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NEWSLETTER

HEGGEL® PS 655

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Fortified Mortar for Durable Protection in High-Chemical Exposure Areas

Dairy Industry: Challenges and Solutions

Corrosion in the dairy industry presents a significant challenge, not only affecting the longevity and efficiency of metal processing equipment but also impacting other construction materials used in facilities. The aggressive nature of various chemicals used for cleaning and sanitization, such as sulfuric acid, nitric acid, and hydrochloric acid, can lead to rapid deterioration of surfaces and structures if not properly managed. These substances, while essential for maintaining hygiene and product quality, can aggressively attack metals and other materials traditionally used in the infrastructure of dairy processing plants.

The strategic approach to managing corrosive materials ensures the longevity of equipment and the safety of the dairy processing environment. This approach protects underlying structures from corrosion damage while maintaining the industry's standards for quality.

In the dairy industry, lactic acid is utilized primarily for pH adjustment in the production of cheese and yogurt. It plays a crucial role in fermentation, aiding the growth of beneficial bacteria and enhancing flavor. While lactic acid is a weaker acid and less corrosive than its stronger counterparts, it can still cause damage to unprotected surfaces and equipment over time.

Sulfuric acid finds its use in the dairy sector for intensive cleaning and sanitization, especially effective in descaling boilers, evaporators, and pasteurizers. Being highly corrosive, sulfuric acid can aggressively attack metals and other materials, necessitating careful handling and the use of corrosion-resistant materials to prevent equipment damage.

Nitric acid is often employed for cleaning stainless steel dairy equipment due to its efficacy in removing mineral deposits while

simultaneously providing a passivation layer that enhances the metal's corrosion resistance. Despite its benefits, nitric acid is highly corrosive and can damage materials that are not resistant to oxidizing acids. Using resistant alloys and taking special precautions are essential when handling nitric acid. It is equally important to protect the surrounding areas with acid-resistant linings to avoid any incidental spillage or splashes damaging the facility.

Hydrochloric acid is used to clean inorganic deposits like hard water scale from dairy processing equipment. Its effectiveness in cleaning makes it valuable, but its high corrosivity to metals and other materials means that it must be handled with materials designed to resist chloride-induced corrosion. In addition, employing acid-resistant linings in areas where such chemicals are used can greatly reduce the risk of corrosion-related damages.

Additionally, other corrosive substances like phosphoric acid and sodium hydroxide (caustic soda) are used in the dairy industry, not only impacting metal surfaces but also requiring robust protective solutions for facility infrastructures.

Phosphoric acid, employed in cleaning-in-place (CIP) systems, is moderately corrosive and used for sanitizing and cleaning equipment to remove mineral build-ups. Its use necessitates the integration of acid-resistant tiles and mortars to protect the structural integrity of processing areas. Similarly, sodium hydroxide, pivotal for removing organic residues such as fats and proteins from tanks and pipelines, is a key component in CIP systems. Protective linings and coatings are crucial wherever sodium hydroxide is used to prevent damage to less resistant materials. Furthermore, nitric acid, also utilized in CIP systems, is effective in removing mineral deposits and enhancing the corrosion resistance of stainless steel with a protective passivation layer. The comprehensive use of acid-resistant materials throughout the plant ensures that all areas are shielded from these harsh chemical exposures, maintaining operational integrity and safety standards.

The application of these acids and other corrosive materials in dairy processing underscores the importance of stringent handling protocols to safeguard equipment and ensure worker safety, emphasizing the need for corrosion-resistant materials and proper storage and handling procedures.

Overview of Corrosion Types

Corrosion in the dairy industry can manifest in various forms, each driven by the unique chemical and physical environments of dairy processing facilities. Uniform or general corrosion typically leads to the thinning and weakening of exposed surfaces, whether they are metal, such as steel, or concrete structures. Both materials can deteriorate if not protected by suitable coatings. Pitting corrosion, characterized by small, deep holes, poses a serious threat not only to metal equipment but also to concrete when protective barriers fail. This localized damage can lead to rapid structural failures. Stress corrosion cracking represents a significant risk under conditions of tensile stress combined with a corrosive environment. This phenomenon affects pipelines and tanks made of metal, and similarly, it can compromise the integrity of reinforced concrete where corrosive agents infiltrate and degrade the reinforcing steel. Crevice corrosion, which occurs in confined spaces such as metal joints and under gaskets, also poses a threat to the seams and edges of concrete structures. If these areas are not adequately sealed or if the sealant is compromised, aggressive localized corrosion can initiate, often hidden from view.

Widespread Corrosion Effects

The consequences of corrosion in the dairy industry are both costly and hazardous. Economically, it leads to increased maintenance costs, potential downtime due to equipment failure, and the need for premature replacement of parts and apparatus. This not only drives up operational costs but can also affect production schedules, reducing overall productivity.

On the safety front, corrosion can compromise the structural integrity of both metal and concrete elements within dairy processing facilities. This degradation poses risks of leaks or catastrophic failures, which can contaminate the product and pose serious health risks to consumers and workers. Moreover, corrosion of equipment and structural components may lead to environmental hazards, where corrosive and potentially toxic substances might escape into the surroundings.

Thus, effectively managing corrosion is critical not only for maintaining operational efficiency but also for ensuring product reliability and environmental compliance. Employing protective strategies such as using acid-resistant materials and protective linings for all exposed surfaces is essential in mitigating these risks and sustaining the industry's viability.

