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Flooring Considerations for the Dairy Industry



Getting the floor right in a dairy is critical to ensuring that the facility can operate effectively, hygienically and in accordance with the sector's strict regulations. This is no easy feat, as conditions within dairies will inevitably subject the floor to a long list of damaging factors that need to be withstood in order to maintain a clean and functional facility.

The industry's ability to make sure that its infrastructure is up to the task at hand is illustrated by the fact that incidence of foodborne illness outbreaks is very rare. This is despite the vast amount of produce consumed, its inherent vulnerability to spoilage and the fact that dairy is one of the nation's main dietary sources, especially amongst children and the elderly who are especially at risk from harmful pathogens.

To ensure that the dairy industry maintains a minimal food-borne illness risk, impeccable hygiene standards are of the upmost importance. To be both hygienic and productive means carefully considering each element of a milk processing facility's design prior to operation, and the choice of flooring installed throughout the complex is a crucial aspect to meeting both of these criteria.

Challenges Facing Dairy Floors

The UK dairy industry might be characterised by small, Archers-esque farms that laze in the sunshine of rural idylls – but the truth is that this is a highly productive, demanding and complex world that requires a close attention to detail in order to maximise output while simultaneously guaranteeing the health of the cattle, the safety of the staff and the integrity of the produce.

The scale of the industry is exemplified by the stats, as every year dairy farms across the UK produce over 14 billion litres of milk, which has a collective worth of approximately £8.8 billion at wholesale level.

Therefore, milking facilities have to be efficient, reliable and hygienic environments so that they can cope with the challenges of this arduous workload. This means that having an inadequate floor can quickly affect a dairies ability to provide a suitable working environment and could lead to a multitude of problems for any dairy producer.

Every day a dairy's floor will be subjected to traffic from rubber boots, cattle and forklift trucks as well as having to manage heavy machinery, milk spillages and intense cleaning routines.

All of these routine factors can potentially cause irreparable damage to the floor and a failing surface will not only affect the movement of people, vehicles and animals but also cause a dangerous hygiene risk. Contaminants can easily accumulate within hard to clean cracks or gaps and this drastically increases the possibility of spoiled products, sick cattle, damaged reputations and regulatory failures.

Dairy Farming and Flooring Regulations

The importance of the floor finish to cleanliness and meeting industry regulations can be seen by how much it is referenced in the guidance for dairy farming provided by the Department for Environment, Food and Rural Affairs (Defra).

For example, Defra states that in the cowshed, dairy operators "should make sure the floor under the cows, dung channels and operator walkways are clean" and it's important to "make sure there is a fall from the area under the udder so it can be kept clean and free from pooling during milking".

In the milk storage areas, Defra recommends that the following design criteria are followed:

- impervious floors, which are free draining to a suitable trapped drain
- external drainage should not be allowed to enter the room
- walls that are smooth and easy to clean



TIP:

Choose durable cementitious PU systems to withstand heavy machinery.

Drainage is a common theme and in the section for animal health and hygiene on the farm, Defra advises that "floors should be water resistant and free draining, with all drainage discharged to a suitable drainage system".

The frequency and intensity of the cleaning also needs to be factored in, as the floor will need to be washed down after every milking session to prevent "dung, slurry and other noxious materials building up". The floor therefore needs to be able to withstand the pressure of the water, movement of cleaning equipment and the exposure to cleaning chemicals inherent to these cleaning sessions.

This advice is reflected in the European Union's food hygiene standards, such as EC regulation 853/2004 which stipulates that food business operators must have "hard floors and smooth walls that are easy to clean and disinfect".

Additionally, EC 854/2004 states that producers “shall put in place, implement and maintain a permanent procedure or procedures based on the HACCP principles”. The floor is central to this, as the regulation goes on to say 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”.

Flooring systems that are HACCP International certified have been rigorously tested to ensure that they meet the strict hygiene demands of a HACCP based food safety plan and can maintain this standard despite prolonged exposure to the industrial demands of large-scale food & beverage plants.

