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CPD Article

Published on 02 August 2020 15:34

How Resin Flooring Delivers Seamless Hygienic Finishes for the Food and Drink Industry

Resin flooring will provide a hard wearing, resilient and durable floor surface with a strong, permanent monolithic bond to a substrate which is resistant to abrasion and thermal shock including power washing and steam cleaning. An impervious surface is achieved with comprehensive resistance to chemicals and process liquids creating a finish which is hygienic and cleanable as certified by HACCP International as a food grade floor system.

Most of the time resin flooring is being installed onto concrete or cementitious surfaces, this provides a great basic substrate. But in food factory facilities and other industrial buildings it isn't suitable as a hygienic finish where food production or other sensitive processes and material handling are in operation, unless it's treated with an appropriate topping. Problems with concrete include not being hygienic as it can be corroded by animal fats, sugars & proteins and it is porous which can allow bacterial growth. Concrete can create dust and be continually dusty because it's weak on the surface and can ultimately break up meaning it is difficult to clean and can have a poor aesthetic finish which isn't suitable for certain facilities

Key Learning outcomes

- The reasons for resin flooring
- Systems for food and beverage facilities
- Standards and legislation for resin flooring
- Surface preparation
- Keys to success

1.0 The reasons for resin flooring

In line with the limitations of concrete there are typical problems which occur with some flooring systems in food factories which lead to flooring failures and a compromise of hygienic standards.

Issues include coating systems which are too thin so they aren't suitable for heavy impact or for exposure to heat and thermal shock which can cause de-bonding and ultimate breakdown of a flooring system. Where existing floor systems have broken up in places this can compromise hygiene and cause potential slip hazards. Any cracks or crevices can be dirt traps and allow for possible bacterial growth. Resin flooring offers solutions to these problems being seamless and durable. The main proven systems promoted for the food and beverage industry sector are polyurethane based resin floor screeds or PU Screeds.

Key performance criteria for PU Screeds. :-

Bond Strength: As a single application PU Screeds have superb adhesion to become monolithically part of a concrete substrate and they are impervious with excellent wear resistance and impact resistance. The bond strength is so good that when tested for adhesion the concrete substrate will fail before the PU Screed does. A bond strength of >3 N/mm² is achieved in line with BS EN 13892-8 2002 testing which confirms substrate failure will occur before the resin flooring does.

Compressive strength: Physical properties include achieving a very high strength of over 50 N/mm² for pu screeds when tested to BS EN 13892-2. A normal strong concrete would achieve up to around 30 N/mm² at the most by comparison. This confirms the hard wearing finish of pu resin flooring.

Water Permeability: The water absorption of PU screeds is nil meaning they provide an impervious surface as required in the food industry. As surfaces are impervious this allows for drainage and hygienic joins to drain systems, control of expansion gaps and the facility for installing coving where required. Screed formulations can also have antimicrobial content which can reduce and protect against bacteria and fungal growth. This performance should be confirmed with testing to ISO 22196.

Thermal Shock Resistance: PU screeds can withstand high and low pressure cleaning including steam cleaning up to 120°C and freezer temperatures down to -40°C when installed at 9mm thickness. This makes them suitable for daily mechanical cleaning which is required in many food environments. With excellent chemical resistance and an impervious finish PU Screed options available provide the balance required between non-slip and cleanability.



Polyurethane resin floor screed installed at 9mm thickness in a food factory

2.0 Systems for food and beverage facilities

The main 2 resin PU Screed systems promoted for the food and beverage industry are either a trowel applied textured finish or a flow applied self-smoothing screed which has a smooth finish. These products are multi-component using a common base resin liquid and a hardener liquid which is mixed with graded aggregates to create each version of the range such as coarse textured finishes or smooth finishes or a slight texture. They can be supplied as a 3-pack product where the colour is already in the base component or as 4-pack where a blank base and separate colour pack is supplied with the hardener and aggregate. They are mixed together by using a forced action mechanical mixer operating like a small concrete mixer. Traditionally supplied in buckets this is now also supplied in modern packaging in sachets which reduces the plastic used. This reduces waste created and allows faster installation.

Both are applied as single applications to a prepared substrate, and where required primer is applied. Primer is not essential for trowelled screeds but is always used with self-smoothing systems as its important to achieve a sealed substrate with no pinholes. Anchor joints are cut in concrete substrates around the periphery of any area being installed which enhances the adhesion of the product. This is because of strength of the resin screed and because a slight shrinkage occurs as the product initially cures.

With these products a superb adhesion and performance is achieved creating a monolithic finish with the concrete so that the PU screed is a long term solution becoming part of a building. This is one of the sustainable aspects of these systems as they should never create future waste product being sent for landfill. PU screeds are fast to install with no seal coats or top coats being required as they are resin rich providing a hard wearing and resistant finish in a single application. Formulations include the use of natural vegetable oils which contribute to the products having an extremely low VOC content (volatile organic compounds). This is why these are the most promoted resin floor systems in food facilities which meet the standards demanded I this industrial sector.

Render versions of the PU Screeds are also available which enable coved skirtings to be formed on top of the floor installation to create seamless floor to wall continuation with a system.



