extraction, blending and packing; some refrigerated storage may be included. Non-chilled products are usually subjected to UHT¹, heat, processing. As such products are for human consumption, manufacturers have special concerns over hygiene and consistent product quality; therefore most unit operations are fully enclosed using pipelines and pumping to transport in a plant, follow strict hygiene regimes, involve many stages of quality control, employ the highest standards of cleaning and maintenance and high speed packing including aseptic systems.

PROCESS AREAS

UNIT PROCESSES

- Extraction - in case of fruit juices and concentrates; usually done in cold. Chillers for storage.
- Sugar solutions manufacture - concentrates made by dissolving raw sugar in water at elevated temperatures.
- Liquids blending - sugar solutions, water, concentrates, flavorings, colorants, preservatives, additives etc. often at elevated temperatures.
- Sterilization - maybe in-line or in steam heated autoclaves if product already canned. Also UHT(1 process)
- Packaging - in variety of containers including cans, PET bottles, glass bottles, crates, and pallets.
- Sealing and labeling
- Chilling

OTHER PROCESSES

- Storage and preparation of cleaning material specially CIP systems
- Bottle washing - caustic washers at high temperatures often with steam - such facilities may be in-line with automatic washers/rinsing equipment/driers with bottles passing direct to filling lines.
- Large stainless steel component storage facilities with associated pumping plant.
- Storage of raw materials
- Washing of incoming raw materials - fruit - with weak alkaline solutions
- Peeling, if required.
- Waste storage and treatment
- Water treatment and purification
- Warehousing and dispatch
- Quality control laboratories

OFFICE AND UTILITY AREAS

In addition to process area, commonly production facilities have number of other utility and office rooms including:

- Laboratories
- Social rooms and lavatories
- Offices and meeting rooms
- Canteen
- Kitchen

BASIC BEVERAGE INDUSTRY FLOOR REQUIREMENTS

RAW MATERIALS

The list of component materials in beverages may be large including:

- Water
- Fruit juice extracts
- Fruit juice concentrates
- Sugar and sugar solutions
- Proprietary concentrates
- Carbon dioxide
- Fruit acids - e.g. citric, acetic, maleic, malic, ascorbic
- Preservatives - e.g. sodium benzoate, benzoic acid sodium sulphite
- Mineral salts - e.g. chlorides, nitrates, bicarbonates, sulphates, phosphates
- Inorganic acids - phosphoric
- Flavorings - natural and synthetic, often oily in nature
- Colorants - natural and synthetic, caramels
- Dispersants - surfactants, emulsifiers, sometimes solvents
- Vitamins

CLEANING CHEMICALS

- Inorganic acids - nitric, phosphoric, hydrochloric, sulphuric
- Organic acids - citric, oxalic
- Alkalis - caustic soda, caustic potash, ammonium, carbonates, bicarbonates, hydroxides
- Surfactants - nonionics, anionics, cationics, amphoteric
- Sequestering agents - EDTA, metasilicates, organic phosphates
- Sterilants - hypochlorites, iodine complexes, cationics, peroxides, amine complexes
- Proprietary acid and alkaline products
- Proprietary blended sterilants, bactericides and bacteristats + detergents

TRAFFIC

Mainly foot and fork lift trucking around 5 tons gross weight especially in packing and dispatch areas and where containers are stored and handled. CIP chemicals may be delivered in bulk but this operation is usually external to plant.

IN A BEVERAGE PLANT THE FLOORS IN MOST AREAS ARE CONTINUOUSLY WET. THIS CAUSES SAFETY AND HYGIENE CONSIDERATIONS

SPILLS

As processing of Beverages is a liquids operation, the potential for spillages throughout a facility is high. Facility flooring may often be continuously wet; so floors are laid to falls to drains, usually stainless steel. Further, wet floors create a potential for slipperiness so that non-slip finishes are needed on safety grounds.

Spillages are usually water based but may contain any of the raw materials and chemical cleaning and chemical processing materials; rarely at high strength except for sugar solutions and cleaning chemicals that may be at elevated temperatures rendering them more corrosive. Being water based, there is potential for evaporation of the water solvent thus becoming more concentrated and corrosive.

Spills of organic matter such as fruit pulps, sugars etc are a potential for microbiological action especially in the warm and wet environment.

PROBLEM AREAS

As floors are almost continuously wet in most areas, there are Safety and Hygiene considerations.

The use of hot concentrated sugar solutions, organic acids and high temperatures, including steam, of cleaning systems both of plant and containers, creates a very aggressive corrosive environment especially when there are spillages. The moist and warm environment is conducive to microbiological growths, especially mould on floor, wall and ceiling surfaces; any surfaces that are porous.

There is a need for run-off to drains of all liquid spills and ease of wash-down and removal of cleaning material; floors must be laid to falls and an integrated floor to drain seal that can take differential thermal movement. In addition, Food Industry Standard coving, plinths for plant etc. must be installed and have same performance characteristics as the floor.

With thermal shock a potential and cycling of plant temperatures, slab movement is probable; floors must incorporate movement provisions. Also isolation of vibrating plant to slab and floor structure is important in order to prevent the failure through cracking and delamination.

Surfaces must:

- Resist spills of raw materials and chemicals
- Be capable of withstanding raw materials and chemicals at temperatures up to 100°C
- Not support microbiological growths and be sterilized with steam, if necessary
- Be non-slip and safe
- Be laid to falls to drains
- Be capable of withstanding thermal shock
- Be non-staining, non-dusting, non-toxic, biologically inert, odor free
- Withstand mechanical wear and tear; resist fork lift trucking, abrasion and impact
- Be easy to clean and maintain
- Be integrated with minimum of joins and seams; coatings enveloping all surfaces
- Have aesthetics required for food industry standards.
- Meet any relevant industry regulations and standards

Any and all seals at drains, tops of coves, expansion/isolation/construction joints, footings for vibrating equipment etc. shall be formed and filled with a sealant Sikaflex® Pro3.

The whole of coated surfaces, horizontal and vertical shall be keyed together to provide a continuous integrated enveloping surface over the entire plant substrate.

All recommendations are to be executed on correctly prepared concrete substrates in accordance with Sika published instructions by an approved, trained and supervised Specialist Contractor appointed by Sika. Preparation shall be executed in accordance with Sika instructions and recommendations.