The Properties of Resin Floors

Unprotected concrete floors are at risk of deteriorating when faced with the practicalities of dairy operations. For example, hot water could eat into the surface layer and the harsh cleaning chemicals required to eliminate dangerous and resilient microorganisms will damage concrete over time, making it porous and harder to clean.

If a floor coating is not able to cope with the strains of the environment it will start to crack. Substances can penetrate cracks in a floor, which could result in microbial growth and the spread of bacteria from pathogens that are able to thrive in broken flooring. This means that the facility could face an increased contamination risk that the cleaning regime will find difficult to cope with and which could adversely affect the sanitation of the dairy.

To avoid this scenario, there are many types of hard flooring systems available to help meet the dairy industry’s challenges and regulations.

The seamless finish of a resin floor creates a shield against the damaging corrosives that would compromise other flooring systems, and is much more robust, hygienic and reliable than an uncoated concrete surface. A resin floor will provide a smooth, easy to clean finish that will work effectively with the onsite cleaning regime to remove contaminants.

The durability of a resin floor also means that dairy farmers can subject it to heavy impacts and pressure from cattle, staff, machinery and vehicles without concern for its integrity. The sturdy and level surface is also ideal for coping with internal transport from forklift trucks frequently braking and turning on the floor. Should even further resilience be required, aggregates such as quartz sand, aluminium oxide and bauxite can be added into the resin layer to improve its strength and add anti-slip properties.

Resin floors have varying chemical and bacterial resistance profiles, depending on the specific make-up of the system. This affects the floor’s ability to protect from corrosive chemicals that would otherwise lead to the floor failing from erosion, softening, embrittlement, blistering or delamination.



TIP:

Lay flooring to falls with integrated drainage to avoid water pooling.

Of the different types of resin flooring systems, one of the most popular hard wearing solutions able to provide the necessary properties is polyurethane. This material combines cement and water-based technologies to produce a mortar that is trowel applied on site to create a very strong and seamless finish. Polyurethane has a high cross-linked density, which makes it a good choice for areas that undergo abusive chemical attack.

The impervious nature of polyurethane helps to avoid bacterial contamination as pathogens cannot seep into the floor and are much easier to remove. This solution is better than epoxy alternatives at resisting bacterial excretion on the floor, which is beneficial in areas of the dairy prone to contact with dung and animal by-products.

**TIP:**

Integrated, seamless coving provides a hygienic joint between floors and walls.

Importantly, polyurethane is much better at resisting thermal shock than other types of resin flooring, as it has a thermal coefficient of expansion similar to concrete. This means that when it is applied over concrete it is able to expand, contract and move with the substrate when the floor is subjected to large temperature changes, like steam cleaning. Floor coatings that do not react with the substrate are much more likely to crack.

Polyurethane's ability to resist corrosives such as organic acids means that the fluids and substances that fall onto the floor in a dairy won't damage the finish. In the milking areas, an epoxy floor would not be as effective as polyurethane as the high level of organic chemical attacks and thermal shock would make an epoxy floor quickly crack or de-bond.

Resin flooring systems are highly adaptable and additives can be included to cater for specific challenges. This includes incorporating antibacterial agents into the finish to give an enhanced hygiene performance that actively works to inhibit the growth of bacteria in between wash cycles.

Joints Between the Floor and Wall

A key area to consider when designing or renovating a dairy is the joint between the floor and the wall, as this creates a difficult to clean gap where bacteria can accumulate.

All rooms involved with the production, handling, processing, packaging or storage of milk should feature coved or sealed joints to help prevent a build up of bacteria.

Coving creates a seamless transition between the floor and wall surfaces, covering up the gap with an easy to clean layer. The coving system installed must be able to withstand the same abuses as the floor, as it will encounter the same corrosives, heat and use.

TIP:

Including a textured, anti-slip profile will help to reduce slips and trips.



