

For manufacturers, the best defense is a hygienic offense

How to select the right level of equipment protection for your processing application



Thanks to greater domestic and global regulatory vigilance, as well as advancing mechanisms for identifying, tracking and tracing pathogens and contaminants, the global manufacturing industry has a better handle than ever before on product safety. Even so, the need for vigilance remains. With today's complex global supply chain, a single food safety breach can affect millions of consumers worldwide.¹ Based on conservative estimates, at least 600 million cases of foodborne illnesses and 420,000 deaths have been reported each year since 2010, and product recalls have grown steadily.^{2,3,4}

As food-borne pathogens continue their assault on consumer health and significantly challenge food production facilities, Food & Beverage manufacturers need to be prudent in deploying advanced sanitary solutions to safeguard their processing plants and keep them from becoming bacterial breeding grounds. Among the important pieces of equipment in any processing plant are the electrical enclosures relied on to protect the housed equipment and provide safety for those in the vicinity.

Meeting hygienic standards

Traditionally designed enclosures have the potential of failure when exposed to the rigors of routine sanitary washdown cleaning procedures used in today's processing plants. In an attempt to circumvent these potential failures, maintenance personnel often end up taking extra manual steps, such as bagging enclosures or caulking doors and seals, to keep moisture from entering or pooling on the enclosure, damaging equipment and breeding bacteria.

Rather than rely on these manual hacks that fatten lean processes and delay production, Food & Beverage manufacturers can take advantage of advanced hygienic electrical enclosure solutions. These specially engineered enclosures are built to withstand the high-temperature, high-pressure sprays of sanitary washdown procedures, especially for clean-in-place and harsh applications. Hygienic equipment design principles encompass:

- **Surfaces** – Most standards require a surface finish with a roughness average (Ra) of 0.8 μm or less.
- **Materials** – Must be compatible with the application. This includes the food being produced, as well as cleaning chemicals and processes.
- **Construction** – Food equipment must be constructed to have self-draining surfaces, and no undercuts and crevices in which soil can accumulate.
- **Installation** – The equipment should allow for complete access during cleaning. If mounted directly to a wall, it must be sealed or offset from the wall to minimize the collection of soil.
- **Maintenance** – The equipment should be designed to withstand the rigors of high-pressure and high-temperature cleaning operation.

HYGIENIC EQUIPMENT DESIGN PRINCIPLES

In addition, hygienic enclosure solutions comply with harmonized global standards that indicate how well they will prevent liquid ingress, resist corrosion, and withstand temperature and pressure ranges. Standards include:

- **IP69** – These ratings indicate the level of protection of an enclosure against ingress of liquids (IPX9) and dust (IP6X). During the testing procedures, enclosures are subjected to the high temperatures (80 C) and high-pressure sprays (approx. 8000 to 10000 kPa) associated with – but more rigorous than – routine sanitary washdown cleaning procedures. IP69 (IEC) for electrical equipment represents the highest level of protection.
- **Type 4X** – Type 4X certification indicates protection for personnel against access to hazardous parts as well as a superior level of protection for equipment inside an enclosure against ingress of water or solid foreign objects like dust, which can damage critical equipment inside the enclosure and cause bacterial growth. In addition, Type 4X indicates a superior level of corrosion resistance.

IPX9 Water Testing Requirements



Large enclosures (≥ 250 mm)

- Enclosure is mounted on wall or its intended use
- Enclosure is sprayed from all practical directions covering the entire exposed surface area
- The spray is perpendicular to the surface
- Distance between nozzle and enclosure is 175 ± 25 mm
- Temperature and force of spray is $(80C \pm 5$ and $0.9 - 1.2$ N)
- Test duration is 1 min/m² of the surface area, with 3 min minimum duration



Small enclosures (< 250 mm)

- Enclosure is mounted on test device (i.e. rotating table)
- Turntable speed is 5 r/min \pm 1 r/min
- Spray positions are at 0°, 30°, 60° and 90°
- Distance between nozzle and enclosure is 125 ± 25 mm
- Temperature and force of spray is $80C \pm 5$ and $0.9 - 1.2$ N
- Test duration is 30 s per position

Passing Criteria

The technical committee specifies the amount of water that may be allowed to enter the enclosure. If any water has entered, it shall not:

- be sufficient to interfere with the correct operation of the equipment or impair safety;
- deposit on insulation parts where it could lead to tracking along the creepage distances;
- reach live parts or windings not designed to operate when wet; and
- accumulate near the cable end or enter the cable if any.

Selecting the right level of protection

Enclosures must be specially engineered for the harsh conditions associated with Food & Beverage applications. In general, an electrical enclosure suitable for washdown environments should:

1. Meet industry standards for preventing liquid ingress and resisting corrosion.
2. Provide a door seal that can be easily maintained and replaced, if necessary.
3. Be robustly capable of surviving the high temperatures and pressures associated with cleaning operations.
4. Reliably maintain functionality after repeated cleaning cycles.