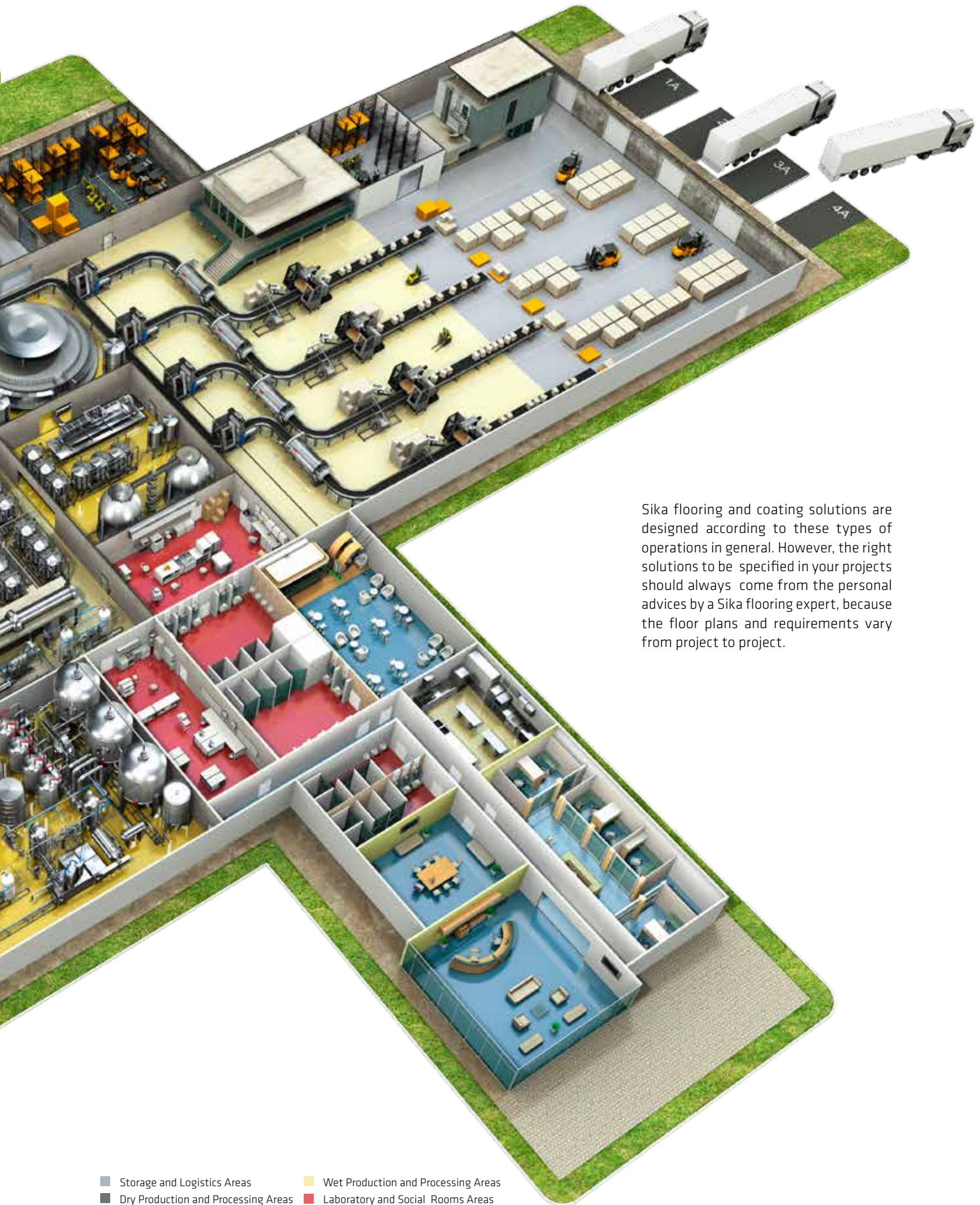
¹ UHT (Ultra-high Temperature Processing or Ultra-heat Treatment) sterilizes food by heating it above +137°C - the temperature required to kill spores in milk - for 1 to 2 seconds. UHT is most commonly used in milk production, but the process is also used for fruit juices, cream, soy milk, yogurt, wine, soups, honey and stews.

https://en.wikipedia.org/wiki/Ultra-high-temperature_processing



SIKA FLOORING AND COATING SOLUTIONS





Sika flooring and coating solutions are designed according to these types of operations in general. However, the right solutions to be specified in your projects should always come from the personal advices by a Sika flooring expert, because the floor plans and requirements vary from project to project.

- Storage and Logistics Areas
 - Dry Production and Processing Areas
 - Extreme Exposure Areas in Production and Processing
- Wet Production and Processing Areas
 - Laboratory and Social Rooms Areas
 - Office Areas



SYSTEM SELECTION FOR BEVERAGE FACILITY SURFACE FINISHES

Main Process	Functional Zone	Floor Solutions							
		Sikafloor® HardTop	Sikafloor® PurCem®					Sikafloor® MultiDur	
			Sikafloor®-1 MetalTop Sikafloor®-2 SynTop	HM-20	HB-21	HB-21 Gloss	HS-21		HS-21 Gloss
Unit Process	Fruit Extraction ¹								
	Sugar/Syrup Plant ¹								
	Blending/Formulation Plant ²								
	Sterilization/Autoclaves/UHT ³								
	Packaging/Capping ⁴								
	Labelling								
Support Processes	Delivery Areas/Empty Bottle Reception ⁵								
	Raw Material Storage								
	Washing Incoming Materials ⁶								
	Peeling ⁶								
	Waste Storage ⁶								
	Water Purification ⁷								
	Chemical Storage								
	Raw Material Storage								
	Bottle Washing/Bottling ¹								
	Warehouse/Dispatch								
	Quality Control								
Offices and Utilities	Laboratories								
	Offices/Meeting Rooms								
	Reception								
	Social Rooms/Lavatories								
	Kitchen								
	Cafeteria								

* Note: These are guide recommendations, always consult a local Sika expert for specific project advise and specification. Local site conditions and regulations may require a tailor made specification.

¹ Thickness 9 mm

² Thickness 6 mm

³ Thickness 12 mm recommended at access to autoclaves, 9 mm other areas

⁴ Thickness 4 mm. In wet areas HB-21 Gloss, in dry areas HS-21 Gloss

POWERFUL TRENDS ARE DRIVING FLOOR AND WALL EVOLUTION IN F&B



Stellar, fully integrated firm focused on design, engineering, construction and mechanical services worldwide is ranked as one of the top food processing design-build firms in the world. Based in Jacksonville, Florida, its expertise in the F&B industry extends over multiple market segments, including everything from seafood and poultry to beverage, and bakery and ready-to-eat. **Manny Valdivieso**, Architect AIA at Stellar, says demands on floor and wall suppliers continue to increase, particularly as economical and regulatory issues continue to tighten.

“We’ve found clients’ biggest concerns surrounding floor and wall surfaces to be financial, both with installation costs and life-cycle costs,” says Valdivieso. “Owners want floor and wall surfaces that are both affordable and specifically suited to their food plant’s conditions. Warranty options are also an important area of consideration.”

Floor and wall systems are a large part of the facility investment material selection process. The system must be durable and equipped to withstand heavy washdown practices while protecting the original concrete surfaces, such as slabs and walls.

Valdivieso says when writing specifications and selecting floor and wall coatings, Stellar always discusses the owner’s requirements, washdown practices, and chemicals. The firm also obtains the owner’s MSDS sheets and provides the information to the supplier for review. “We appreciate when the supplier reviews the provided documentation

and recommends a system best-suited for the plant’s specific needs.”

DESIGN

Stellar employs the latest in Building Information Modeling (BIM) to facilitate more educated decision-making throughout the life of F&B projects. This technology allows owners to visualize a facility in 3D before it’s built, and let’s then see the impact of any changes made to materials and finishes. “It’s important for floor suppliers to have BIM objects available to both facilitate and streamline this process,” notes Valdivieso.

Combining proven food expertise with BIM technology helps to ensure facilities are sanitary and food-safe, effectively optimize the space needed for production lines, and accommodate the possible future need to move large equipment for periodic maintenance or upgrades.

Another key area of consideration is cost of ownership. “The main criteria should be how well the system will withstand

chemicals, temperature fluctuations and mechanical shock from equipment used on the surface,” notes Valdivieso. “Owners often assume their systems will last a long time, so they do not discuss them in the preliminary design phase. Instead, they discuss systems with maintenance personnel after the systems have already been specified and designers are in the bidding stages.”

He adds that the greatest potential for improvement from suppliers lies in durability and warranty options. If the right information about project’s needs and expectations is provided to the floor or wall suppliers by the owner and designers up front, it could help them come up with a more attractive system warranty.

REGULATION TRENDS

Currently, there are a slew of compliance considerations for the F&B industry, including product certification standards (SQF code), government policies (USDA, FDA’s Food Safety Modernization Act), management systems (HACCP)



Source: Stellar.

and agencies (OSHA). Stellar anticipates the biggest trend in the future of construction to be an increase in these requirements.

He points out that as governing authorities continue to increase sanitation expectations, more hygienic and seamless floor and wall materials are taking command. "These are long lasting materials that can withstand the impact of chemical abuse, thermal shock, and temperature changes. Materials should also address vapor transmission from substrate," he notes.

That said, owners generally do not request certificates, but they want their systems to meet food industry standards nonetheless. "Installers themselves hold certifications illustrating they have received proper training and are equipped to install the systems properly."

Communication is another important factor in meeting construction schedule deadlines. Ideally, representatives should

be able to communicate in whatever country they're working in. "The ability to attend design meetings is also a huge advantage with suppliers," Valdivieso says. "In addition to being highly trained, suppliers should also be able to easily articulate material and warranty options."

These are some of the things on the "wish list" owners have regarding their floor and wall suppliers. There are others. He says working with companies that

are expert in processing design-build and with experienced suppliers such as Sika will help them make the right choice in meeting their specific requirements successfully.

