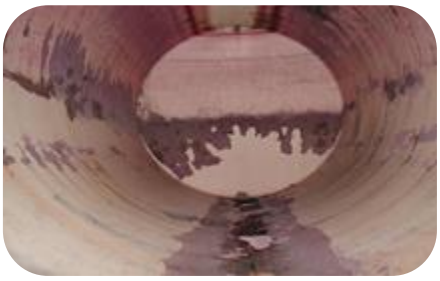
Chemical tanks

There are several coatings that can be used for the internal lining of chemical tanks. The criteria that must be considered for the correct PES coating system to be chosen is as follows –

- Chemicals being stored in the tank
- Operating temperature
- Viscosity of material being stored
- Surface preparation



Strong acids and aqueous chemical solutions

For tanks storing strong acids, which includes concentrated Sulphuric Acid or Hydrochloric Acid, Nitric Acid up to 20%, Phosphoric Acid up to 75%, or Acetic Acid up to 20% then PES-Chem 511 UCEN must be used. The minimum surface preparation for this type of application is abrasive blast clean to Nace #2, SSPC-SP10 near white metal, with a 3-4 mil angular anchor profile, SA2.5, 75 micron profile. The coating system must be applied in a minimum 2 coats at approximately 10 Mils (250 microns) wet film thickness per coat. PES-Chem 511 UCEN does not need a primer when being applied to steel and can be applied by brush, roller or plural feed hot spray for larger areas. The material can also be post cured at high temperature to offer increased chemical resistance, please speak to Plant Equipment & Services technical consultant at 1-888-778-6510 or pes1@pes-solutions.com for further guidance.

Mild aqueous chemical solutions

Typical chemicals would include sodium and potassium hydroxide, 10% sulphuric acid or below, 20% hydrochloric acid or below, diesel, fuel oil or Xylene. For these chemicals PES-Chem 501 CRSG can be applied to abrasive blast cleaned surfaces in a 2 coat application, minimum 10 Mils 250 microns wet film thickness per coat. The product can be applied by brush, roller or standard airless spray equipment.

Solvent tanks

Many organic chemicals can degrade standard epoxy based lining systems and therefore result in premature failure of the coating. Typical chemicals include Toluene, Xylene, Styrene, Ethanol, Butanol and Benzene. Depending on the type of solvent being stored and any risk of elevated temperature either PES-Chem 501 CRSG or PES-Chem 511 UCEN can be used as an effective lining system for steel tanks storing these types of chemicals, please speak to a Plant Equipment & Services Technical Consultant at 1-888-778-6510 or email pes1@pes-solutions.com.

Waste water, effluent, river water tanks

These types of liquids and products can be stored in a wide range of tanks constructed from GRP, Steel, Stainless Steel and Concrete. Also the type of fabrication of the tank needs to be taken into consideration. There are two types of PES coating material that can be used for these applications, PES-Chem 501 CRSG (100% solids epoxy) and PES-Chem 507 DWPU (100% solids Polyurethane). PES-Chem 501 CRSG can only be used for rigid tanks that store or process waste water, effluent or river water. PES-Chem 507 DWPU can be used for all types of storage or process tank/ vessel and is particularly effective when used on sectional steel tanks (Braithwaite).

These materials can be applied directly on to abrasive blast cleaned, Hydro blasted, water jetted and mechanically prepared steel and GRP surfaces. However for long term protection of metallic surfaces we would always recommend abrasive blast cleaning to Nace #2, SSPC-SP1 with a 3-4 Mil profile using angled grit (SA2.5, 75 micron). For concrete structures and tanks the surface will need to be abrasive Blast cleaned or mechanically abraded using diamond discs. Once the Coated area is free of dust then the concrete substrate will need to be Sealed using the relevant PES primer.
There are three primers to choose from –

1. PES-Chem 503 SPEP – two pack solvent free epoxy sealing primer, standard cure time of 6-8hours
2. PES-Chem 504 SPXF – two pack solvent free epoxy sealing primer, fast cure 2-3 hours
3. PES-Chem 505 Damp Seal – two pack solvent free epoxy primer for high moisture content concrete

All of these primers may require 2 coats to seal a porous surface, they can be applied by brush, roller or standard airless spray, (if spraying standard practice is to back roller the product into the concrete surface to ensure maximum penetration).

