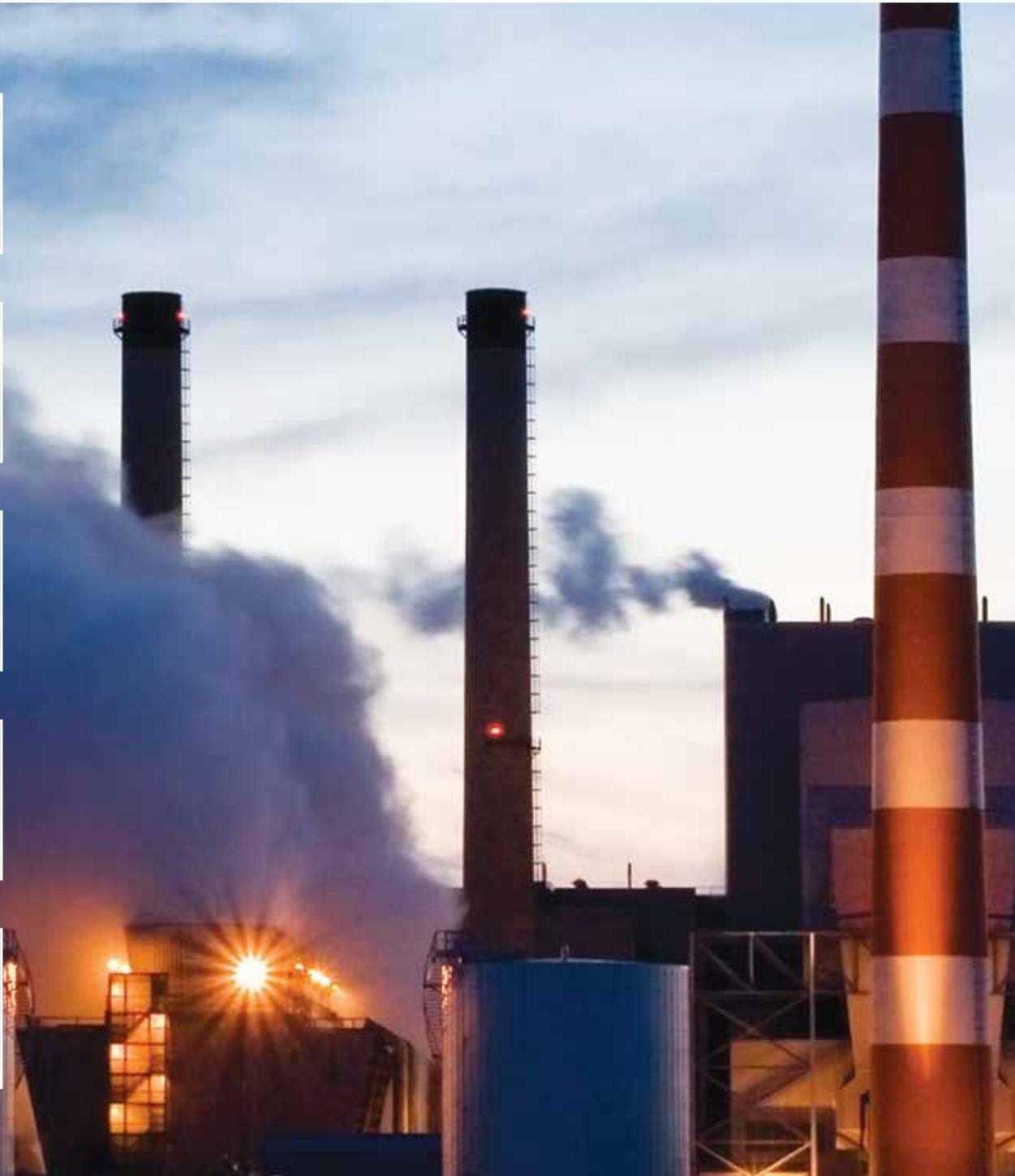
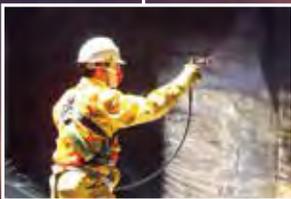




CORROSION ENGINEERING™

Corrosion Protection Systems

Protecting People, Assets, and the Environment





Sophisticated Corrosion Control Solutions for the Most Demanding Environments

Industries that use or produce corrosive or hazardous chemicals are challenged to maintain safe and reliable facilities while preserving the environment. Since the mid-1900s, factory owners put their trust in acid brick linings, constructed with Corrosion Engineering™ chemical-resistant mortars and membranes, to help them achieve these goals.