"As a major design-build firm, we've worked with Sika in a variety of markets around the world, and we appreciate their top notch service, and impressive knowledge of floor, wall, and roof systems. Working with Sika has been a favorable experience every time."



Source: Stellar.



Sydney Fish market before renovation.

FLOOR RENOVATION IN AN OPERATING FACILITY – IT’S ABOUT SPEED AND PRODUCT SAFETY

Renovating a food or beverage plant is complex work that has its own unique challenges compared to building a greenfield facility. This applies equally to ceilings, walls, doors, utilities, lighting, floors, and all other major features.

One of the main issues during a renovation project is time, more specifically downtime and how to keep it to a minimum, which means minimizing interruptions to production in other parts of the plant that aren't being worked on. In addition, the work going on should be clean, odorless, and isolated by barriers as needed to make sure food remains clean and uncontaminated, and employees remain safe at all times

All this requires good planning and seamless cooperation between the project parties. Leading the charge should be an experienced main contractor who can make sure the right materials for the

job are chosen and installed properly. In the end, refurbished floors and all other features should have the same level of hygienic and functional performance as those found in a greenfield plant.

Two things that affect the time needed to install a new floor are application and curing. Time can be saved with both by choosing the right materials from the start, for instance ones that can handle high amounts of humidity in the cement substrate if that happens to be the case, which it often is. As for curing, choosing materials that do this faster than others can also save time. A third factor to be mindful of is potential product tainting

from odors, VOCs, and other emissions, especially during the application process. At particular risk are the more sensitive products – wet or moist as opposed to dry – such as dairy and meat.

Below are case studies of two companies, a fish market in Sydney, Australia, and a dairy in Günsburg, Germany. Both used Sika flooring and contracting partners who were certified to install them.



Operations continued during flooring works.

FLOOR UPGRADE IN A FISH MARKET – ODORLESS WITH SHORT DOWNTIME

The Sydney Fish Market, situated on the edge of Blackwattle Bay, has been an Australian institution since 1945. The market is the largest of its type in world with 50 tons of seafood being auctioned on the trading floor each day.

The original floor of the market had to handle a lot of stress. It was constantly wet, and had to endure a constant stream of forklift trucks carrying or dragging heavy containers laden with seafood from one end of the market to the other. Add to this an incredible amount of foot traffic, day in and day out.

After many years or of applying a variety of temporary fixes with varying results, the owner of the Sydney Fish Market decided it was time to upgrade to a food-grade floor replacement.

This meant the old floor had to be completely demolished, and the new one prepared, re-graded and then laid in stages, all while the market was still open for business. This required careful planning between all parties.

To prevent customers from being annoyed and food from being tainted during the process, the search was on for a floor that produced little or no odor, even during installation, that protected the food

against taint, and that could stand the test of time for at least 20 years.

The search ended when Danlaid Contracting Sydney along with Sika Australia proposed a Sikafloor® PurCem® HB-21 flooring system to the client. Sikafloor® PurCem HB-21 is a low VOC, water-based polyurethane hybrid screed that is certified for food industry use. It is resistant to significant heat variations and chemicals, easy to clean and maintain, and well-suited to both dry and wet areas.

Danlaid demolished the old floor to a

depth up to 50 mm using hydroblasting, which kept dust and airborne particles to a minimum and provided a solid substrate on which to re-build. Workers then re-graded the base to create positive falls for water displacement, and applied an epoxy sub-fill mortar and the Sikafloor® PurCem® HB-21 finish layer on top.

The floor ended up being part of a larger overall facility upgrade. It was business as usual throughout construction, and all aspects met projected budget and timeline schedules resulting in a well-satisfied client.



In Sydney Fish market 50 tons seafood is being auctioned every day.

WHEN TIME IS MONEY, AND YOU ONLY HAVE A WEEKEND TO RENOVATE

Zott SE & Co. KG is a major European dairy based in Mertingen, Germany, where the company's main plant is situated. There, it produces a variety of yogurts, desserts and "Zottarella," the brand name of the company's mozzarella cheese. In 2012, it along with Zott's "Bayernthaler" became the first cheese products in Germany permitted to use the "GM-free" label.

Bayernthaler, a hard cheese, is produced at a Zott plant in Günzburg, where all was not well with the tile floor. The tiles, which were held down by an epoxy-based adhesive, had begun to show a lot of wear and damage.

Zott's goal was to replace the tiles with a state-of-the-art seamless resin-based floor surface that was highly durable, chemical resistant, easy to clean, and slip-resistant. An additional requirement was timing – the whole job needed to be done over a two-and-a-half day weekend. The assignment went to Dynapox GmbH, a company based in Legefild, Germany that specializes in resin floor application, especially for the food and beverage industry.

Dynapox started on a Friday afternoon by removing the old tiles and the mortar bedding. Next, workers applied Sikafloor® HardTop-80 cementitious flooring screed

along with a bonding layer to level out any uneven concrete and provide a solid base for the flooring surface. The surface chosen was the seamless Sikafloor® PurCem® HM-20, a flooring system that is proven to be highly resistant to chemicals and thermal shock, and that is able to go into use a mere 24 hours after being allowed to set.

The result? Zott got a new state-of-the-art seamless resin floor for its plant in Günzburg, saved a lot of money by installing it over a weekend, and resumed full operations again the following Monday morning.



Zott Dairy in Günzburg.

SCHEDULE AT A GLANCE



FRIDAY AFTERNOON: Mechanical removal of old tiles and epoxy adhesive. Substrate preparation and cleaning.



FRIDAY EVENING: Application of the bonding layer and the cementitious fast curing Sikafloor® HardTop-80 flooring screed.



SATURDAY MORNING: Substrate preparation after curing of the screed.



SATURDAY AFTERNOON: Application of the Sikafloor® PurCem® HM-20 hybrid polyurethane flooring.



SUNDAY AFTERNOON: Floor back in use.



MONDAY MORNING: Plant resumes full operations.

SIKA@WORK IN FOOD AND BEVERAGE INDUSTRY

A selection of international clients and their production facilities where Sika solutions have been applied:

- Marbo Pepsico, Snack production, Backi Malic, Serbia
- Valio, Dairy production, Riihimäki, Finland
- Coca-Cola HBC, Bottling plant, Dietlikon, Switzerland
- Ferrero, Chocolate production, Guanajuato, Mexico
- Nestle, Coffee factory, Montes Claros-Minas Gerais, Brazil
- Zott Dairy, Gunzburg, Germany
- Lactalis, Dairy production, France
- SuKarne, Meat processing, Torreon, Mexico
- Dafgards Bakery, Källby, Sweden
- Floridis S.A. Meat processing, Athens, Greece
- Vinicole de Rivesaltes Bourdoil, Winery, France
- Carlsberg, Brewery, Dali, China
- Asahi Indofood, Beverages, Cicurug, Indonesia
- Cadbury, Chocolate, Port Elizabeth, South-Africa
- Mills DA, Dairy products, Fredrikshamn, Norway
- Frigosorno, Meat processing, Osorno, Chile
- Sölen Cikolata, Chocolate, Gaziantep, Turkey
- Orogel, Vegetable processing, Cesena, Italy
- Carrefour, Food handling and storage, Spain
- Lindner Hotel Gallery Central, Kitchen, Bratislava, Slovakia
- Sydney Fish Market, Fish trade, Sydney, Australia
- SAB Miller, Brewery, Guayaquil, Ecuador
- Molinos Rio de la Plata, Frozen food, Pilar, Argentina
- Micarna SA, Meat processing, Courtepin, Switzerland



ISTANBUL METROPOLITAN MUNICIPALITY, ISTANBUL, TURKEY

Sika solution:

Sikafloor® PurCem® for flooring in fish storage and freezer floor



RAIMBEK VOSTOK AGRO UST-KAMENOGORSK, KAZACHSTAN

Sika solution:

Sikafloor® PurCem® Gloss for flooring in a new dairy plant



DRAKE ADELAIDE, AUSTRALIA

Sika solution:

Sikafloor® PurCem® for flooring in a meat processing plant



**PILGER BAKERY
BREITENBERG, GERMANY**

Sika solution:
New bakery using Sikafloor® PurCem® flooring



**MALTEUROP
VITRY-LE VINCENT, FRANCE**

Sika solution:
Sikafloor® PurCem® for flooring and Sikagard® Hygienic Wall Coating for vertical surfaces in a plant refurbishment



**SCHENK ES TARSA KFT
SZIGETVAR, HUNGARY**

Sika solution:
Sikagard® Hygienic Wall Coating in a food plant refurbishment

HYGIENICALLY SEALED DETAILS

Joints and junctions are the weakest part of a flooring system in industrial environments. They are exposed to similar stresses as the floor itself, but also need to accommodate possible movements in the structure or between building components. Normally joint materials are elastic and also show lower resistance against mechanical and chemical stresses than the flooring material. These joints are most apparent between different components (e.g. drains, gullies), between floors and walls and around columns and entrances. Damaged, leaking and worn out joints allow dirt and bacteria to harbor.

