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Contact the Flooring Specialist
+91 44 4017 6600
india@flowcrete.com

Flooring Considerations for the Dairy Industry

Polygiene
Safer to Touch

Since 2000 India has been the world's largest milk producer and since then it has been exponentially increasing and outpacing the production rates of the rest of the world, to the point where today India creates 17% of the world's milk.

In 2014 alone 140.6 million tons of fluid milk was produced, which was up 4.5% on the previous year. A combination of factors are believed to have combined to create this soaring demand for milk, including rising consumer income, an increasing demand for dairy products, rapid urbanization and improvements in processing technology.

This impressive growth looks set to continue, as the national government, multi-national companies and international markets invest more and more attention, time and resources into the industry.

However as India's dairy industry goes from strength to strength it is important for the nation's producers to ensure that the infrastructure and working practises that are in place are able to safely and effectively produce, store and distribute the increasing levels of dairy produce. Without investing in the right materials and systems, expanding dairy farms risk creating the conditions for unsafe milk production that could expose large numbers of end consumers to contaminated produce.

To be both hygienic and productive means carefully considering each element of a farm's design prior to operation, and the choice of flooring installed throughout the dairy complex is a crucial aspect to meeting both of these key criteria.

Challenges Facing Dairy Floors

Milking facilities have to be efficient, reliable and hygienic environments that can cope with the numerous challenges of an arduous workload and an inadequate floor can create a multitude of problems.

Every day the dairy environment will undergo traffic from rubber boots, cattle and forklift trucks as well as having to manage heavy machinery, lactic acid spillages and intense cleaning routines. While all this is going on the level of cleanliness, animal welfare and employee safety have to be simultaneously accounted for in the ongoing operations.

All of these routine factors can potentially cause irreparable damage to the floor and a failing floor will not only affect the movement of people, vehicles and animals across the facility 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 a failure to meet the expectations of regulatory bodies.

The Milk and Milk Product Order 1992 (MMPO) is one of the primary accreditations in India that assures authorities and end users of the quality of the product and the credentials of the manufacturer.

Making sure the floor is up to the task it faces is a key part of achieving this status. The MMPO specifically states that all areas where "raw materials are handled and dairy products are manufactured" should have "solid, waterproof flooring" which is "easy to clean and disinfect and which allows water to drain away". These rules stress the importance of flooring in the creation of a hygienic dairy environment and mean that the choice of floor plays an important role in a dairy's ability to satisfy regulatory demands.

The Properties of Resin Floors

There are many types of hard flooring systems available to the dairy industry to help maximise the potential of their buildings.

The seamless finish of a resin floor creates a shield against the damaging corrosives that would compromise other substances, and is even more robust and durable than concrete. A resin floor will provide a smooth, easy to clean surface that will work effectively with the on-site cleaning regime to remove germs from the area.

The robustness of a resin floor also means that dairy farmers can subject it to heavy trauma from cattle, staff, machinery and vehicles without concern for its integrity. The sturdy and level surface is also ideal for coping with the internal transport from forklift trucks that will be 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 to the resin layer to improve its strength and 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 itself from corrosive chemicals that would otherwise lead to the floor failing from erosion, softening, embrittlement, blistering or delamination.

Of the different types of resin flooring systems, one of the most popular hard wearing solutions able to provide the necessary benefits 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. A polyurethane resin floor screed has a high cross-linked density, which makes it a good choice for areas that undergo abusive chemical attack.

The MMPO also states that "floors, ceilings or roof linings, walls and partitions shall be kept in a satisfactory state of cleanliness and repair, so that they do not constitute a source of contamination to raw materials or dairy products".

TIP:
Durable cementitious polyurethane flooring can withstand heavy duty machinery.

The non-porous and difficult to penetrate nature of polyurethane helps to avoid bacterial contamination as pathogens cannot seep into the floor and are much easier to remove during cleaning. This solution is better than epoxy alternatives at resisting bacterial excretion on the floor, which is especially beneficial in areas of the dairy that are prone to contact with excessive amounts of dung.
Importantly polyurethane is much better at coping with thermal cycling than other types of resin flooring, as it has a thermal coefficient of expansion similar to that of 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 temperature changes over time. Floor coatings that do not react in line with the substrate are much more likely to crack along the surface. A polyurethane screed's robust nature also means that it can withstand thermal shock without failing, which is often caused during hot water washes.