Draining in a Dairy

Dung, cleaning fluids, lactic acid spillages and many other sources can create substantial excess liquid in a milking facility. Water ponding can be a serious hygiene concern as it is a prime site for bacterial growth. A non-porous, well drained floor is important to making sure that water does not stagnate and lead to unhygienic conditions.

A resin floor is impervious to water and facilitates good draining, allowing for the more effective removal of any unwanted matter or liquid. This is especially important when coping with the large amounts of faecal matter that build up during milking, as blocked dung channels or long standing effluence pose exceptionally dangerous hazards.

The potential danger from unmoved animal waste is evident in the fact that disease causing pathogens such as Salmonella, E. coli and faecal coliform can be 10 to 100 times more concentrated than in human waste.

Effective drainage is vital to making sure that the unwanted effluence quickly flows away. Properly sloped floors will facilitate this process and help to avoid undesirable, unhygienic, unsafe conditions.

Drainage is another area where the smoothness of a resin floor is beneficial, as it will aid the flushing of water and help to ensure that there are no pools of standing water.

Slip Resistance

Contamination isn't the only danger that can stem from excessive water, as slippery conditions are a danger to the health and safety of any workers, visitors or animals in the area.

In spaces prone to wet conditions, the site's management needs to minimise the risk of slippery surfaces, especially in a workplace as potentially dangerous as a dairy. When assessing the onsite conditions, it is not just the main milking zone that needs to be considered, but also the storage rooms, staff areas, corridors and walkways.

To effectively decrease the chance of falling, special aggregates can be added into the mixture of a resin floor to create an anti-slip surface which actively enhances grip underfoot.

Hygiene requirements need to be brought into the decision-making process here, as the ease of cleaning needs to be judged against the level of grip required because coarsely textured surfaces are harder to clean than smooth surfaces.

**TIP:**

Ensure hygiene across the whole facility, including packaging areas.

Flooring Away from the Milking Area

While the main focus of attention will be on the milking area, a dairy operator shouldn't overlook all the other buildings that make up the facility - as the condition of these areas can have a significant impact on a dairy's productive capacity. A recent study by the University of Guelph highlighted this fact, as it showed that the frequent cleaning of the barn alley floors has a significant correlation to the cow's health.

Some areas within a dairy processing facility will require additional performance requirements including thermal shock resistance for cool rooms or different slip-resistance grades across the facility depending on the onsite operations.

Epoxy resin surfaces are ideal for non-processing zones such as offices, entrances, staff rooms, corridors, warehousing and most areas exposed to less rigorous service conditions. Like the other systems, they can have anti-slip resistance profiles, limiting the risk of falls across the dairy complex.

A resin floor is useful in storage rooms in particular, as they need to be kept clean at all times. Ideally placed away from all the obvious sources of contamination, this room's design should mimic the main milking area with impervious floors that are free draining to a suitable trapped drain and walls that are smooth and easy to clean.

Considerations Prior to Installation

Before you decide to have a resin floor installed, it is important to weigh up each dairy's specific requirements.

By talking to a resin flooring specialist about the individual demands of a facility you will get a good understanding of what solutions will work best for you. For example, do you need a very high-level of anti-slip flooring? Will the floor be exposed to thermal shock? Where is hygiene the biggest priority? What type of chemicals will the floor be exposed to?

Once you have come to an informed conclusion, make sure the specialist resin floor is installed by a qualified applicator so that the coating adheres properly to the substrate with a seamless finish that is able to provide a strong and impervious surface.

After installation, the finish needs to be properly cleaned and maintained. If you are introducing a new cleaning product, conduct a small spot test on an inconspicuous area as a precaution. Most special purpose cleaning materials won't damage a resin floor but to get the most out of a new surface and to maintain any properties that may have been added, treat the floor in accordance with the manufacturer's instructions.

This guide has been produced to give an overview of the choices available and factors to consider when specifying a resin flooring system within a dairy processing environment.

Detailed recommendations and advice are available from our network of regional technical and sales representatives.

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