In general, joints and details make daily cleaning and maintenance more difficult and time consuming when compared to seamless flooring. Building owners and managers often agree that joints and details are their biggest, most expensive problem when dealing with their current flooring system.

Therefore, it is ideal in food and beverage facilities to provide surface solutions with hygienic, jointless connections. Sika provides liquid-applied flooring system solutions which cure to provide a completely seamless, smooth floor with not cracks, gaps or joints.

Unique advantages with jointless hygienic junctions provided by Sika products include the following key features: anti-microbial, non-porous, easy to clean and maintain, long term durability, hard-wearing and good aesthetic appearance.

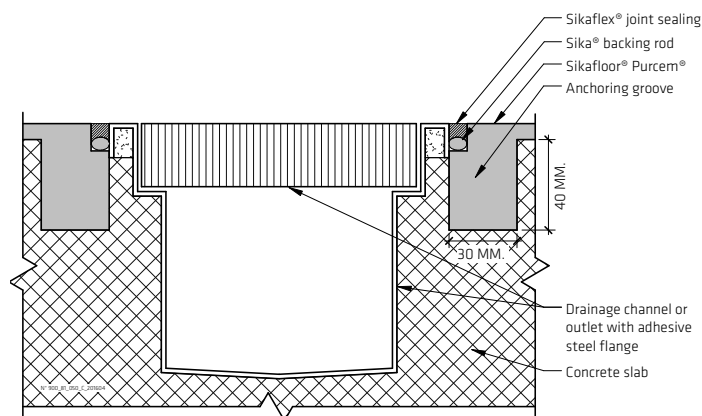
Sikafloor® flooring systems and Sikagard® wall coating systems do not support the growth of bacteria or fungus. As anti-microbial coating, such products prevent the growth of bacteria on the surface, thanks to the material constitution and lack of joint crevices. Because they are completely seamless, there are no hiding places for dirt and bacteria. Thus, it is easier and faster to clean and maintain a hygienic environment.

However, there is no way to prevent all of the joints in floors. The concrete substrate is subject to shrinkage during its initial cure period as well as temperature change causes slight expansion or contraction. These forces may cause movement in the structure and between different building parts.

Since the joints are the most susceptible areas in flooring applications, the proper planning and design of a floor joint, has to be performed with specific precautions to prevent the future damage. Sika® Floorjoint and Sikaflex® sealing solutions for floor joints are designed to



Sikafloor® PurCem® DRAINAGE CHANNEL - THERMAL EXPORURE AND DYNAMIC LOADING

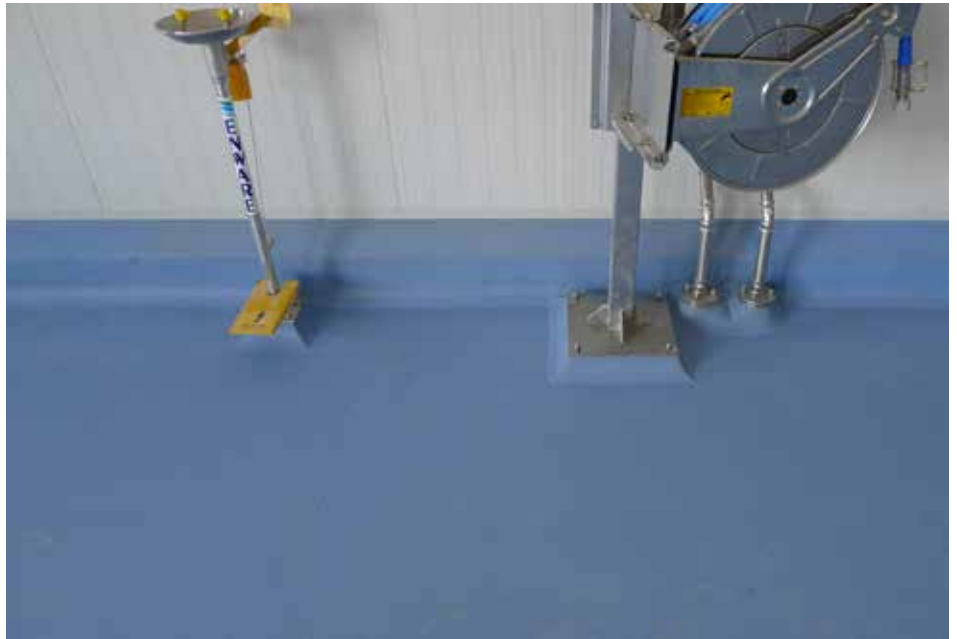


hygienically seal surfaces, with specific joint movement and mechanical wear resistance from traffic and structural movement. Water, aggressive cleaning agents and sanitizers used in food and beverage processing facilities also can impact the durability of floor joint sealants. Therefore, they must have suitable mechanical strength, chemical resistance and excellent adhesion. Precise requirements are dependent on the function and location of the respective joints.

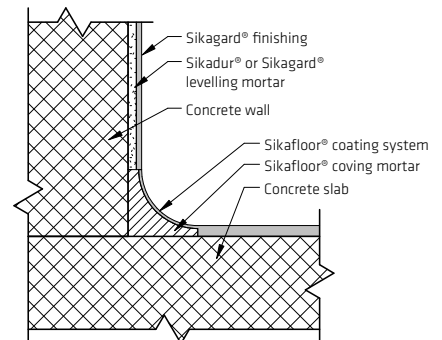
As shown in detail drawing and image, the radius cove is a standard Sika detail which is free of joints and makes a practically maintenance-free, smooth curve transition. Such coving is required at the floor to wall connection and other horizontal to vertical junction in food processing areas.

Sika flooring experts provide tailored detail drawings and advice for joint sealing solutions according to each unique situation.

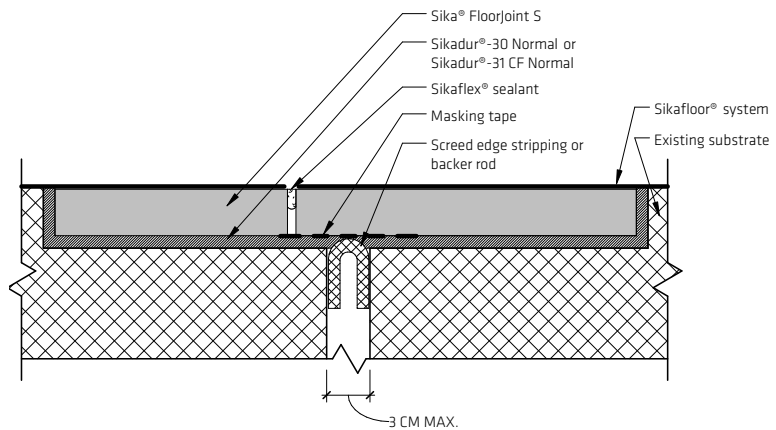
For movement joints in floors, for example between a freezer and production area, Sika has a new innovative joint profile solution Sika® Floorjoint, which can be seamlessly connected to any Sikafloor® resin flooring system and can be made watertight when combined with Sikadur® Combiflex SG System.



Sikafloor® FLOOR-WALL COATING CONNECTION WITH RIGID COVE



Sika® Floorjoint S FLOOR MOVEMENT JOINT





REGULATIONS AND CERTIFICATION IN FOOD AND BEVERAGE FACILITIES

Thousands of pages in many countries regulate various aspects of food law. Yet, it's surprising to find how slim those pages are regarding the design and construction for food processing plants.