Polyurethane floors are good at resisting corrosives such as organic acids, which is highly beneficial in a dairy where lactic acid is present in large quantities and where it will often spill onto the floor.

An epoxy solution would not be as effective as polyurethane in the milking areas as the high level of organic chemical attacks and thermal shock that polyurethane is able to withstand would make an epoxy floor crack or de-bond.

Hygiene Importance

Unsafe food production and processing areas can easily lead to foodborne pathogens spoiling the product and potentially harming the end users.

This highlights the importance of maintaining a hygiene within food production areas, and an effective cleaning routine is vital to ensuring this. If not acted upon contaminant build up could not only lead to corrosion of the floor but also damage the health of the animals, contaminate the milk and ruin the dairy's reputation.

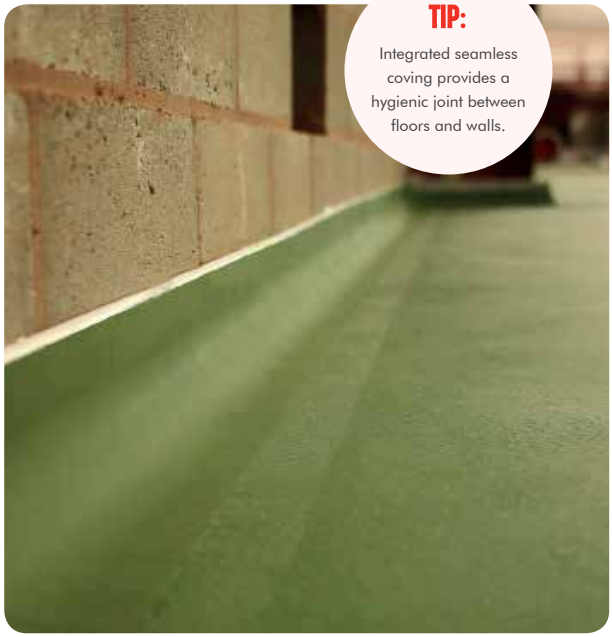
The well being of cattle is a key priority for the Indian dairy industry, as improving the overall standard of animal health will help to increase productivity. With the largest cattle population in the world (134 million cows and 125 million buffaloes) it is clear to see how maintaining high levels of animal health will be advantageous.

To maintain a hygienic milking area many dairies will undergo cleaning sessions of between 30 to 60 mins after milking. If there are two or three milking

sessions per day then just cleaning the dairy can take up a significant amount of time and energy. If the specific floor surface is not strong enough then the frequent washes will erode the surface layer and make a previously impervious floor porous and ineffective. This means that the floor needs to not only be smooth and level to allow for effective cleaning but also highly durable to withstand the intensive maintenance.

Unprotected concrete floors are especially at risk of deteriorating when faced with hot water cleaning, power washes in particular will eat into the surface layer. The harsh cleaning chemicals required to eliminate dangerous and resilient microorganisms will also 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 will 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, with the possibility of contaminants entering into the extraction and storage processes.



Resin flooring systems are highly adaptable and additives can be included to cater for specific challenges. Antimicrobial agents which complements regular floor cleaning and hygiene practices between wash cycles can be included into the finish to give an enhanced hygiene performance.

