



You Build, We Protect!

# NEWSLETTER

HEGGEL® FRP 343

November 2023



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## Sewer Systems: Combating Corrosion Enhancing Durability

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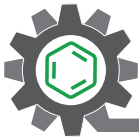


### The Critical Role of Sewer Systems

**Sewer systems** in heavy industries such as oil and gas, mining, petrochemicals, etc. are pivotal for environmental conservation and operational sustainability. For instance, in the oil and gas, these systems are tasked with handling complex wastewater streams. This wastewater, rich in hydrocarbons, heavy metals, and various chemical additives, is a byproduct of the extraction and refining processes. Efficient sewer systems ensure that this contaminated water is safely transported to specialized treatment facilities. This process is not just about removing harmful substances; it is also about compliance with stringent environmental regulations, aimed at protecting local ecosystems and water sources from industrial pollutants.

In mining operations, sewer systems address a different but equally challenging set of waste management issues. The mining process generates significant amounts of wastewater containing suspended solids, minerals, and potentially toxic metals. Effective sewer and wastewater treatment systems in mining are crucial for mitigating the risks of soil and water contamination. These systems also enable the recycling of water within the mining operations, which is particularly vital in regions facing water scarcity. This approach not only conserves valuable water resources but also aligns with global efforts towards sustainable mining practices.





The reliability of sewer systems specifically in heavy industries cannot be overlooked.

A failure in the system can lead to operational shutdowns, environmental disasters, and significant legal and financial repercussions. Therefore, continual investment in and maintenance of these systems are essential for the smooth and environmentally responsible operation of heavy industries.

The integration of advanced technologies for monitoring and treating industrial wastewater further exemplifies the evolving nature of these systems, aiming to balance industrial efficiency with ecological responsibility. In summary, sewer systems in heavy industries are not just functional necessities; they are integral components that reflect the commitment to sustainable industrial practices and environmental protection.



### Corrosion and Deteriorating Dynamics in Industrial Sewer Systems

Industrial sewer systems, particularly in the oil and gas sector, are constantly challenged by significant corrosion issues. This corrosion originates from a variety of sources, critically impacting different components of the sewer infrastructure and thereby compromising both its efficiency and safety. The wastewater in these industries is typically characterized by a complex mixture of chemicals including acids, alkalis, hydrocarbons, and salts. In the oil and gas sector, the complexity is further amplified by by-products from petroleum processing.

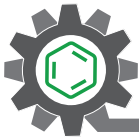
These aggressive substances rapidly corrode traditional sewer materials like concrete and metal, leading to accelerated deterioration and posing substantial maintenance challenges. The scenario is further complicated by the high temperatures and pressures typical in industrial settings, which exacerbate the wastewater's corrosive nature, accelerating chemical reactions and the rate of corrosion. This results in more rapid physical degradation of infrastructure components such as pipes and containment structures.



Microbiologically influenced corrosion (MIC) also significantly impacts industrial sewer systems, as microorganisms in nutrient-rich, hydrocarbon-laden wastewater produce corrosive by-products, damaging the infrastructure. Environmental and operational factors such as oxygen, water, and fluctuating flow rates lead to uneven corrosion in industrial sewer systems, complicating their maintenance and durability. This corrosion, impacting pipelines, tanks, pumps, and treatment facilities, can cause structural failures, spills, and contamination, affecting wastewater management efficiency. The challenging conditions, involving harsh chemicals and corrosive microorganisms, require a thorough approach to maintenance and material selection to ensure the longevity and effectiveness of these critical infrastructure systems.

In addition to corrosion, mechanical requirements and wear/abrasion issues are significant concerns in sewer systems within core industrial sectors. These systems are not only exposed to corrosive substances but also face mechanical stresses and abrasive forces. Mechanical stresses from high flow rates and pressure fluctuations constantly leading to material fatigue, cracks, and potential structural failures. Simultaneously, abrasion and erosion from the continuous movement of solids and high-velocity fluids, to the heavy loads imposed to the related areas further degrade these systems.

Together, these factors demand robust and resilient infrastructure to ensure long-term operational integrity.