The regulations for floors, walls and ceilings are even slimmer. The main requirements for floors concern cleaning, personnel safety and surface drainage.

For example, the EU the Regulation 852/2004 Annex II Chapter II says that the surfaces of floors, doors and walls need to be maintained in sound condition and that they should be easy to keep clean and, when necessary, easy to disinfect. The legislation states that "this will require the use of impervious, non-absorbent, washable and non-toxic materials."

All well and good. A separate rule claims that the floors have

to be made in ways that make adequate surface drainage possible. The regulations do not differ much between different continents and regions. Depending on perspective, this can either be a blessing or a curse: a company is given more freedom in design of the facility, but on the other hand, has less specific requirements on how to operate safely.

There are a number of independent associations that have created certification and approval programs for food safety. The quality of flooring weighs in heavily to all of these standards and certifications. Sika is pleased to help you sort them out for your particular application:

INDEPENDENT CERTIFICATION OF SIKA FLOORING AND COATING

ISEGA



Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 (Annex II Chapter II) on the hygiene of foodstuffs. ISEGA Test institute.

FDA & FSIS



The Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA) Food Inspection Safety Service (FSIS) which share the primary responsibility for regulating food safety in the United States. FSIS has responsibility over meat, poultry and some egg products. FDA regulates all foods other than meat, poultry and some egg products.

HACCP



HACCP (Hazard Analysis and Critical Control Points). Food production, storage, and distribution monitoring system for identification and control of associated health hazards. It is aimed at prevention of contamination before end-product evaluation.

CSM



“Cleanroom Suitable Materials” (1 is the world’s first standardized product qualification according to ISO 14644 and GMP standards for use in clean rooms. In food related areas: Biological resistance test assessing the action of bacteria and mould on the material, according to ISO 846. Riboflavin test assessing the clean-ability of the surface. according to “Clean-room Suitable Material” procedure. Fraunhofer Test Institute.

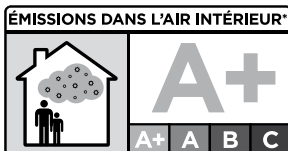
¹ “Clean-room Suitable Materials” is the world’s first standardized product qualification according to the ISO 14644 and GMP standards for use in clean rooms.

AgBB



AgBB (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten) is a scheme for health-related assessment of emissions of volatile organic compounds (VOC, VOC and SVOC) from construction products in Germany. The scheme has criteria for testing and assessment for VOC emissions from construction products suitable for indoor usage. It sets quality standards and restrictions relevant to VOC emissions for future production of construction products for indoor usage.

A+



ANSES. (The French Agency for Food, Environmental and Occupational Health and Safety) provides collective expert assessment of applications for the marketing of pesticides and biocides, as well as chemicals within the framework of the REACH regulations according defined procedure and criteria. It issues marketing authorizations, following assessment work, of plant protection products, fertilizers and growing media, and their adjuvants.

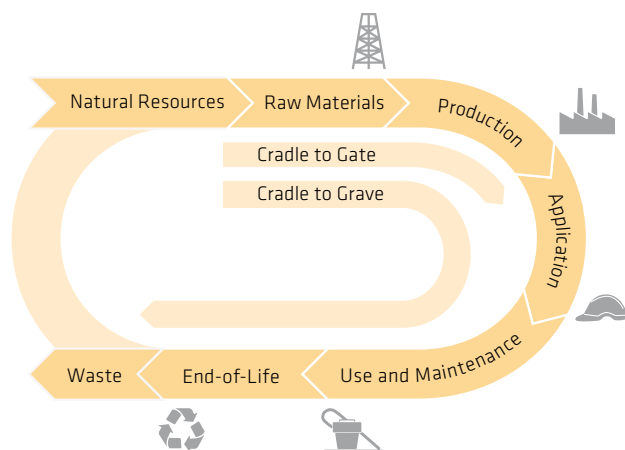
Campden BRI

Sensory evaluation of chocolate to test the taint potential of a flooring compound. Campden BRI Test Institute.

SIKA SOLUTIONS AND SUSTAINABILITY

Limited resources, climate change, water, and infrastructure are global megatrends which are re-shaping Sika's markets and also guiding Sika's business. As an innovator and technology pioneer, Sika thinks ahead and is committed to a better environment through an integrated product approach.

Sika's innovative solutions and our products sustainability are Sika's contribution to the sustainability of your projects. Being aware that environmental impacts occur at each stage of the product life cycle, Sika uses Life Cycle Assessment (LCA) methods according to the ISO 14040 series and Standard EN15804 to provide quantitative evaluation of the potential environmental impact of our products and services over their entire life cycle.



Therefore Sika works to develop:

- Energy-efficiency solutions
- Climate protection solutions
- Material-efficiency solutions
- Water-efficiency solutions
- All of which can contribute towards sustainable construction

Sika has always been a pioneer in supplying solutions to meet the highest environmental standards and actively aligns itself to various green building certification programs, including LEED, BREEAM and DGNB. Sika is looking to genuinely provide sustainable values and is a member of WBCSD, UNEP (SBCI) and Responsible Care.

Sika sustainability solutions focus on:

- Durability of the building materials
- Very low VOC and particle emissions from Sika product ranges to be tested and approved to the most stringent global standards for emissions including AgBB, AFSSET, and M1, etc., plus they also have the lowest fire ratings.
- Ease of use and ease of maintenance once the products have been applied.
- Development of recycling processes and facilities for Sika products.

Promotion of alternatives in specifying refurbishment solutions to contribute to a sustainable future with far less investment and resources than a rebuild.

We believe that in the future, this positive approach will remain crucial to Sika's success in the global market, and we will continue to anticipate and respond strongly to major environmental challenges ahead, which will undoubtedly continue to result in better and more sustainable solutions for all areas of construction.



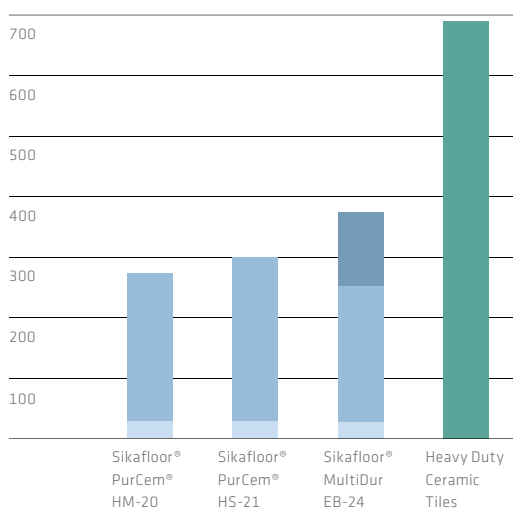
LIFE-CYCLE ASSESMENT (LCA) RESULTS FOR POPULAR Sikafloor® Purcem® FLOORING SYSTEMS USED IN FOOD INDUSTRY

The performed LCA* shows that the Sikafloor® Purcem® hybrid flooring has half lower Cumulative Energy Demand (CED) compared to other flooring solutions like High Duty Ceramic Tiles. This added with the life expectancy of fifteen years without any refurbishment - especially interesting property for

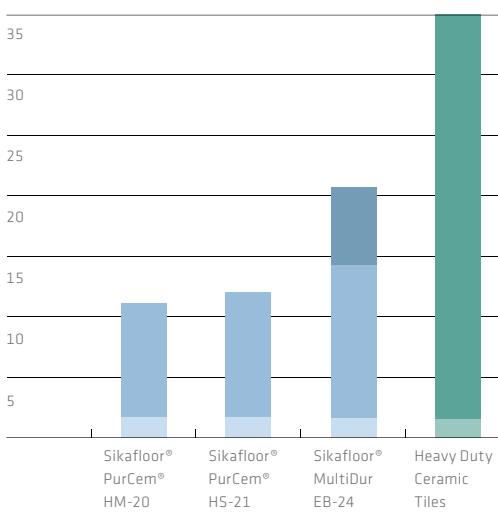
food and beverage industry. In addition the proven extremely low VOC emission values confirm the possibility to work and apply the product close to foods stuff during the production operations.