While many continue to rely on acid brick linings to address severe chemical, mechanical, and thermal service conditions, the range of corrosion resistant linings and materials available today provides more versatile means of achieving plant safety, reliability, and environmental goals. Armor's Corrosion Engineering division offers a variety of corrosion protection solutions to meet the needs of industrial processors.

- » Anchored Thermoplastic Concrete Protection Liners
- » Cellular Glass Block Lining Systems
- » Graphite & Vitrified Tiles
- » Acid-Resistant Brick Mortars, Tile Grouts, & Adhesives
- » Polymer Concretes & Structural Grouts
- » Polymer Modified Underlayment
- » Potassium Silicate Concretes & Gunites
- » Urethane & Asphaltic Flexible Membranes
- » Laminate Linings
- » Flake-Filled Linings
- » Seamless Trowellable Floor Toppings
- » Slurry-Broadcast Flooring
- » Expansion Joint Sealants & Fillers

INDUSTRIES SERVED



SULFURIC ACID PLANTS

Acid towers and sulfur pits in sulfuric acid plants



PHOSPHORIC ACID/FERTILIZER

Phosphoric acid attack tanks in fertilizer plants



COAL-FIRED POWER PLANTS

Coal-fired power plant ducts & chimneys in desulfurized flue gas service



PULP AND PAPER MILLS

Digesters and chlorination towers in pulp bleach plants



PIGMENT AND DYES

Chlorinators in titanium dioxide plants



STEEL MILLS

Pickle tanks, acid regen, and wastewater collection trenches & sumps



METAL & MINERAL PROCESSING

Smelters and cell house infrastructure corrosion protection



SPECIALTY & BASIC CHEMICAL PLANTS

Aluminum sulfate digesters. Chlor-alkali plant infrastructure



FOOD & BEVERAGE PLANTS

Durable, hygienic process flooring



BATTERY PLANTS

Acid battery formation rooms and reclamation bunkers

TANKS AND PROCESS EQUIPMENT

Corrosion Engineering offers durable primary containment lining solutions for demanding environments. Hot corrosive chemicals, exothermic reactions, agitated sediment – these conditions often call for acid resistant brick or tile linings. For cooler service temperatures, flake-filled PENNCOAT™ Linings are an economical choice. With a broad product line from which to choose, Corrosion Engineering can help you evaluate options to meet your needs.



Anchored thermoplastic ACROLINE™ Systems, available in HDPE, PP, PVDF, and ECTFE, are a great option for concrete tanks. ACROLINE™ Systems have been installed in diverse applications ranging from potable water treatment tanks, to phosphoric acid attack tanks.



Historically, **brick linings** are utilized in the most demanding environments, and provide reliable service with minimal maintenance.



Flake fillers in our **PENNCOAT™ Lining** formulations reduce the lining's permeability for longer life in immersion service. Systems are designed for brush, roller, trowel, and spray application.



Phosphoric acid attack tanks are lined with **carbon brick** set in **FURALAC™ Green Panel Mortar** over a chemical-resistant membrane such as **TUFCEM™ II Membrane**.



In acidic environments subject to thermal cycling, adding a layer of **PENNGUARD™ Block Lining System** behind the brickwork insulates the membrane and extends its service life.



Urethane-asphalt TUFCEM™ II Membrane was used to coat the exterior surface of this sulfur pit made of **TUFCEM™ Silicate Concrete**. The sulfur pit was precast in two pieces then joined in the field.



Vinyl ester mortars have historically been used in tile-lined, pulp bleach plant equipment. Our family of **vinyl ester PENNCHEM™ Mortars** provides customized performance to address variations in pH and temperature for optimal mortar longevity.

FLOORING SYSTEMS

From dropped tools to vehicle traffic, process and containment area floors can take a beating. We design effective corrosion protection linings with abrasion and impact loads in mind. Choose from Corrosion Engineering's flooring systems to fill your requirements for durability and chemical resistance.