Sectional steel tank coated with PES-Chem 507 DWPU

Concrete holding tank coated with PES-Chem 507 DWPU

Concrete river water tank coated with PES-Chem 501 CRSG

Containment areas/bunds

In general wherever there are storage vessels of acids, aggressive chemicals and hydrocarbons these areas will be contained within a bund to contain any spills or leaks. Containment areas are predominantly built with concrete; however older containment areas may use brick work for the walls. For newly constructed containment areas the moisture content of the concrete will be main factor to consider, the majority of PES-Chem primers and coatings cannot be applied to concrete surfaces until the moisture content has fallen below 7%. However PES-Chem 505 Damp Seal is a primer that can be applied to damp surfaces or newly laid concrete substrates with readings up to 30% moisture content. Once cured the primer will allow the concrete to breath while sealing the surface from any further moisture ingress.

For older containment areas, chemical contamination and damage to the concrete surface itself will be areas for consideration. If any chemicals have been spilt or allowed to soak into the concrete surface these areas will have to be cleaned using either, high pressure water jetting for surface contamination, or enzymes or re-laying of concrete for chemical contamination that has been allowed to soak into the concrete structure. If there is any doubt as to the contaminant and the extent to which it has soaked in to the porous concrete surface it is standard procedure to perform patch tests in designated areas of the containment area to ascertain the best method of surface preparation and application of product.

Also it is advisable to construct a coving at the floor and wall interface, such coving can be constructed using PES-Chem 570 Concrete Patch Repair XF, or from using PES-Chem 503 SPEP mixed with dry kiln sand. The surface preparation and priming will be the same as above.

An area where linings of containment areas are prone to failure is the expansion joint. To ensure that the joint is allowed to expand and contract while not harming the PES-Chem system above, bring primer and recommended chemical resistant coating into the expansion joint. After coating has cured lightly sand coating on the walls of the expansion joint, install backer rod, PES sealant then top coat with PES 196SL. The three products manufactured for Polymeric Engineered Systems that can be considered for protecting concrete containment areas are PES-Chem 501 CRSG, PES-Chem 502 CRXF or PES-Chem 511 UCEN.


Old diesel bund with concrete floor and brick walls coated with PES-Chem 501 CRSG


Concrete containment area coated with PES-Chem 501 CRSG


Chemical pit coated with PES-Chem 511 UCEN

Protection of tank externals

The protection of tank externals covers products capable of intermittent chemical resistance where tanks are stored in a chemical process/manufacturing areas and protection of the steel surfaces from weathering and UV degradation. PES-Chem products cover a wide range of possible surface preparations and all are dependent on the required design life of the coating system and the practicality of the surface preparation options available. As a rule, the better the surface preparation the longer the design life of the system.
A quick guide of what to use and when is set out below-

Product	501 CRSG	502 CRXF	506 Aluprime	508 UVPU	511 UCEN	554 RB	555 Pesinox
Hand Tool	√	√	√	X	X	√	√
Mechanical	√	√	√	√	X	√	√
500psi Water Jet	√	√	√	X	X	√	√
Hydro Blast	√	√	√	√	√	√	√
Abrasive Blast	√	√	√	√	√	√	√
Chemical Vapour	√	√	X	√	√	X	X
Chemical Splash	√	√	X	X	√	X	X
Marine Environment	√	√	√	√	√	√	√
UV Stability	X	X	X	√	X	√	√

For more detailed information please refer to the USA Standard ISO 8501-1 Classification chart at the back of this manual.

Manual and mechanical surface preparation, typically PES-Chem 501 CRSG, 506 Aluprime, 554 RB membrane and 555 Pesinox can be used for this type of surface preparation. We would recommend as standard that all edges, welds should be stripe coated with a further 2 coats of material.

500psi water jetting surface preparation, the same as above.

Hydro blasting surface preparation, PES-Chem 511 UCEN can be used for water blasting at 5000psi and above.