LCA RESULTS FOR POPULAR FLOORING SYSTEMS

Cumulative Energy Demand (CED) for 1 m² flooring system [MJ/m²], 15 years



Global Warming Potential (GWP) for 1 m² flooring system [kg CO₂-eq./m²], 15 years



■ Competitive Technology
■ Top Sealer
■ Base Coat
■ Primer
■ Adhesive

Note: Materials for repairs are included where they are required to provide the defined life expectancy (Sika ComfortFloor® PS-23, Sikafloor® MultiDur EB-24)

*Life Cycle Assessment (LCA) is a standardized method to assess and compare the inputs, outputs and potential environmental impacts of products and services over their life cycle. LCA's are increasingly recognized as the best way to evaluate the sustainability of products and systems. As a standard approach Sika evaluates all 8 impact categories. However for flooring, categories considered to be most relevant include: Cumulative Energy Demand (CED), Global Warming Potential (GWP), and Photochemical Ozone Creation Potential (POCP).

Sikafloor® SOLUTIONS – A SAFE AND DURABLE MATCH FOR YOUR SPECIFIC NEEDS



What makes a floor a Sikafloor®? At Sika, the global leader in innovative flooring solutions, we listen carefully to what our customers want and need, stay abreast of changes that can impact your business, and make significant investments in research, development and testing in order to bring you trusted, engineered solutions based on evidence and best practices. Our time-tested, proven approach is rooted in more than 100 years of experience developing technologies used in flooring as well as concrete production, below-ground waterproofing, roofing, sealing and bonding, and other industrial applications.

We know that your business has its own unique flooring requirements in terms of impact resistance, rolling load resistance, wear resistance, safety regulations, antistatic performance, chemical or fire resistance and, increasingly, quick and efficient installation. Because our products can be customized to meet your technical requirements while still complying with government regulations, you're assured of getting excellent solutions that have only the characteristics you want and need.

Sika is a global expert in all core technologies commonly used in our specialty area of seamless flooring. And, all Sikafloor® solutions are developed and manufactured according to industry standards as well as our own strict standards for quality assurance and business ethics. To ensure the perfect solution for your business, we offer several flooring families for you to choose from. The families are based on core technologies. Variations within each family allow you to find solutions fine-tuned to your individual needs. All of the families are bonded together by our core flooring values: seamless solutions for your needs, innovative designs, durable and sustainable performance by offering more value at less impact, and full professional support by expert field personnel who are not only the best at what they do but who also take great pride in their work and care about your project.

We design every seamless Sikafloor® product using liquid-applied synthetics or synthetic-cementitious-hybrids. Our synthetic solutions are ideal for a wide variety of applications which is why you find them in industrial buildings, food and pharmaceutical facilities, car parks, schools, libraries, hospitals, shopping malls, museums, apartment building balconies, private residential properties and other settings.

Our cementitious flooring solutions are designed for ready-to-use and subfloor preparation applications. For time-critical projects, we offer a unique technology that reduces the waiting time for moist concrete to dry - our Sikafloor® EpoCem® intermediate layers can be installed directly on green and damp concrete.



Whether you're a building tenant, owner or applicator, Sika has you covered. In addition to our array of product offerings, we can supply you with industry certifications, proof of product performance and a global network of flooring specialists. For applicators, we also offer training programs to ensure proper installations. We do these things because we believe in Building Trust.

SIKA PRODUCT OFFERINGS:



Sikafloor® MultiDur

Epoxy flooring systems by Sika, a global standard. Your workhorse for heavy-duty performance, these flooring systems offer excellent mechanical strength, wear-resistance and chemical-resistance. Although seamless floors, by definition, are aesthetically pleasing, color and design are typically not our customers' major driver in choosing these flooring options. Rather, functionality and delivering long-lasting performance is where these floors excel. Choose from smooth, textured, broadcasted (slip-resistant) and mortar finishes to ensure the usability, safety and cleaning regime best fitting your needs.

Within the Sikafloor® MultiDur family you will find special solutions with extremely high chemical resistance;

solutions approved for cleanroom usage; and electrostatic discharging, dissipative and electrically conductive flooring. For more basic flooring use and high performance wall coating needs, we offer water-borne coating systems.

Sikafloor® MultiDur solutions are commonly found in:

- Storage, logistics and sales areas
- Production, processing and cleanroom areas (dry and wet)
- Ground-bearing decks, car parks and parking garages
- Commercial, public and residential areas

Sikafloor® DecoDur

Decorative epoxy flooring systems by Sika. These added design options for heavy-duty flooring are perfect for projects where you want more than a traditional, uni-color design and need the performance of an epoxy floor. Within the Sikafloor® DecoDur family, we offer flooring solutions with different grades of mechanical and chemical resistance, all in a speckled design. Patterns range from a granite effect up to a larger full-flake design and are available in a variety of colors.

Typically, Sikafloor® DecoDur floors are installed with a smooth or lightly broadcasted surface texture. At your preference, we can finish the floor with a matte sealer designed to withstand common household and light-industrial chemicals or a tougher, more chemical-resistant, glossy finish.



Sikafloor® DecoDur floors are commonly found in:

- Life science facilities
- Laboratories
- High-pedestrian traffic zones in commercial and institutional buildings
- Food courts



Sikafloor® MultiFlex

Polyurethane flooring systems for heavy duty and industrial usage by Sika. Sikafloor® MultiFlex systems are known for their higher elasticity which allows for crack-bridging designs. Further, these floors excel in absorbing base floor movements.

Sikafloor® MultiFlex solutions include designs installed directly on top of elastic waterproofing membranes and are available with or without special surface protection. These floors are installed in smooth, light broadcast and heavy broadcast (high anti-slip) designs.

Sikafloor® MultiFlex can commonly be found in:

- Storage, logistic and sales areas (raised floors)
- Production, processing and cleanroom areas (dry and wet)
- Car parks, intermediate and top decks

Sika ComfortFloor®

With decorative, polyurethane flooring systems for commercial and residential applications by Sika, perfection has never been so close. Global technology leadership in industrial and resilient flooring comes together in our Sika ComfortFloor® family, offering seamless, high-end aesthetics for even the most discerning clientele. An environmentally friendly solution, Sika ComfortFloor® is mainly based on natural oils and organic raw materials. Its backing – comprised of resilient, acoustic isolation pads – are made of recycled rubber and foam particles.

Sika ComfortFloor® products offer nearly unlimited design freedom. They are typically installed in a matte finish and are available in 72 standard colors. Custom colors are also an option, as are two-tone “concrete-look” designs and the ability to create your own floor art. Additional options include broadcasted colored flakes for a speckled design and



a light, anti-slip surface texture for use in wet areas such as showers and toilet rooms. All products offer very high color stability.

Sika ComfortFloor® solutions are commonly found in:

- Institutional buildings such as schools,

museums, libraries and hospitals

- Commercial buildings such as shopping malls, hotels, office buildings and restaurants
- Residential buildings of high-end, modern design
- Therapeutic, restorative and exercise facilities, such as yoga or spa spaces



Sikafloor® MonoFlex

One-component, polyurethane flooring solutions for easy installations, by Sika. Sikafloor® MonoFlex flooring solutions have earned their excellent reputation based mainly on their performance as a waterproof finish for balconies, walkways and staircases with pedestrian traffic. These moisture-triggered solutions are true innovations in terms of sustainability and ease of application.

Upon request, broadcasted colored flakes can be added for a speckled design. A light or medium anti-slip surface texture can also be provided. All products in this family offer very high color stability.

Sikafloor® MonoFlex solutions are commonly found in:

- Balconies
- Pedestrian walkways and staircases

Sikafloor® PurCem®

Polyurethane cementitious hybrid flooring systems by Sika. These innovative flooring solutions deliver extreme performance in terms of mechanical and chemical resistance as well as reduced environmental impact. Because they're durable, low maintenance and available with resurfacing options, our versatile Sikafloor® PurCem® range of products is gaining global appreciation and can be found in a wide variety of heavy-duty applications. The special core technology of an elastic resinous binder reacting with cementitious fillers is what makes this product family resistant to high temperature variations, even thermo shocks for certain designs. Installation on damp concrete surfaces is possible with Sikafloor® PurCem®.