Beyond these basic requirements, it is important to match the right level of protection to the processing application rigor required.

- **Basic Level** – For applications with no food contact that experience minor washdown or chemical contact, enclosures that meet IP66 and Type 4X are suitable.
- **Medium Level** – For food processing applications where enclosures will come into mild contact with water spray and chemicals, sloped top enclosures that meet IP66 and Type 4X are suitable.
- **High Level** – In harsh applications where hygienic design is required due to clean-in-place, cleaning chemical rich contact and/or large temperature swings, sloped top enclosures that meet IP69 (IEC) and Type 4X. In addition, solutions that include a replaceable FDA food-grade silicone gasket help provide even more protection against water ingress, chemical attack and the harborage of bacteria.

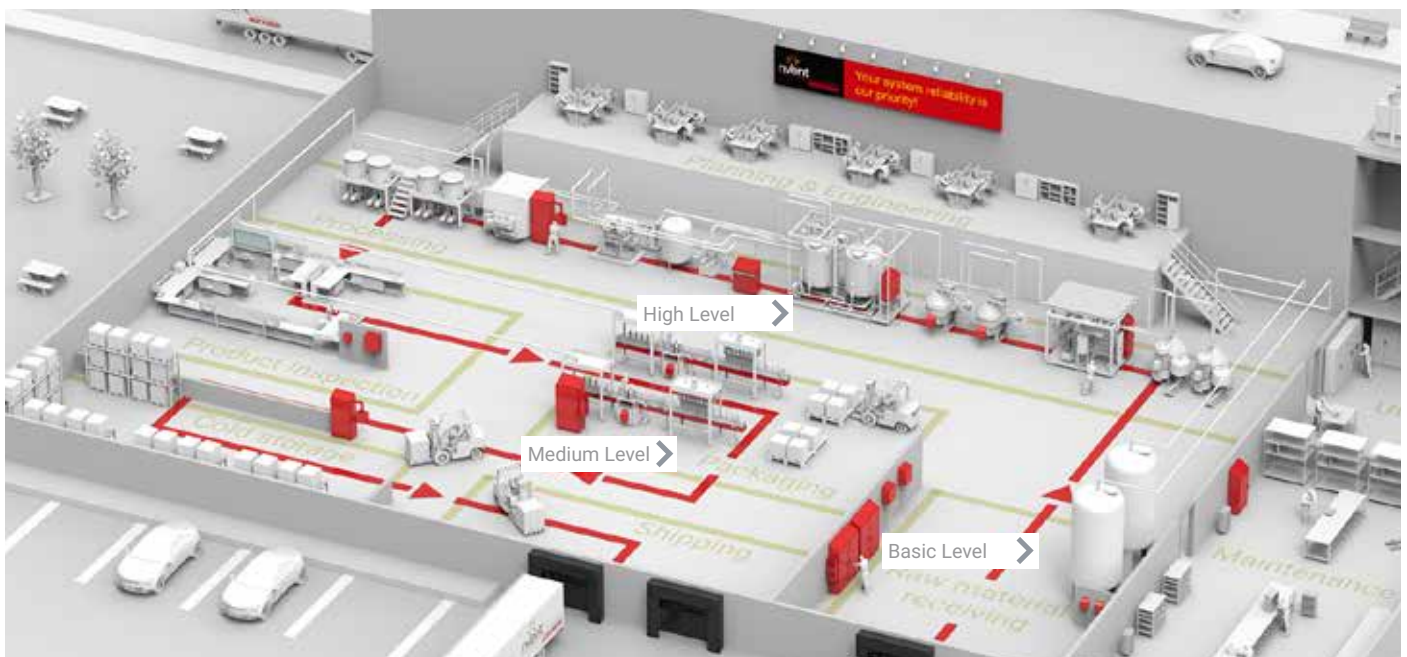
Equipment for ultimate protection

By applying the right level of electrical enclosure solution protection to the washdown application need, Food & Beverage manufacturers will minimize their risks of bacterial growth and other contaminants, resist corrosion to equipment, promote longer lifecycles for controls and drives, and ultimately speed and simplify routine maintenance for sanitary washdown procedures.

With people’s lives and millions of dollars at risk, the Food & Beverage manufacturers that adhere to international best practices and leverage hygienic equipment designs will be best equipped to thrive.

Sources:

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2. World Health Organization, "Estimating the burden of foodborne diseases." <https://www.who.int/activities/estimating-the-burden-of-foodborne-diseases> Accessed October 18, 2022.
3. World Health Organization, "WHO steps up action to improve food safety and protect people from disease." <https://www.who.int/news/item/07-06-2021-who-steps-up-action-to-improve-food-safety-and-protect-people-from-disease> Accessed October 18, 2022.
4. OECD, "Global recalls: an enhanced co-ordination." <https://www.oecd.org/about/impact/global-recalls-portal.htm> Accessed October 18, 2022



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