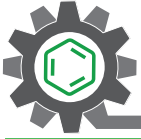
## Chemical Corrosive Challenges in Heavy Industry Sewer Systems

Sewer systems notably in the oil and gas sector, regularly encounter a wide array of chemicals that are highly corrosive or reactive. It is vital to understand these chemicals for effective design, maintenance, and operation of these systems. Hydrocarbons and petroleum products, core to the oil and gas industry, often contain corrosive substances like organic acids. The processing of these materials can also yield sulfur compounds and other corrosive by-products. Acids such as sulfuric, hydrochloric, and sometimes nitric acid, encountered in these industries, are particularly damaging to metals and concrete, necessitating corrosion-resistant materials and coatings to guard the in-contact infrastructures against the destructive effects of such exposures. Alkalis, like sodium hydroxide, used for pH adjustment and cleaning, also pose a corrosive threat to concrete and some metals. Salts, whether as industrial by-products or in water treatment chemicals, are notably corrosive when dissolved in water, accelerating metal corrosion in sewer systems.

Oxidizing agents, including chlorine and peroxides used in water treatment and other processes, aggressively attack sewer system materials. Heavy metals present in industrial wastewater are corrosive and pose environmental and health risks. Organic solvents, common in various industrial applications, can degrade materials and protective coatings within sewer systems. Additionally, microbiologically influenced corrosion (MIC), particularly in systems handling hydrocarbon-rich wastewater, occurs due to microbial metabolic processes, significantly impacting metal surfaces.

Addressing these chemical exposures in sewer systems of high-intensity industrial sectors, especially in the oil and gas, involves using specialized, corrosion-resistant materials, coupled with regular maintenance and monitoring. This approach is critical for the durability of sewer infrastructure, maintaining operational efficiency, and adhering to environmental and safety standards.





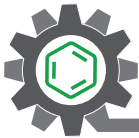
## Corrosion Protection Strategies for Heavy Industry Sewer Systems

Corrosion protection in sewer systems is crucial for maintaining the integrity and functionality of the infrastructures involved. Various methods are employed to mitigate the effects of corrosion, ensuring the longevity of these systems and compliance with environmental and safety standards.

Primary methods of corrosion protection in sewer systems include the use of corrosion-resistant materials such as stainless steel, titanium, and robust non-metallic compositions like thermoplastic liners. Designing for corrosion resistance is crucial, incorporating easy maintenance, inspection, and compatibility with specific wastewater types.

Cathodic protection is another technique to prevent metal corrosion. Additionally, corrosion inhibitors like phosphates and silicates can be added to control water corrosiveness. Regular maintenance and inspection are vital in early corrosion detection and management, involving routine cleaning, leak checks, and part replacements, supplemented by advanced monitoring systems. Environment control around the sewer infrastructure, through proper drainage, reduced exposure to corrosive atmospheres, and managing temperature and humidity, is also beneficial. However, these methods are not certain, durable solutions and should not be solely relied upon for corrosion protection purposes.