Typically, Sikafloor® PurCem® floors are installed in a light or heavy anti-slip broadcast or in a full mortar build-up to ensure high performance in wet areas. A smooth/light-textured surface finish is available for dry areas.

Sikafloor® PurCem® Gloss is the latest innovation to our Sikafloor® PurCem® family. This product's glossy finish allows for significantly easier floor cleaning. Specified with a smooth surface finish and in a low- to medium- thickness, this solution can be an alternative to some Sikafloor® MultiDur products.

Sikafloor® PurCem® solutions are commonly found in:

- Food and beverage processing facilities
- Professional kitchens
- Cool storage areas
- Heavy-duty processing areas, especially wet processing



Sikafloor® Pronto

Methacrylate (P.M.M.A.) flooring systems that speed up installation times to the maximum, by Sika. Our Pronto family is known for its high resistance to a wide variety of uses. The super-fast curing time of these synthetics allows for super-quick refurbishments, though proper ventilation is required during installation to avoid inconveniences from odors.

When applied to areas with pedestrian traffic, Sikafloor® Pronto surfaces are typically installed in a smooth or light broadcast finish. A colored-flake broadcast finish can be provided upon request. A heavier broadcast finish is available for applications where there is vehicle traffic.



Sikafloor® Pronto solutions are commonly found in:

- Commercial kitchens

- Processing areas
- Pedestrian walkways, such as balconies and staircases

- Animal facilities
- Multi-story and underground car parks

Sikagard® WallCoat

A wall coat that blends specific, engineered performance requirements with decorative designs, by Sika. When you

need more than just paint, our family of Sikagard® WallCoat performance and decorative wall coating systems delivers unique benefits for demanding surface

finishing, including chemical resistance and heavy-duty mechanical resistance.

Our wall coat has the ability to withstand chemicals used in cleaning regimes and in-film preservatives providing finishes that do not promote the development of fungi, bacteria and other micro organisms. Our wall coat systems come in an array of colors, many of them match specified Sika flooring product colors. Sikagard® WallCoat solutions do it all easily.



Sikagard® WallCoat solutions are commonly found in:

- Cleanroom certified areas
- Food and beverage processing facilities
- Hospitals and laboratories
- Concrete surface protection
- Tunnels
- Commercial, institutional and residential interior finishing



Sikafloor® HardTop

Concrete surface hardening, curing and sealing and heavy-duty industrial screeds, by Sika. Our dry shake Sikafloor® powders are broadcasted directly onto the fresh concrete – before the powerfloat finish is applied – to create an extremely hard-wearing, monolithic concrete floor. Additional performance can be achieved through various liquid-applied surface hardeners, curing compounds and surface sealers.

Sikafloor® HardTop solutions are commonly found in:

- Storage, logistics and sales areas
- Non-critical, heavy-duty industrial areas such as dry processing facilities
- Car parks, parking garages

SikaCeram® StarGrout

SikaCeram® StarGrout is the new generation of epoxy grout classified R2T and RG according to the tile adhesive Standard EN 12004 and the tile grout Standard EN 13888. This premium tile grout is suitable for grouting all kinds of ceramic tiles, mosaic, marble and natural stone, for both interior and exterior use on joints between 1 and 15 mm. Thanks to its extremely high mechanical and chemical resistance it is a perfect choice for places where absolute hygiene plays a deciding role, in either residential or commercial areas such as swimming pools, laboratories, industrial kitchens or the food industry.

This new product offers great benefits to the tile setter and craftsman, e.g. outstanding workability, easy to clean off, reduced odor, long lasting, plus a

perfect finish with the neutral silicone Sikasil® C with the same color, name and shade.





Sika® FloorJoint

The sound and feeling of rumbling over crossing joints in warehouses and trafficked areas is familiar to most people. It can feel uncomfortable and cause irritation for ears and body. Innovative joint panel Sika® FloorJoint offers the perfect solution with ultra-thin and almost invisible joint profiles for reducing the noise and vibration over the joints. The profiles are installed on the same surface level as the floor, which means no thresholds. Another functional benefit of the system is the reduction of impacts on the vehicles crossing the joint, meaning the significant cost saving in spare parts and maintenance of the forklifts.

Sika® FloorJoint has two profile options, Sika® FloorJoint PD and S, which are compatible with Sikafloor® flooring

systems and can also be made watertight by using Sikadur® Combiflex SG System. The installation of the panels is easy and fast providing extremely short downtime. The system fits perfectly to fast space refurbishment jobs. Sika® FloorJoint systems have good chemical resistance, are totally seamless to surrounding floor surface and absolutely corrosion-free, perfect solution for food processing environment.

Main uses in:

- Warehouses
- Industrial floors
- Parking areas
- Commercial and public buildings



FULL RANGE SOLUTIONS FOR A WATERTIGHT AND SECURE BUILDING ENVELOPE

1. HIGH PERFORMANCE ADMIXTURES FOR CONCRETE

Concrete structures and elements including the foundation, basement, walls, columns, beams and floor slabs form the main part of the overall building envelope. Sika's solution includes concrete admixtures which increases the performance factors of such concrete components, such as strength, workability, watertightness and many other features. Sika experts also provide tailored solutions for architects to create special design effects when specifying concrete as a key visual design element in their projects.

2. WATERTIGHT BASEMENTS AND OTHER BELOW GROUND STRUCTURES

In food and beverage facilities, the ground bearing areas need to be waterproofed. Sika has over 100 years of experience in providing waterproofing solutions. The selection of the most appropriate waterproofing concept and system for any specific project is dependent on many factors, and it is important to involve a qualified waterproofing specialist at the early stages of design. Your local Sika Technical Services Department can provide expert advice and proper solutions to all your problems.

3 & 4. SEALING AND BONDING FOR WATERTIGHT FACADES AND WINDOW INSTALLATION

Energy efficiency requirements for exterior walls are becoming more stringent, strongly influencing building standards worldwide. Sika has developed sealing and bonding technologies and systems for facades to help designers meet higher energy efficiency and environmental requirements, whilst ensuring safe, economical installation and also reducing overall construction time. Sika works in close cooperation with leading facade designers and manufacturers using the latest material technologies for all types of facade construction.

5. CORROSION AND FIRE PROTECTION OF STEEL STRUCTURES

Steel structures in buildings all need to be protected against corrosion caused by exposure to the surrounding environment. In manufacturing facilities, they also have to meet stringent building regulations for fire protection.

Sika has a proven track record of providing durable and reliable corrosion and fire protection coatings on steel structures for over 50 years. Our coating systems are available in different colors and comply with the latest National and International Standards including ISO EN 12944 for steel corrosion protection, and ISO EN 13381-8 for fire protection.

