

WHITE PAPER: ENSURE PRODUCT AND OPERATIONS INTEGRITY BY SELECTING THE PROPER ENCLOSURE FOR WASHDOWN ENVIRONMENTS

PROTECTING YOUR ADVANTAGE

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To maintain sanitary conditions, demanding food and beverage applications require high-pressure washdowns and harsh cleaning chemicals, which could damage electronic controls if they are not properly protected.



NSF/ANSI 169-certified enclosures will ensure product safety, equipment protection and a sanitary production environment.

Today's strict regulations and increasing public and media scrutiny regarding product safety and contamination have placed food and beverage producers under considerable pressure. Producers must ensure that all machinery used in these applications is sufficiently clean and contaminant-free, and the consequences of not performing rigid washdowns are dire—from recalls and liability to long-term damage to company brands. Thus, these intensified cleaning processes, including 1200 psi washdowns and more concentrated chemical solutions, are critical.

Successful washdowns will remove all waste materials and residue from processing systems and controls, thereby preserving product quality. However, establishing a suitable washdown environment for the application at hand requires numerous steps.

For example, it is imperative that staff are educated about their facility's proper washdown techniques and solution composition, since a cleaning solution that is too rich or weak can impact the sanitation level or even damage the overall system. Staff should also be aware that particulates from certain solutions can linger in the air for as long as four hours, potentially affecting product purity. Plus, to resist harsh washdown conditions, all electrical equipment, system controls and components used in these environments must be correctly rated for the application.

Even with the appropriate rating, if electrical and electronic controls are not properly enclosed and protected from undesirable washdown side effects—such as product damage, contamination or corrosion—food and beverage producers may face significant consequences, including production downtime and high equipment replacement costs.

At the same time, any equipment or means of protecting that equipment must be designed and constructed to maintain a sanitary work environment and minimize the probability of a foodborne outbreak. Selecting an appropriate electrical enclosure is key to ensuring that both of these critical requirements are met.

To promote sanitary conditions and optimize product safety in the long run, only enclosures and equipment with the appropriate NSF certification should be installed. NSF, the world's leading not-for-profit consumer safety ratings agency, developed the NSF/ANSI 169 standard—which specifies the essential design criteria for food equipment and devices, including electrical enclosures. NSF/ANSI 169 certification, as it applies to electrical enclosures, assures that all hinges, mounting devices, latches and door surfaces will protect the critical equipment while resisting exposure to environmental elements and accumulation of dirt and debris. A few of the design and construction criteria that are required for NSF/ANSI 169 include:

- Lift-off hinges with removable pins (no continuous hinges are allowed)
- Leg stands that provide a minimum unobstructed clearance of 6 inches underneath the enclosure

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- Sloped surfaces to facilitate runoff, including a sloped top, sloped door edges, and/or a sloped flange trough gutter above the enclosure door opening
- Welded joints and seams that have been deburred
- Easily-cleanable fasteners, including slot-head quarter-turn latches
- No exposed threads, or projecting screws or studs in a food or splash zone



Choosing an enclosure that is NSF/ANSI 169-certified will ensure that key enclosure attributes—including construction, quality, design, hinging, sealing/gasketing, mounting and latching—promote sanitary conditions while protecting electrical equipment in challenging plant environments.

Construction and Quality

The first step in the selection process is determining whether an enclosure has the construction and quality needed to withstand harsh chemical washdowns.

Enclosures used in these applications need to be made of a non-absorbent

material—such as Type 304 and 316L stainless steel—to resist moisture ingress. An enclosure's finish is also important, since the finish can determine whether contaminants are successfully removed from the enclosure surface during washdown. A #4 finish is typically recommended to keep contaminants from accumulating on the enclosure. Plus, selecting an enclosure with smooth welds eliminates the risk of contaminants infiltrating tiny nooks and crannies in the enclosure's design.

To ensure quality consistency and repeatability, food and beverage producers should select an enclosure that has been produced using automated manufacturing processes. This automation minimizes product variation from order to order, affirming that each enclosure will meet the same stringent application requirements.

Many food and beverage applications require enclosure modifications. Some manufacturers can produce and ship enclosures that are modified according to customer-supplied specifications, saving the customer on-site installation time and expense. Again, it's important that the manufacturer uses automated processes to help ensure the modifications are performed consistently and accurately.