Corrosion Engineering's seamless flooring solutions include: **PENNCOAT™ MR**, **PENNTROWEL™ SBR**, and **PENNTROWEL™ L/F Systems**, which incorporate reinforcing fabric for enhanced durability and crack bridging capabilities. Consider several resin formulations to suit your chemical resistance requirements.



Compared with trowellable PENNTROWEL™ Surfacers Systems, **PENNTROWEL™ SB Systems** are applied using less labor-intensive slurry-broadcast installation techniques. These methods yield a non-slip, durable broadcast floor finish.



Vitrified TUFCEM™ Tiling Systems are the ultimate solution for wet dairy, beer, and meat processing facilities, where sanitary design, durability, and a safe walking surface are critical.





When installation time is limited, consider a pre-cured, adhesively bonded sheet membrane like **PENNCOAT™ 600 Membrane**. Seams are sealed with heat and chemical-resistant tape.



With unparalleled durability and thermal shock resistance, few alternatives outlast a properly specified, installed, and maintained **acid brick and membrane floor**.



Aircraft maintenance facilities utilize aggressive chemistries for parts and engine cleaning and paint stripping. Properly selected **PENNCOAT™ Lining** or **PENNTROWEL™ SB Flooring** provides effective concrete protection in these facilities.



When your project schedule doesn't provide enough time to install acid brick flooring, substitute cast-in-place polymer concrete for faster turnaround. For battery plants and other acidic environments, consider cast-in-place **TUFCHEM™ Silicate Concrete** or **TUFCHEM™ Epoxy Concrete** flooring.



SECONDARY CONTAINMENT & EXPANSION JOINTS

Practical and economical, Corrosion Engineering's secondary containment lining systems provide just the right amount of protection against occasional chemical spills or short-term immersion.

Strong acid containment dikes demand robust protection against thermal shock. Thermal shock produced when strong acid leaks into standing water can delaminate thin liquid-applied linings. Thicker linings, such as acid brick or polymer concrete, offer excellent protection against thermal shock.

A chemical containment system is not complete until expansion joints are filled. Chemical-resistant FLEXJOINT™ Sealants are hard enough to withstand a variety of wheeled cart and vehicular traffic.



User-friendly **PENNCOAT™ Linings** and **PENNCOAT™ MR Linings** are practical and cost-effective solutions for secondary containment structures designed to resist occasional chemical splash and spill.



The elastomeric nature of **TUFCEM™ II** and **PENNCHEM™ 97 Membranes** allow them to accommodate some movement in the substrates over which they are applied. Both are useful secondary containment linings.



TUFCEM™ Silicate Concrete is an acid-resistant substitute for Portland cement concrete. This active pharmaceutical ingredient plant, which uses strong sulfuric and acetic acids, constructed secondary containment dikes using TUFCEM™ Silicate Concrete that was mixed on site in a continuous volumetric mix truck.



This lead-acid battery manufacturer protects its strong acid storage and mixing containment areas with **acid brick** and **FURALAC™ Green Panel Mortar** over **asphaltic PENNCOAT™ 101 Membrane**.

EFFLUENT COLLECTION SYSTEMS

Often characterized by a variable mixture of constantly flowing chemical spills, steam condensate, storm water runoff, and process contact water, industrial wastewater streams give collection systems the corrosion-erosion “one-two punch.” With many trenches, sumps, and manholes below grade, effective groundwater protection can be as critical as corrosion protection.



Durable fiberglass reinforced **PENNTROWEL™ MR and L/F Systems** can withstand constant chemical immersion and abrasion from sediment entrained in process effluent streams. The fabric also helps these linings maintain their integrity along inside corners, where seasonal thermal cycling could undermine a weaker lining system.



Many “off-the-shelf” precast polymer concrete trench drains just don’t provide sufficient chemical resistance for corrosive industrial environments. When your effluent collection system demands a more robust, custom solution, think of Corrosion Engineering. Choose from **ACROCAST™ Vinyl Ester Concrete, TUFCEM™ Epoxy Concrete**, and **PENNCHEM™ Novolac Concrete**, available in silica and carbon grades.