Abrasive blast cleaning, all of the coatings can be used on blast prepared steel, areas to be considered would be chemical resistance to vapour or intermittent splashes from aggressive chemicals

Chemical vapour and chemical splash, we would recommend that only PES-Chem 501 CRSG, 502 CRXF, 508 UVPU and 511 UCEN be used for contact areas with chemical vapour. PES-Chem 501 CRSG, 502 CRXF and 511 UCEN should be used for surfaces that can be in contact with aggressive chemicals.

UV Stability, only PES-Chem 508 UVPU, 554 RB Membrane and 555 Pesinox are UV Stable. PES-Chem 501 CRSG, 502 CRXF and 506 Aluprime can be over coated with PES-Chem 508 UVPU to give UV stability.

Coating Applications - Corrosion

Oil storage tank, water jetted at 500psi and coated with PES-Chem 555 Pesinox – 10 mils stripe coat with 2 coats at 14 Mils WFT

Oil storage tank, abrasive blast cleaned to Nace 2 near-white blast with 3-4 mil profile. Stripe coated with 10 mils of PES-Chem 501 CRSG, 1 x coat of PES-Chem 501 CRSG applied by standard airless spray at 12mils WFT, 1 coat of PES-Chem 508 UVPU applied by standard airless spray at 5 mils WFT

Sectional steel tank containing waste water, abraded mechanically with belt sanders and 2 coats of PES-Chem 508 UVPU applied by roller at 5 mils WFT per coat.

Structural steel

This section covers structural steel used in the fabrication of civil engineering projects. This type of steel work can be exposed to marine, chemical and industrial environments all of which can have differing levels of humidity and corrosion. Chemical vapour, humidity and marine/salt water environments will corrode mild steel structures relatively quickly and if left unchecked can lead to failure of the steel surface. To simplify where PES coating system can be used structural steelwork can be split into two areas - new steelwork and existing steelwork.

New steelwork

New steel fabrications will invariably be supplied with a holding primer already applied to the surface or be supplied as bare steel with the possibility of mill scale as a surface contaminant. In both cases abrasive blast cleaning is the only method where the applicator can be sure there is no possibility of any surface contamination remaining on the surface prior to the application of a PES coating system.

Existing steelwork

As standard all grease, oil and other surface contaminants must be removed in order for the chosen PES coating system to work successfully. Failure to remove all of the surface contaminants will ensure premature failure of the product applied. However in many cases abrasive blast cleaning is not only practical it is also not allowed environmentally. There are several PES coatings which can be applied to manual, mechanical and hydro blasted surfaces and will for a period of time offer good levels of corrosion protection. However the applicator and customer must acknowledge that in many cases this type of preparation will have an adverse effect on the design life of the system.

For more information on surface preparation and surface contaminants please refer to the following documents –

- ***USA Standard ISO 8501-1 Environmental classification chart PES products***
- ***Surface preparation guidelines for steel surfaces***

The quick guide table in the protection of tank externals can also be used as a guide for new and existing steelwork fabrications and structures.

Pipework

This section covers existing pipework and the various applications that are found within industrial sites where PES coating systems can be used. The main areas where PES system can be used are –

- Protection against Corrosion Under Insulation (CUI)
- Protection against weathering and UV degradation
- Protection against chemical vapour and splashes
- Thermal protection on hot pipework

Protection from corrosion under insulation

For any existing chemical, petrochemical and industrial manufacturing site corrosion under insulation is one of the main issues facing engineers and facility managers. CUI can cause premature failure to pipework and is seen as one of the main reasons for unplanned maintenance costs. Using PES-Chem 501 CRSG as a surface tolerant protective coating can ensure that mild steel pipework is protected for many years. PES-Chem 501 CRSG can be applied to surfaces that have only been prepared by mechanical grinding or by hydro blasting. The material must not be applied to pipe work hotter than 104°F, however PES has developed a material, 561 Thermal Barrier, which can be applied to surfaces up to 212°F in temperature, therefore allowing critical operating systems to continue operating while application work is carried out.



Protection from weathering, UV degradation and general atmospheric corrosion