Design

Common enclosure-related problems that can negatively affect the enclosed components and reduce washdown effectiveness include washdown solution pooling on the enclosure, contaminant entrapment between a wall and a wall-mount enclosure, and unreachable, recessed areas created by free-stand enclosure floor stands.

These challenges can be efficiently and effectively overcome when addressed early in the enclosure system design process.

An enclosure with a 20° sloped top facilitates washdown solution runoff to virtually eliminate "birdbath" pooling.



Small floor stands and leg footprints minimize floor contact, reducing potential entrapment areas for washdown solutions and contaminants.

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For example, wall-mount enclosure stand-offs provide access to the back of the enclosure, facilitating more effective washdowns by removing contaminants more easily. The difficult-to-clean areas beneath free-stand enclosure floor stands can be minimized by using a smaller, specially designed floor stand or leg footprint. Enclosure finish is also an important design factor, since smooth welds and shallow crevices create a more hygienic surface.

Incorporating sloped top enclosures into the system is another crucial element, as this design can help prevent washdown solution pooling, minimizing the risk of contamination for maximized uptime and reduced process changeover downtime. For an even more effective runoff solution, producers can select an enclosure with a 20° sloped top design combined with a sloped body door flange trough collar and sloped door edges. These features direct washdown effluent away from processing equipment for optimal sanitation.

Hinging

Asymmetrical, lift-off, bullet-style enclosure door hinges are the best choice for washdown applications. They feature a rounded top and smooth finish to allow complete and easy hinge area cleaning, minimizing entrapment while still providing simple enclosure access. Alternative piano/continuous hinges, by nature of their design, are not conducive to resisting contamination and washdown conditions.

Sealing/Gasketing

While choosing the optimal enclosure construction and design for washdown environments is essential, selecting a high-performance seal or gasket is a critical component to ensuring the enclosure's success. Seals/gaskets and their adhesives must be constructed of materials that are compatible with stainless steel, since this is typically the specified enclosure material in these applications. Also, seals/gaskets and adhesives must withstand harsh, high-pressure washdowns and be checked periodically for resiliency loss and compression.

Likewise, all holes, cutouts and components must be completely sealed with materials meeting the aforementioned requirements. Conduit and/or controls entering the enclosure can be protected with UL Type 4X-certified connectors.

Mounting

As previously noted, the challenging-to-clean area underneath a free-stand enclosure's floor stand is minimized when the enclosure utilizes a smaller stand or leg footprint. For further convenience and minimized water retention, adjustable legs can be employed to support an enclosure while accommodating the plant floor's drainage slope, without having to be shimmed—thereby reducing potential entrapment areas.



Facilitate runoff with a sloped door flange with trough collar and shielded bullet hinge.



UL Type 4X-certified handles deliver secure, effortless sealing.

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Enclosure Ratings for Washdown Areas

Several well-known organizations have created washdown environment enclosure performance standards. These standards are chiefly concerned with high water pressure and liquid temperature, since machinery can be quite sensitive to these conditions.

The National Electrical Manufacturers Association (NEMA), Underwriters Laboratories Inc. (UL) and Canadian Standards Association (CSA) are standard-writing organizations commonly recognized in North America. Their ratings are based on similar application descriptions and expected performance.

UL and CSA require enclosure testing by qualified evaluators. They also send site inspectors to ensure that manufacturers adhere to prescribed manufacturing methods and material specifications. NEMA does not require independent testing and leaves compliance entirely up to the manufacturer.

However, keep in mind that an enclosure rating can only be as high as the ratings of its enclosed components. This makes it critical to ensure both the enclosure and components are properly rated for washdown environments.

Latching

Standard industrial enclosure latching is generally not suitable for washdown applications. Typically, latches are not designed to facilitate cleaning solution runoff and may not provide adequate seal integrity. To keep latches clean and ensure the washdown is effective at removing contaminants, select a low profile (flush with the enclosure) and/or smooth latching design with a minimal number of openings, such as tool-to-open slots. It is equally important to choose a handle that latches securely and forcefully to prevent washdown solution and harsh cleaning chemicals from entering the enclosure.

Maintaining sanitary food and beverage processing environments while protecting the associated control systems from high-pressure washdown solutions remains an ongoing challenge. However, specifying an enclosure designed with features suitable for such applications—one that is high quality and correctly constructed, designed, hinged, sealed, mounted and latched—combined with staff washdown procedure training can help food and beverage producers overcome these challenges.



Enclosures engineered to resist caustic cleaning agents and intense washdowns while promoting runoff are ideal for protecting sensitive control equipment.