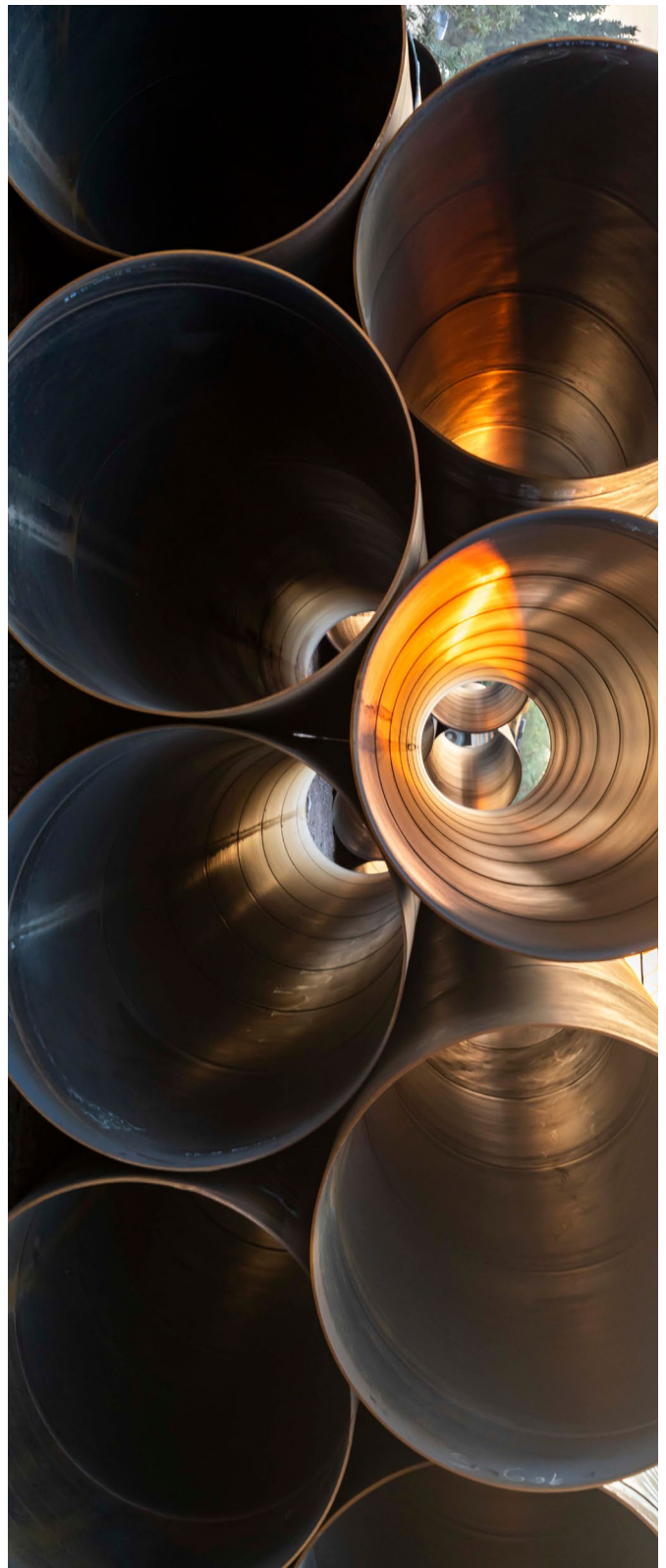




**Protective coatings and linings** stand out as one of the most effective strategies for protecting sewer systems in major industrial sectors, particularly in the oil and gas. These coatings and linings create a robust barrier between the corrosive substances within the sewer and the infrastructure material, preventing direct contact and corrosion. There are various types of coatings and linings available, including traditional options like epoxy-based and polyurethane-based coatings. However, the critical factor lies in choosing the most suitable lining and coating. This is because many epoxy-based and polyurethane-based coatings do not demonstrate effective resistance against corrosive chemical fluids.

Protective coatings and linings not only extend the lifespan of sewer components but also contribute significantly to the overall safety and environmental compliance of these vital systems.

Fiber Reinforced Polymer (FRP) linings have emerged as highly efficient solutions, offering excellent chemical resistance and durability. Their ability to resist a wide range of corrosive agents, including acids, alkalis, salts, and hydrocarbons, due to various resin basis used in the system, makes them a preferred choice where traditional materials are susceptible to rapid corrosion.