Polyurethane resin floor screed being installed by trowel and then lightly back rolled which helps achieve a consistent resin rich finish

3.0 Standards and legislation for resin flooring

Polyurethane resin screeds promoted for the food industry should be tested by Campden BRI the Food Research Association and be certified as being food safe meaning they are non-taint and odourless. This confirms they don't have degrees of toxicity or any components unsuitable for food rooms. Polyurethane resin flooring can also include in its formulation the use of natural plant oils and natural silica aggregates which helps achieve this performance and contributes to the sustainability of the product. The requirement for non-slip performance should also be considered? Performance can be proven using a TRRL Pendulum test, the method adopted by the Health and Safety Executive. The test for this is BS 7976-2:2002+A1:2013 where a pendulum reading above 36 confirms low slip potential. This is often stipulated as a requirement in food factories. Textured pu screeds can achieve readings in the mid forties in wet and dry conditions.

The European law for flooring in Food facilities states that 'Floor surfaces are to be maintained in a sound condition and be easy to clean and, where necessary, to disinfect. This will require the use of impervious, non-absorbent, washable and non-toxic materials' This is the legal requirement for assessing and mitigating food safety risk within food businesses.

EC Legal requirements guidance includes in Article 5 the statement 'Food business operators shall put in place, implement and maintain a permanent procedure or procedures based on the HACCP principles'. This programme sets out the due diligence requirement for managing hazards from all sources. These requirements are specified by authorities such as the Global Food Safety Initiative, the Food Standards Agency, European Food Safety Authority, the World Health Organisation and many others.

The flooring materials checklist used by HACCP during evaluation of a flooring material is shown below. This guidance highlights what is important and is often the only way for a floor material manufacturer to prove that a floor material is robust and fit for purpose. What if the wrong floor material is selected, for instance one that is not resistant to expected conditions which might include thermal shock or heavy traffic or if there is no clear guidance on the selection and control of installation?

HACCP International principals for flooring for food factories. :-

- How is it installed?
- How's installation controlled?
- Is it food safe?
- Is it impervious?
- Is it slip resistant?
- Is it thermal shock resistant?
- Is it chemical resistant?
- What's its fire rating?



Non-slip performance testing on polyurethane floor screed using the TRRL Pendulum

4.0 Surface preparation

Preparation is essential to ensure a long term solution and to establish the degree of adhesion or bond strength mentioned previously where the bonding exceeds the strength of a concrete.

The most common method for large projects is vacuum shot blasting where steel shot is fired at a surface to create a an 'orange peel type' texture. This is widely used for large, flat areas of flooring, texturing the surface area to increase adhesion and penetration. Steel shot is fired at the surface and re-circulated, stray shot is collected by magnetic rollers and debris vacuumed away. A rough, sandpaper-like texture is created. Typically around 600 – 1000 m² can be vacuum shot blasted per day. Smaller machines can be used for edges and confined spaces.

Other methods of substrate preparation include Diamond Grinding which is often suited to lower-build or thinner applications. Industrial diamond tipped discs create a lower profile texture finish compared to shot blasting. This method can also be controlled under vacuum.

Where a substrate is heavily contaminated or needs to hot hard with abrasive equipment scabbling processes can be used where tungsten flails are used to create a rougher textured profile. This textured will be great to enhance adhesion and if a screed thickness is being applied up to 10mm in thickness this will hide the heavy textured surface. A thinner coating type system might not cover this profile so the texture would still be apparent within the finished resin floor?



Polyurethane floor screed being installed onto prepared and primed concrete

5.0 Keys to success

System guides can be provided as an overview on the purpose of a particular system showing benefits and the scope of use. An outline specification is provided with details on preparation and each stage of application for the floor system making these comprehensive documents for specifying and application purposes. High performance floor system guides are all available through the RIBA sites along with case studies and product brochures.

Preparation is always essential and involves specialist professional equipment.

The installation of resin flooring products is a professional job which should only be done using experienced dedicated resin flooring contractors.

Manufacturers work closely with nationwide approved contractors. This can be a vital part of a manufacturers service to ensure an appropriate contractor is used for each project who has the expertise, experience and the skilled labour force to progress applications from start to finish.

It is always essential to consider the cleaning regime for an area to make sure the floor finish specification will be appropriate for a facility. If an area is mainly just being swept and only occasionally deep cleaned it will need a smooth finish to allow for this. Usually for food facilities however a proper daily cleaning regime is in operation. Having invested in a resin floor system to achieve the maximum lifespan it is recommended that a cleaning regime is employed to get the best from the investment whether it is a new build project or a refurbishment project. It is not unusual to find that the previous cleaning method, materials and processes are no-longer effective or acceptable or do not achieve the level of cleanliness that is now being required of the floor area. Cleaning in pharma production facilities will normally include a combination of mechanical processes and chemical processes. This means using rotary floor washers or scrubbers or sometimes scrapers and squeegees used in conjunction where required with power washing and steam cleaning or a straight forward hose down. Aggressive cleaning regimes will sometimes be used on a daily basis to maintain hygienic standards in a food factory. Resin floor screeds can withstand this and benefit from such cleaning. Thinner coating systems will not be durable enough to withstand such processes for long periods. Usually low foam detergents are required using straight forward cleaning chemicals and there is no need for high or low PH products as the actual process used is more important.



Polyurethane floor screed installed in a commercial kitchen