Keep What's Under Foot in the Forefront of Your Mind

Choosing specific floor coatings has an impact on the plant and its product

By Doni Riddle

Industrial facilities of all kinds in the U.S. are required to adhere to federal standards, and the food processing industry is certainly no exception. Because of the nature of the products they produce, food processing plants are under closer scrutiny by regulators than many other industries.

In warehouses and light industrial areas and in industries not involved with consumable products, having uncoated concrete floors may be a perfectly acceptable choice. But in food and beverage plants, where cleanliness and purity are paramount, it is non-negotiable that concrete floors be covered with an appropriate protective coating, very often provided by a seamless, hygienic floor coating system.

The floor of a food processing facility is typically exposed to all sorts of food byproducts including fats, hot oils, blood, sugar solutions, and natural food acids. Some of these substances can cause serious damage to concrete because of their corrosive nature. In addition, these contaminants can infiltrate uncoated concrete, resulting in uncontrolled growth of bacteria, ultimately degrading the processed food's purity.

Consequently, coatings selected for application to food and beverage processing facility floors must be durable enough and thick enough to create a protective barrier that prevents contaminants from permeating the concrete substrate and ensures a hygienic surface.

What Kind of Coating?

What kind of coating is the big question that plant operators and industrial maintenance managers must answer in order to meet government requirements and ensure a safe, sanitary processing facility. Processors of foodstuffs face demands for hygienic surfaces across a variety of plant areas, all with differing corrosive conditions such as for dry storage areas, cold storage rooms, and mixing, canning, and slaughtering areas.

Floor coating systems have been developed to meet this range of service

conditions, and frequently there are a number of systems that can be used for an application. As a result, the type of floor coating used is one of the most important product specifications a food processing plant manager can make.

For years, plant managers have come to rely on a range of specialty floor coating products to fulfill any number of requirements. These floor coatings are available in several formulations.

Epoxies

The FDA and USDA have approved a broad range of epoxy flooring systems including high-solids or 100 percent solids epoxy flooring products. Epoxies may be blended with aggregates, such as marble or quartz, particularly for non-processing areas such as lobbies and entryways, where a clean, well-maintained look is part of an overall plan regarding company image. These coatings are typically trowel-applied, two-component systems. A wide variety of textures and colors may be achieved by broadcasting aggregates to create non-slip or skid-resistant floors.

High-solid epoxies provide outstanding protection against acids and alkalis. Fast-drying, odorless epoxy mastics, epoxy primer sealers, and surfacers are among the formulations currently available. These coatings offer a number of key benefits including outstanding adhesion, an excellent ability to withstand abrasive cleaning procedures and cleaning chemicals, fast curing properties for minimized downtime of the area being treated, and compatibility with textured, anti-slip additives. Additionally, high-solids formulations are low in volatile organic compounds (VOCs).

A popular choice suitable even for clean-room floors is a self-leveling epoxy system utilizing a 100 percent solids binder resin with a blended aggregate, which is easily applied with a notched trowel or squeegee and back-rolled with a texture roller. The system comprises a penetrating primer, an epoxy resin glaze as the binder resin, a filler with dry silica sand as the slurry aggregate, and a topcoat that may be a polyamide epoxy, a stipple epoxy, a high-performance pigmented epoxy, or a polyurethane enamel.

When a rapid return to service is one of the factors that minimizes plant downtime, 100 percent solids epoxies are a wise choice for coating floors. Many operators of meat processing facilities select 100 percent epoxy coatings because these coatings offer strong bonding characteristics, resistance to thermal and mechanical shock, and the ability to endure frequent cleaning with hot water at high pressure. They also may be used in areas where highly acidic products are processed.

For a greater amount of chemical and heat resistance, novolacs are a good choice. Novalac is a type of epoxy that has a higher aromatic structure. Epoxy novolacs stand up to aggressive chemical contaminants such as sulfuric acid and harsh cleaning solutions.

In less demanding environments such as food packaging, waterborne epoxies are a good fit because these areas don't have the same high protection demands. In

general, though, the use of waterborne epoxies for this industry is limited.

Urethanes

Polyurethane coatings continue to be popular for flooring applications in the food industry. These coatings typically come in slurry form and tend to be somewhat more costly upfront, but their service life often outlasts other product categories. In fact, these systems are making significant gains on epoxy and vinyl ester flooring systems in many meat and poultry plants.

Urethane cement slurry and mortar systems provide superior resistance to thermal cycling when compared to epoxy and vinyl ester coatings in addition to providing excellent long-lasting performance. They also have very low odor during application and have a seamless, easy-to-clean surface when dry.

Another advantage provided by these mortar systems are the decorative choices available. Depending on the manufacturer, customers can request colored quartz, which can be broadcast into the slurry. The quartz is used in place of silica and is sealed with a protective clear epoxy or urethane topcoat. Other aggregates can also be used to add texture.

But without a doubt, the most significant benefit offered by some mortar systems is their quick drying capabilities. With these products, plants can be returned to service in as little as six hours. However, slurries are not recommended for floors that are sloped to drain.

Methyl Methacrylate

Methyl methacrylate (MMA) coatings are also used for food and beverage facility floors because they can be applied at relatively low temperatures, cure quickly, and are low in odor, reducing the risk of imparting an unpleasant taste or odor to processed foodstuffs. As a result, MMA coatings are often used in cold-storage areas such as freezer rooms.