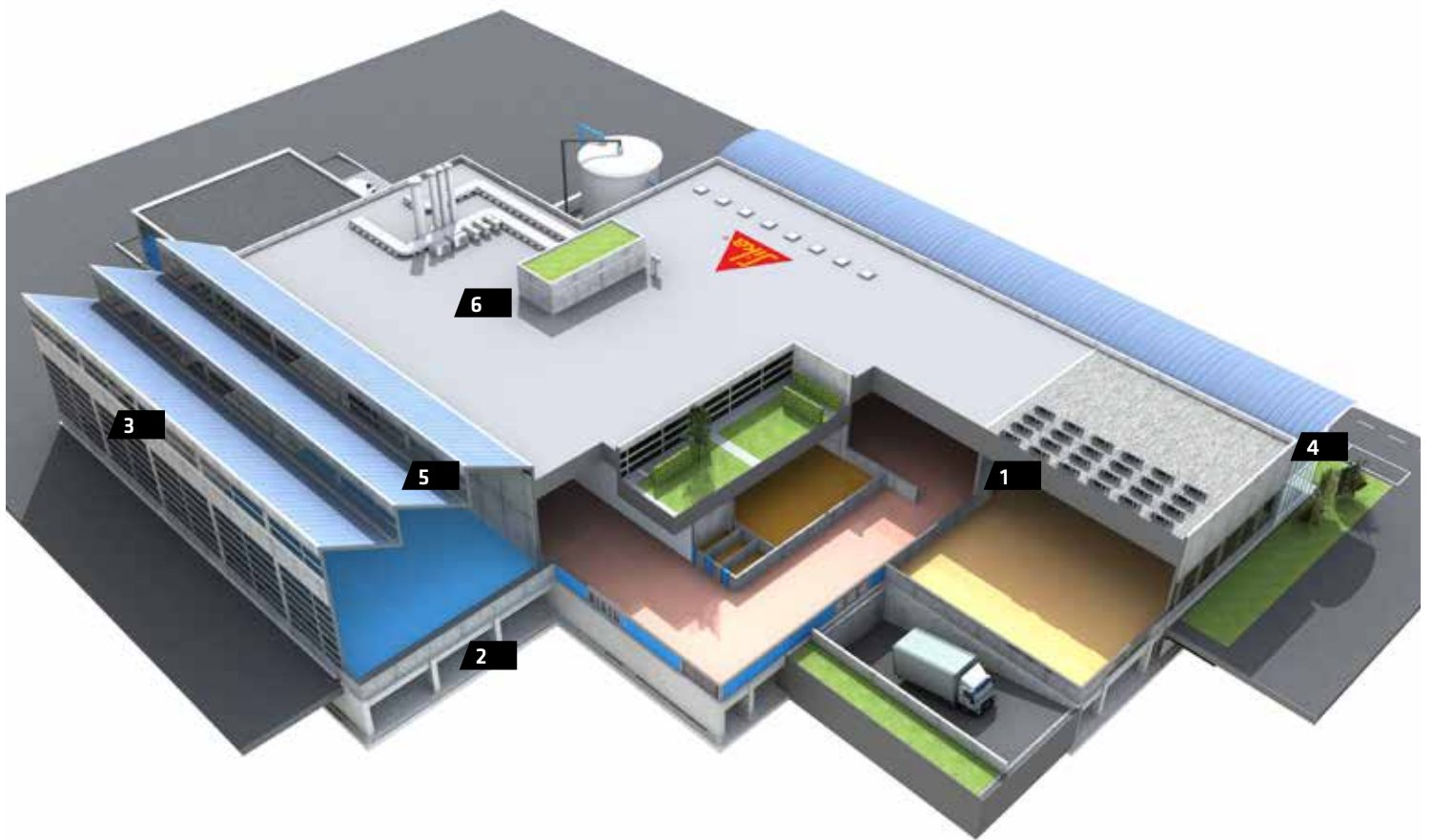
6. DURABLE AND LONG LASTING ROOFING

A long-lasting watertight roof is essential for the reliable operation and sustainability of a plant. Rain, snow, wind uplift forces, sun light, and many other environmental influences can cause failure of the roof system. This results in leaking and damage which require costly repairs, and possibly re-roofing. As the global leader with a proven record of over 50 years, Sika produces high quality and long-lasting Sarnafil® and Sikaplan® polymeric membranes, plus SikaRoof® MTC liquid applied membrane that meet the specific needs and budgets of roofing for health-care facilities.

Sika supplies solutions for the new-build and refurbishment of the following roofs:

- Exposed roofs
- Gravel ballasted roofs
- Green roofs
- Helipads
- Solar roofs
- Balconies

INTERIOR ENVIRONMENTS CAN ONLY RUN PERFECTLY WHEN PROTECTED BY A PERFECTLY TIGHT BUILDING ENVELOPE. TAKE CONTROL OF YOUR ENVIRONMENT WITH BUILDING ENVELOPE SOLUTIONS FROM SIKA.



SOLUTIONS FOR:

1
Admixtures for concrete

2
Basement waterproofing

3
Sealing and bonding for glazed facades

4
Facade joint sealing/Window installation

5
Fire and corrosion protection for steel structures

6
Roofing

SIKA AS A RELIABLE AND INNOVATIVE PARTNER IN THE CONSTRUCTION OF FOOD & BEVERAGE FACILITIES

Sika is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing, and protection in the building sector and the motor vehicle industry. Sika has subsidiaries in more than 90 countries around the world and manufactures in over 160 factories.

100 YEARS OF EXPERTISE

Our reputation for quality and reliability is virtually unmatched, and is illustrated through a comprehensive portfolio of problem solving products that have been employed for many years in a diverse range of applications. Whether we are waterproofing your basement or your roof, protecting your floors and wall, sealing your skyscraper or your car, or working with you on your building, you will see why we are renowned for Building Trust. For the full range of solutions from basement to roof, please refer to our brochure on manufacturing facilities.

WORLDWIDE PRESENCE FOR CUSTOMERS

Sika has a long track record of success as a complete system and problem solution provider on many different food & beverage facility projects all around the world. Please visit the “reference” section on www.sika.com to see a selection of these projects. With extensive technical expertise and solid practical experience on every continent and in all types of climate and environments, Sika is a highly qualified and reliable partner for all of your projects. Sika has highly professional technical and sales teams to support our customers and their clients. These teams include qualified engineers and technicians with expertise in all of the relevant technologies and applications, together with technical service engineers that have extensive practical installation and on-site training expertise to help ensure that the work is completed correctly and is ‘right the first time.’

WHAT MAKES SIKA SUCCESSFUL IS THE COURAGE FOR INNOVATION

873 employees globally are dedicated to research and development. Sika’s success and reputation is based on our long-lasting tradition of innovation.

Accordingly, the core of Sika business is the innovation management and the focus on developing quality products and the best solutions for customers. Sika Technology AG in Switzerland takes the lead in long-term research programs for the whole Sika Group, whilst the responsibility for the development of new solutions sits with our 20 Global Technology Centers plus 18 Regional Technology Centers worldwide. New products and systems are also developed on a regional level to meet local markets’ specific needs and requirements.

MORE VALUE, LESS IMPACT

Sika is committed to pioneering sustainable solutions to address global challenges, and to achieve this safely at the lowest impact on resources. Creating and increasing value while reducing impacts – that is the goal. Our strategy fully integrates sustainability into all of our business processes, and we strive to create value for our customers and partners along the whole supply chain and throughout the lifespan of our products. The value created far outweighs the impacts associated with production, distribution and use.

KASPAR WINKLER
FOUNDED SIKA IN

1910

SIKA HAS PROVIDED WATERPROOFING
SOLUTIONS FOR MORE THAN

100 YEARS

THE FIRST PRODUCT - Sika®-1 -
IS STILL ON THE MARKET

EVERY YEAR SIKA SUPPLIES ENOUGH ROOF
MEMBRANES TO COVER THE

**WHOLE OF
MANHATTAN**

CORE COMPETENCIES:

**BONDING, SEALING, DAMPING, REINFORCING
AND PROTECTING LOAD-BEARING STRUCTURES**

IN BUILDING AND INDUSTRY.

SIKA HAS WORLDWIDE

**98 TECHNOLOGY
CENTERS**

EVERY YEAR SIKA FILES

**70 NEW PATENT
APPLICATIONS**

SIKA'S CLEANROOM FLOORING SYSTEMS RELEASE

**1,000 TIMES
LESS EMISSIONS**

THAN STANDARD LOW VOC SYSTEMS

WITH

84 AWARDS

IN 16 YEARS, SIKA IS THE COMPANY WITH THE MOST
CONCRETE REPAIR PROJECTS AWARDED WORLDWIDE

SIKA HAS SUBSIDIARIES IN

93 COUNTRIES

AROUND THE WORLD

SIKA HAS

**17,000
EMPLOYEES**

SIKA ACHIEVED TOTAL SALES OF

**CHF 5.49
BILLION IN 2015**

BUILDING TRUST



ALSO AVAILABLE FROM SIKA



FOR MORE SIKA FLOORING INFORMATION:



WE ARE SIKA

Sika is a specialty chemicals company with a leading position in the development and production of systems and products for bonding, sealing, damping, reinforcing and protecting in the building sector and the motor vehicle industry. Sika's product lines feature concrete admixtures, mortars, sealants and adhesives, structural strengthening systems, industrial flooring as well as roofing and waterproofing systems.

Our most current General Sales Conditions shall apply. Please consult the most current local Product Data Sheet prior to any use.



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BUILDING TRUST