Corrosion Protection in the Dairy Industry is critical for maintaining the integrity of dairy equipment, ensuring product safety, and extending the service life of both metallic and concrete structures. Here are some key strategies:

Material Selection: Acid-resistant ceramics and composite materials are crucial for protecting concrete surfaces and metal equipment in harsh chemical environments typical of dairy processing.

Protective Coatings and Linings: Effective for both metal and concrete, protective coatings and linings such as ceramic-based or resin-based mortars shield surfaces from direct exposure to corrosive agents. This is especially important for flooring and areas prone to chemical spillage.

Maintenance and Environmental Control: Regular maintenance, correct cleaning protocols, and controlled environments help prevent corrosion. Ensuring thorough rinsing of cleaning agents and maintaining optimal humidity and ventilation minimize the risk of corrosion on all surfaces.

By focusing on these methods, the dairy industry can effectively safeguard both concrete and metal infrastructures, maintaining peak operational performance and adhering to stringent safety protocols.

Advantages of Protective Coatings and Linings

Protective coatings and linings are vital for safeguarding surfaces in dairy processing environments, effectively isolating the surfaces and areas from corrosive agents such as acids, alkalis, and solvents. These solutions ensure the longevity and functionality of metal and concrete infrastructure that encounter harsh and corrosive conditions. The versatility of these protective measures allows for their application across various sections of the dairy plant, delivering substantial benefits throughout the facility.

Tile linings, in particular, combined with acid-resistant mortars, provide a robust barrier that significantly enhances the durability and corrosion resistance of concrete surfaces. From a financial standpoint, using resistant tile linings and mortars can be more cost-effective than alternatives such as extensive use of high-grade protective materials for floors and walls.

While protective linings are highly effective for corrosion protection in concrete infrastructure within the dairy industry, their suitability as the "most" effective solution can depend on specific factors, including the operating environment and economic considerations. Given these variables, **HEGGEL PS 655** stands out for its exceptional performance in enhancing the resilience of concrete surfaces against corrosive conditions in diary industry.

Advanced Polyester Resin Based Mortar

HEGGEL PS 655 is a two-component mortar that leverages the robust capabilities of a modified unsaturated polyester resin. This advanced formulation is meticulously designed for the efficient installation and jointing of acid-resistant ceramic tiles and bricks. Its specialized composition ensures strong adhesion and long-lasting durability in environments where corrosion resistance is critical. The convenience of its application process makes it an ideal choice for projects demanding high performance with minimal downtime.

The technical composition of **HEGGEL PS 655** offers exceptional resistance to a wide range of inorganic and organic acids, alkalis, and oxidizing agents. The chemical resistance of **HEGGEL PS 655** makes it a standout solution in the field of protective mortars. It is specifically resistant to a variety of corrosive media, including lactic acid, sulfuric acid, nitric acid, hydrochloric acid, etc. among others.

This exceptional chemical resistance makes it suitable for use in harsh environments where exposure to these substances is frequent, such as diary plants. By providing a reliable barrier against such aggressive chemicals, **HEGGEL PS 655** ensures that surfaces remain protected against corrosive substances that can degrade other types of mortar. This level of protection is crucial for maintaining the integrity and functionality of the treated areas, thereby reducing the need for frequent repairs and replacements and costs associated with corrosion damage.

Moreover, **HEGGEL PS 655** is designed to deliver superior adhesion for ceramic tiles and bricks, making it an excellent option for installations that demand robust and durable connections. Ideal for areas needing structural integrity and longevity, this advanced mortar is particularly effective in industrial settings where the presence of heavy machinery or substantial foot traffic can challenge the

resilience of flooring and wall systems. The unique formulation of **HEGGEL PS 655** enhances the durability and safety of these surfaces, helping to prevent the maintenance issues and structural failures often associated with less effective materials.

In addition, **HEGGEL PS 655** is capable of withstanding temperatures of up to 100°C, depending on the specific chemical application. This temperature resilience makes it suitable for both indoor and outdoor use, extending its versatility across different climatic conditions and operational environments. Whether it is exposed to the high temperatures of direct sunlight in outdoor installations or the varying temperatures of industrial indoor settings, **HEGGEL PS 655** maintains its performance characteristics without degradation.

This adaptability to different environments and conditions underscores its effectiveness as a reliable choice for a wide array of construction and maintenance projects.

HEGGEL PS 655 is specifically formulated for the full-joint or hollow-joint installation of acid-resistant tiles and bricks, showcasing its adaptability in various demanding environments. Its application is ideal for a diverse array of areas within industrial settings, such as pits, channels, secondary compartments, storage spaces, and workshops, where exposure to aggressive chemicals is prevalent. This versatility makes **HEGGEL PS 655** an indispensable solution for facilities that require strong and reliable protection against harsh chemical interactions, ensuring the integrity and longevity of infrastructure in conditions subjected to corrosive substances.

Technical Data	Value	Unit
Flexural Strength DIN EN ISO 178	35	MPa
Compressive Strength DIN EN ISO 604	92	MPa
Tensile Strength DIN EN ISO 527	15	MPa
Modulus of Elasticity DIN EN ISO 178	5.0×10^{3}	MPa
Therm. Coefficient of Linear Expansion ISO 11359-2	3.2×10^{-5}	1/K
Thermal Conductivity ISO DIN 22007	1	W/mK