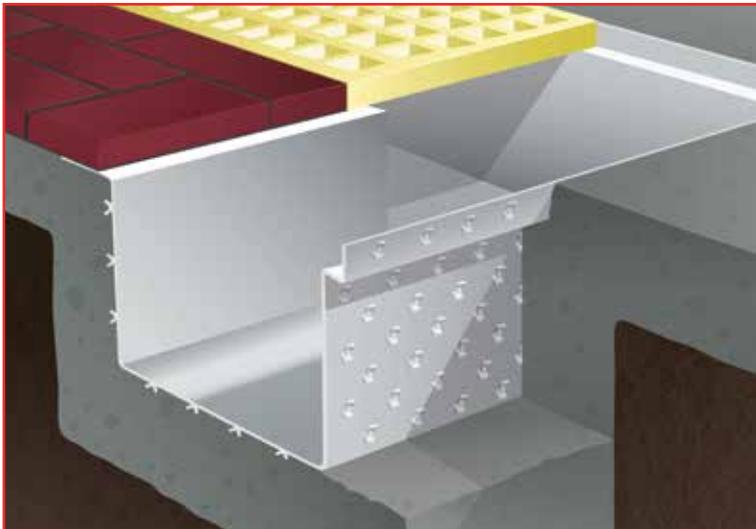


Though coatings have gained favor for their low initial cost, durable **acid brick linings** typically provide corrosion protection at a lower cost per year of service.

ACROLINE™ Anchored Thermoplastic Concrete Protection Liner Systems

Available in several thermoplastic materials, ACROLINE™ Anchored Thermoplastic Concrete Protection Liner Systems provide reliable corrosion protection and chemical containment.

Integrally extruded anchors on the back of our ACROLINE™ Systems mechanically lock the thermoplastic sheeting into the surface of the concrete structure. This robust anchoring system enables the liner to resist delamination from hydrostatic backpressure (below grade) or thermal expansion.



Liners may be fabricated with grating seats, pipe stub-outs, and overlap flanges. Fabric-backed **ACROLINE™ Systems** provide a bonding surface over which other chemical-resistant linings may be applied at tie-ins, such as between a trench liner and adjacent **acid-proof brick flooring**.



When downtime is critical, **shop-fabricated ACROLINE™ Systems trench and sump liners** save precious field construction time – concrete can be restored and lined in the same step.

ACROLINE™ Systems are Available in Several Thermoplastics:

- » High-Density Polyethylene (**HDPE**), UV stable black
- » Block Copolymer Polypropylene (**PP-B**), gray and UV stable black
- » Flexible Polyvinylidene Fluoride (**PVDF**), UV stable natural
- » Ethylene-Chlorotrifluoroethylene Copolymer (**ECTFE**), UV stable natural

PADS, PIERS, & PEDESTALS

When corrosion threatens the structural integrity of tank pads, pump piers, and column pedestals, the safety of your workers may be at risk. To protect these structures against chemical attack, consider building them out of chemical-resistant polymer concrete or seal them with a corrosion barrier. Polymer concretes include: TUFCEM™ Silicate Concrete, ACROCAST™ Vinyl Ester Concrete, PENNCHEM™ Novolac Concrete, and TUFCEM™ Epoxy Concrete.



■ **TUFCEM™ Silicate Concrete** offers unmatched resistance to strong nitric, sulfuric, phosphoric, and hydrochloric acids. Construction tools and techniques are similar to those used for conventional Portland cement concrete.



■ Column base plates need solid support for efficient load transfer. High-strength **TUFCEM™ Grout** is a great choice for pours up to one foot deep.



■ Leaking pump fluids can corrode Portland cement concrete pads from under base plates and mounting bolts. For structural support that is corrosion resistant, consider using **Corrosion Engineering polymer concrete**.

FLUE GAS HANDLING EQUIPMENT CHIMNEYS & DUCTS

The chimneys and ducts of coal-fired power plants equipped with flue gas desulfurization systems demand sophisticated corrosion protection. Corrosion Engineering systems resist acidic condensate produced when gas temperatures fall below the acid dew point. Whether you are reheating the gas after scrubbing or running wet, Corrosion Engineering linings can provide the protection you need.



The global power generation industry relies on our unique **PENNGUARD™ Block Lining System** for long-term corrosion protection in their stacks. This versatile lining system is even suitable for seismic zones and can be applied over steel, concrete, gunite, brick, and fiberglass structures.