Polyureas

When environments demand tough, flexible and impact-resistant floors, polyurea coatings are an excellent choice. There are 100 percent pure polyurea coatings available that are USDA-acceptable and even UL-approved to the ANSI-NSF 61 standard; as a result, they are increasingly used for tanks holding potable water as well as for floor coatings for food and beverage industry floors.

All polyureas are formulated with no VOCs, have no odor and dry tack-free in as little as 45 seconds. These coatings are especially useful in food processing areas because they provide a seamless and flexible surface that can withstand

temperatures as low as 20&#176F and as high as 250&#176F.

Because of their elasticity, polyurea coatings are ideal for substrates such as concrete, which tend to crack. As an elastomer, these coatings have the ability to stretch and bridge gaps up to 1/8 inch. Due to this flexibility, polyurea coatings are not limited by temperature extremes. More rigid coatings tend to crack as the substrate expands or contracts because of differences in the coefficient of linear expansion.

Choosing Coatings

Being armed with an understanding of these coatings and their capabilities is one part of selecting the right coating for the job, but there are other considerations as well ranging from government regulations to food taste and odor considerations.

Probably the most important factor in floor coating selection is the need to comply with governmental requirements for the food industry in the U.S. Several agencies at both the federal and state levels regularly inspect food processing facilities to make sure the products being produced for human consumption are free of impurities. Inspections cover many issues, but among the most crucial is that floor coatings must meet or exceed exacting standards set by the USDA. This agency insists that the chemical makeup of coatings used in food and beverage facilities contain only resins and additives found on their own approved list. In addition, NSF International, an independent, non-profit organization, certifies products and writes standards for food, air, water, and consumer goods.

The government requirements imposed by the USDA are not the only standards food processing plant managers must keep in mind when selecting floor coatings. The EPA at both federal and state levels imposes a range of standards that cover the amount of VOC emissions from floor coatings. For example, California requires adherence to very strict standards to fight the accumulation of smog that often affects certain areas of the state, and many states in the Northeast have laws that reflect a similar concern for air quality. While many food processing facilities in the U.S. are located in states that are less stringent in their VOC-compliant rules, the industry nevertheless is generally aware of the need to be knowledgeable of VOC emissions concerns. Consequently, many food processing plant managers select coatings with low-VOC emission rates even when not obligated to do so by law.

Traffic

The volume and type of traffic is another important criterion in selecting a floor coating for a food processing facility. Personnel safety and potential liability issues compel food processing plant managers to ensure skid-resistant floors by using textured or grit surfaces. The degree of texture is typically determined by the conditions of operation, frequency of cleaning and maintenance, and presence of oils, greases, and other potentially slippery substances.

A high-medium grade of texture for food processing makes sense because these environments are often "wet" either from cleaning agents or from the inherent exposure to oils and grease. Where high impact and heavy loads are part of the traffic pattern, a flexible membrane can be applied beneath the floor coating.

Cleaning

Floors in food facilities must be thoroughly cleaned regularly, often several times daily, to keep the food processing operation pure and up to government standards. Consequently, food processing facility floor coatings must be durable enough to handle vigorous cleaning procedures, which typically include very hot water, steam, and aggressive cleaning chemicals. It is clear that only high-performance floor coatings will withstand this kind of punishing maintenance.

On a typical day in a food processing facility, floors are exposed to a variety of process chemicals as well as corrosive cleaning chemicals, primarily detergents. If a floor is subjected to only minor chemical contact, a thin film coating may suffice; however, if a floor is exposed to the variety of moisture, temperature, and chemical conditions typically found in a food processing area, it is essential that the plant manager select a thicker, more durable floor coating that can offer sufficient protection to meet those conditions.

In addition to the corrosive nature of the cleaning chemicals, the very hot, high-pressure steam used in daily cleanings can take its toll on a food processing facility floor. The pressure alone is often capable of removing a standard coating, much like what happens when a deteriorating concrete driveway is pressure-washed. Because the cleaning process is performed repeatedly and at very high temperatures, it is crucial that the coating be thick and durable.

Odors

A factor not always considered by food processing plant managers is the need to avoid the transference of unwelcome odors or tastes to food products. Some foreign substances give off odors or tastes that render final food products unacceptable. Water-borne coatings are significantly less likely to emit odors that might be absorbed, thus they are generally an excellent choice for floor applications in food processing facilities.

Application Conditions

Yet another factor in selecting a floor coating for a food processing facility involves application conditions. While these issues are typically not relevant for installation of floors and coatings in new facilities, they are indeed germane when updating or retrofitting an existing facility.

Food processing facilities are often very damp, sometimes cool or even cold, and

sometimes hot, all in a typical day. The selected coating must be able to be installed under any and all of these conditions. There are specialty coatings that have the ability to cure even under this unusually broad range of conditions. Urethane modified cementitious flooring systems, for example, can perform in steam heat as well as freezing or below zero temperatures. Some of these systems also offer a rapid return to service, which could be critical to plant operations.

Aesthetics

Until fairly recently, aesthetics was rarely a consideration in the selection of a floor coating, but times have changed. Some areas of food processing plants are often part of a public tour route, and in general company management is more aware now of the need to convey a clean, colorful, positive image for company morale and wider public relations efforts. Consequently, one last factor in selecting a floor coating may be the palette of colors available from the chosen manufacturer.

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