Joints Between the Floor and Wall

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

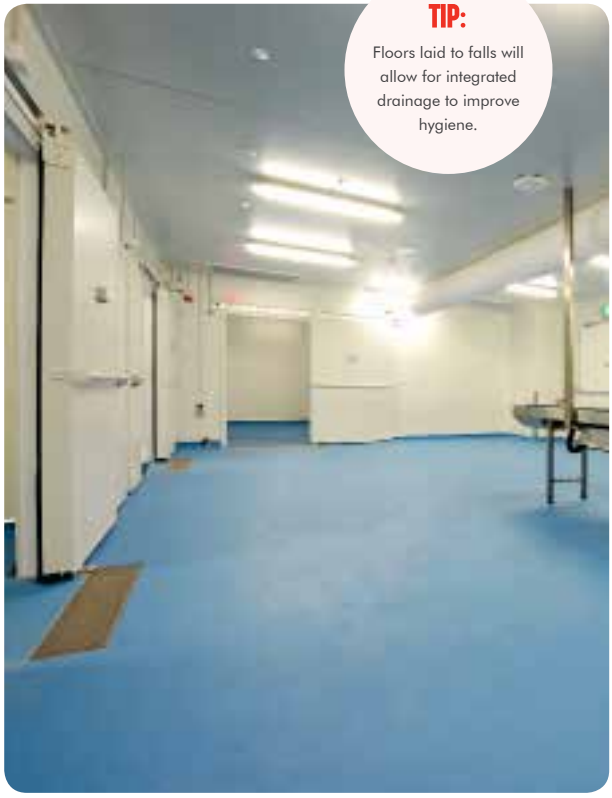
Coving creates a seamless transition between the floor and wall surfaces, covering up the gap with an easy to clean layer. The coving system installed must be able to withstand the same abuses as the floor, as it will encounter the same corrosives, heat and use.

Draining In A Dairy

Liquid from dung, cleaning fluids, lactic acid spillages and many other sources can create substantial excess water in a milking facility. The pooling of too much water 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, which will make the removal of any unwanted matter or liquid much easier and more effective. 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



fecal 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 out of the dairy. Properly sloped floors will facilitate this process and help to avoid undesirable, unhygienic and 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.

Worker Health And Safety

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 or visitors in the area.

In any facility with areas 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 on site conditions it is not just the main milking zone that needs to be considered, but also the storage rooms, staff areas, corridors and walkways.
Effective draining is important in tackling slip hazards, but to further 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.

Again hygiene requirements need to be brought into the decision-making process, 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.

Dairy environments can be so wet that a flooring system without an extremely low water absorption rate faces inevitable discolouration if not disintegration. Resin floors can be fitted to include designs that will not fade, which is ideal if

clear lineage is an important aspect of the dairy floor for safety or operational reasons.

Limit Downtime With Fast Cure Floors

Many operators of dairy farms may be concerned that refurbishing their floors will lead to damaging downtime and a problematic halt in day-to-day operations. However methyl methacrylate (MMA) resin systems can offer an extremely tight turnaround in installation to minimise production losses.

These fast-cure solutions drastically reduce disruption by creating a fully trafficable flooring surface that is usable mere hours after application instead of days or weeks.

And dairy operators won't compromise strength, life span or durability to achieve this fast turn around – in fact an MMA system provides a floor that is double the strength of traditional epoxy quartz screed.

MMA floors can be installed at extreme temperatures, from -20 degrees to +35 degrees, which means that it can be installed in cold storage rooms without having to shut the room down, so it can remain at its optimum temperature throughout the floor application process. This trait also means that the refurbishment can take place at any time of year and so can be applied when it is most convenient.

While MMA floors have a high resistance to a range of acids and alkalis it is not as good as polyurethane at withstanding corrosive chemicals or thermal shock and therefore may not be as viable as polyurethane within the most intensive production and processing 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. For example the frequent cleaning of the barn alley floors has a significant correlation on the cow's health.

The MMPO stresses the importance of ensuring hygienic conditions are maintained throughout the milk production chain "from the place of milk procurement up to the final stage of sale of the milk or milk product to the end consumer".

Epoxy resin surfaces are ideal for non-processing zones such as offices, entrances, staff rooms, corridors, warehousing and most areas exposed

TIP:

Maintain hygiene across the facility with seamless, slip resistant resin flooring.

to less rigorous service conditions. Like the other systems they can have anti-slip additives included into the mix to limit the risk of falls across the dairy complex.

A resin floor is useful in storage rooms in particular, as they especially 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 install a resin floor it is important to weigh up a 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?

TIP:
Choose flooring that resists attack from sugars, acids and cleaning agents.

Once you have come to an informed conclusion make sure the specialist resin floor is installed by appropriately qualified tradespersons to ensure that the coating adheres properly to the substrate with a seamless finish 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 resin choices available and factors to consider when specifying a resin flooring system within a dairy facility.

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

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