When initial cost considerations drive the chimney lining selection process, power generators turn to **PENNCOAT™ Linings**, which incorporate flake fillers. These linings, as well as fiberglass reinforced **PENNTROWEL™ L/F Systems**, find application in other parts of the FGD plant including tank linings, neutralization basins, and cooling tower bases.



In predominantly hot and dry stacks, plural component **TUFCEM™ Silicate Gunite** lining is an economical choice. For best performance, the substrate and anchoring system are first lined with a chemical-resistant membrane, such as **PACMASTIC™ 325**, prior to installation of the gunite.

CORROSION ENGINEERING LINING SYSTEMS & MATERIALS

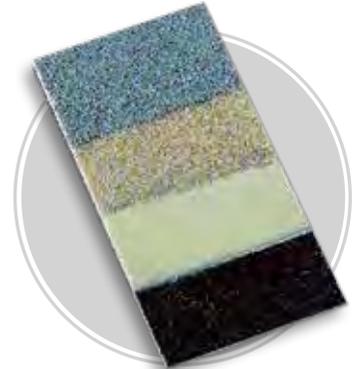
PENNCOAT™ Lining Systems



PENNCOAT™ MR Linings (Mat Reinforced)



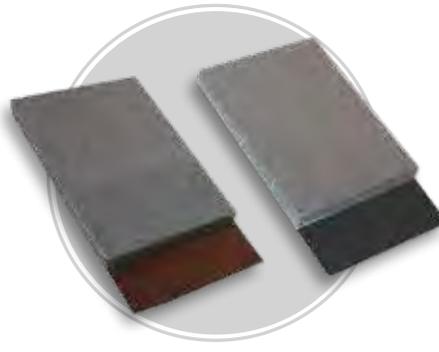
PENNCHEM™ 97 Membrane with PENNCOAT™ 331 Lining



PENNTROWEL™ SBR Flooring Systems (Slurry-Broadcast, Reinforced)



PENNTROWEL™ Surfacing (Trowel-Applied)



PENNTROWEL™ L/F Systems (Lining/Flooring)



TUFCEM™, PENNCHEM™ (shown), and ACROCAST™ Polymer Concretes



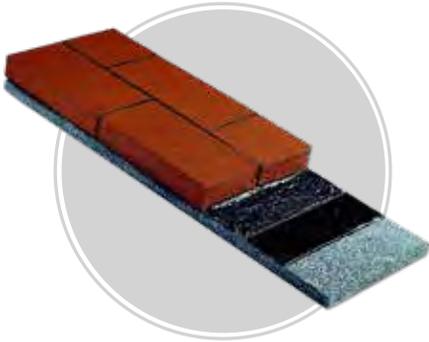
FLEXJOINT™ Sealants



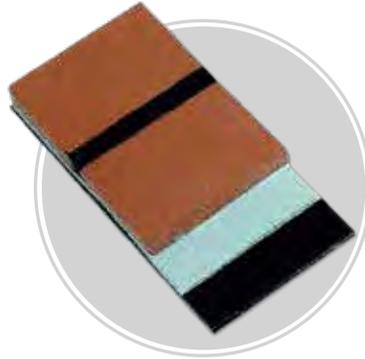
PENNGUARD™ Block Lining Systems



**Acid Brick over PENNCOAT™
101 Membrane**



**Tile Grouts and THINSET™
Adhesive Bed Joint**



**Vitrified TUFCEM™ Tiling
Systems**



**ACROLINE™ Anchored Thermoplastic
Concrete Protection Liner Systems**



Choosing the right lining system to protect your plant equipment and infrastructure against corrosion is complex. Choosing a material supplier who will take the time to guide you through the process is simple.

Contact Corrosion Engineering for lining recommendations, design details, material specifications, and installer referrals at **customerservice@armor-inc.com**.

Visit **corrosion-engineering.com** for access to our comprehensive online product catalog.

About

Corrosion Engineering

Corrosion Engineering's heritage extends back to its foundation at Pennsylvania Salt in the 1940s, where it began developing corrosion resistant linings and materials for the company's pulp and paper chemicals manufacturing plants. Since then, the sophisticated line of chemical resistant brick mortars has grown into a broad range of corrosion protection solutions for multinational clients.



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