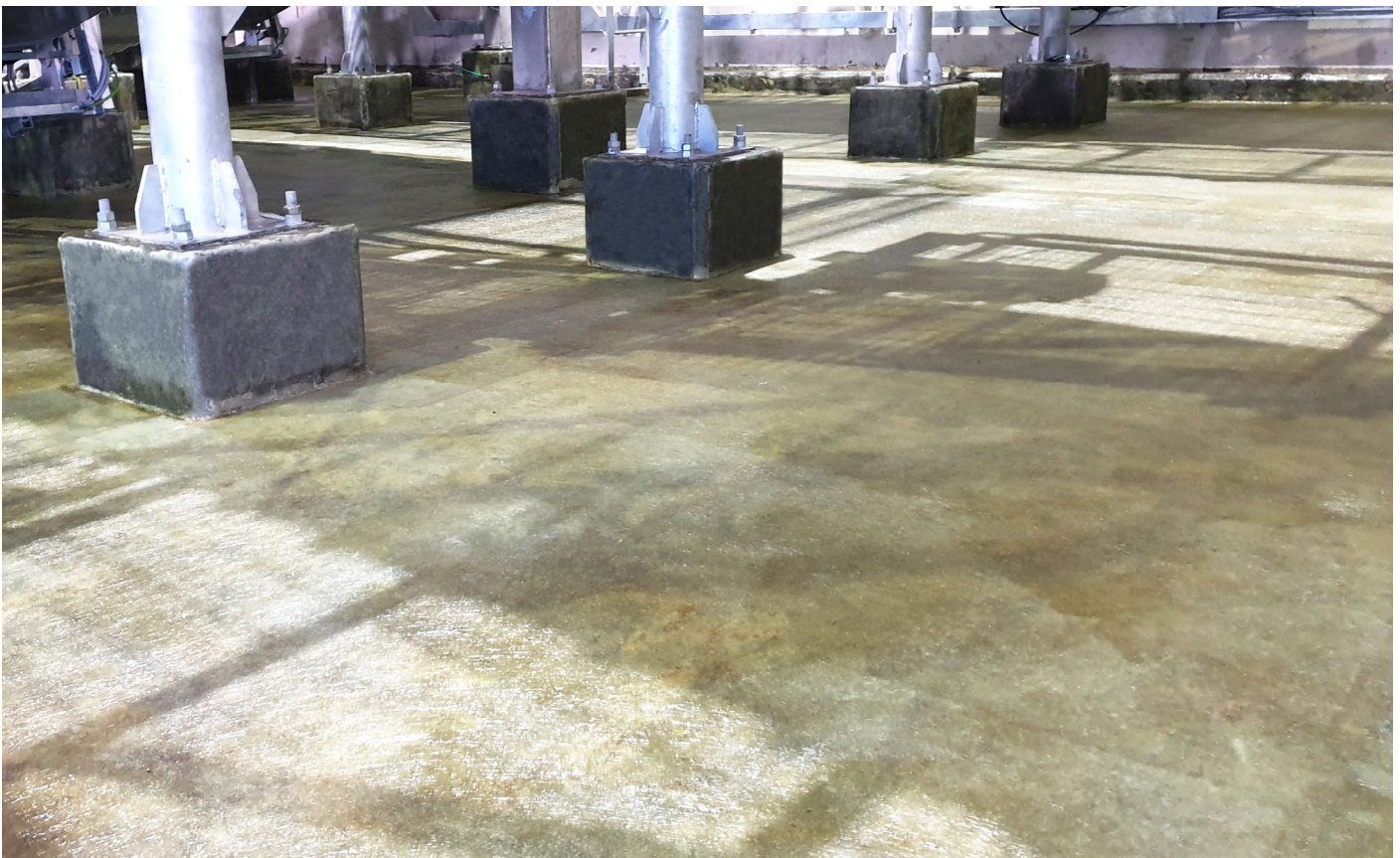




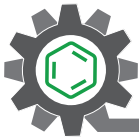
FRP linings are particularly advantageous in scenarios where high strength-to-weight ratios are required. This makes them suitable for applications in large tanks and pipelines where adding significant weight with traditional materials would be impractical. Moreover, FRP is versatile in terms of its application; it can be tailored to fit various technical requirements, making it ideal for complex industrial structures. Once the lining is installed and cured it forms a solid, durable layer that adheres to the interior surface of the sewer system component. Depending on the process conditions, the resin base can be chosen for an adequate corrosion resistance property, and therefore, can significantly extend the life of sewer system components.

This reduces the need for frequent replacements or repairs, thereby lowering long-term maintenance costs. Furthermore, given that the coating is reinforced with a glass mat, the FRP linings demonstrate enhanced mechanical properties.

**HEGSEL FRP 343**, a vinyl ester resin-based coating, provides superior defense against corrosion, surpassing conventional market systems. Through its exclusive formulation, **HEGSEL FRP 343** offers extensive chemical resistance, ensuring optimal protection against corrosive agents like nitric acid and solvents in sewer facilities and infrastructure.







## ► Vinyl Ester based Laminate System

**HEGSEL FRP 343** is an advanced lining system designed for robust protection in various applications. It is constructed from high-performance vinyl ester resin, with its components including the **HEGSEL FRP 343** Primer, optional **HEGSEL FRP 343** pre-filling, and the core **HEGSEL FRP 343** Solution fortified with glass fiber mat and glass fleece. This comprehensive system offers exceptional durability and corrosion resistance, making it an ideal choice for a wide range of industrial and infrastructure needs. Whether used alone or in combination, these components work seamlessly together to provide reliable and long-lasting performance, ensuring the longevity and integrity of the coated surfaces.

**HEGSEL FRP 343** serves as a versatile lining solution, safeguarding concrete and metal substrates from diverse industrial processes. Its counterpart, **HEGSEL FRP 343** laminate, excels as a crack-bridging seal, capable of effectively sealing cracks up to 0.4 mm wide, whether within indoor or outdoor catch areas constructed from steel concrete. Notably, this laminate is well-suited for floors requiring the traversal of pneumatic full rubber tires, Vulkollan tires, or polyamide tires, ensuring robust protection and adaptability across a range of applications.





## Application Areas

- Containment areas
- Sewer facilities
- Flooring in industrial plants
- Storage tanks
- Neutralization ponds
- Trenches, pits and sumps

Technical Data	Value	Unit
<b>Adherence to concrete / screed</b> DIN EN ISO 4624	> Inherent tensile strength	–
<b>Modulus of elasticity</b> ASTM C580	18,300	MPa
<b>Elongation at tear</b> ASTM C307	2.8	%
<b>Temperature resistance</b> (Under bricks and tiles)	120	°C