Water and Wastewater Facility Protection Systems

Asset protection for essential infrastructure

- EpiMax 225
- EpiMax 330
- EpiMax 333AR
- EpiMax 333WB
- EpiMax 421HAR
- EpiMax 575
- EpiMax 655
- EpiMax 655AR

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What needs to be considered in the selection of a Water and Wastewater Processing Protection System?

• Background - why coat concrete?

Concrete is frequently thought to be a durable and long-lasting material. However this is not always the case. If unprotected concrete is exposed to aggressive environments, it will deteriorate. This is especially so in water treatment and waste water processing, in those areas exposed to severe chemical activity.

• Design life - budget compliance

The first important question to ask when selecting a new concrete protection system is - What is the required design life – 2, 5, 10 or 20 years? And, is frequent or regular maintenance feasible?

It is virtually impossible to keep any concrete structure from cracking. Without proper protection, these cracks become the routes through which moisture, salt, acid rain and other chemicals can begin the degradation process on concrete remarkably quickly.

The specification must meet the agreed design life and the intended maintenance-free period.

• Management of surface preparation during application

This is the basic foundation of any protection system. Preparation process must be effective and consistent. Inadequate surface preparation is a leading cause of premature failure.

• Chemical and mechanical performance

The chemical and mechanical performance requirements including impact and abrasion resistance must be addressed. Any protection system applied to concrete must exhibit excellent adhesion and have a bond strength that exceeds the tensile strength of concrete.

• Potable water approved

All coatings and linings in contact with drinking water must be "potable water approved". They must not support microbial activity or taint stored water.

• Practical application characteristics

EpiMax supplies protection systems that can be applied by spray or roller in thicknesses of 150 – 3000 microns per pass. Trowel applied systems can achieve 75 mm thickness.

• Sustainability - whole of life

Sustainability is related to the quality of life in a community - whether the economic, social and environmental systems that make up the community are providing a healthy, productive, meaningful life for all community residents, present and future.

Sustainable development has been defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs".

With regard to concrete protection systems, sustainability should consider the "whole product life cycle". This includes production, application, service life and disposal.

Within any environment, the selection and installation of systems that offer longer service lives will always minimise the non renewable resources required for the complete reinstallation process (new surface preparation, new waste removal, new system manufacture, new installation).

A low VOC level is not all that is required to make a coating sustainable. The arithmetic of the application and the durability is very important. If the system lasts longer, it's even better.

Underperforming systems will always have greater environmental impact due to re-installation costs (surface preparation grinding energy, disposal and then the impact of the re-application itself).

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***Clean water is the most important** resource on our planet. Climate change has emerged as one of the most important political and business issues of our time, and the water industry faces greater challenges than many other industries. The availability of good quality water is in decline.*

The issue of the delivered quality of potable water from **water treatment facilities** has become critical as government and community health standards have risen. The requirement for potable water supply has increased with population growth, producing an equivalent increase in the volume of wastewater.

Wastewater is also being increasingly valued as a resource as recycling programs are adopted and general effluent quality is also rising as new environmental standards are being enforced.

These challenges are driving up the cost of water. **EpiMax** concrete protection systems provide a variety of cost-effective options to assist utilities in reducing their infrastructure management costs.

Hydrogen sulphide (H_2S) generation in wastewater treatment facilities has always been present. It causes corrosion in the form of sulphuric acid attack of concrete in sewer collection/treatment systems. Gaseous H_2S condenses on aerated, wet concrete surfaces; is metabolised by sulphur-oxidising bacteria or SOB; and is oxidised to form dilute sulphuric acid (H_2SO_4).

In recent years there is a general trend toward higher H_2S concentrations in **wastewater treatment facilities** which has promoted much higher concrete corrosion rates in domestic treatment plants (especially in larger regional plants) than seen in the past. This has resulted in several significant changes in exposure conditions that must now be considered when selecting protective coatings or linings for concrete protection in wastewater treatment systems. Coating systems that were effective in protecting concrete from H_2S and associated sulphuric acid attack in the past are failing dramatically in these newer, more severe environments.

EpiMax has built its reputation on a construction engineering foundation. Our experience has been forged on an impressive variety of civil, environmental, industrial, mining, defence and general services construction.

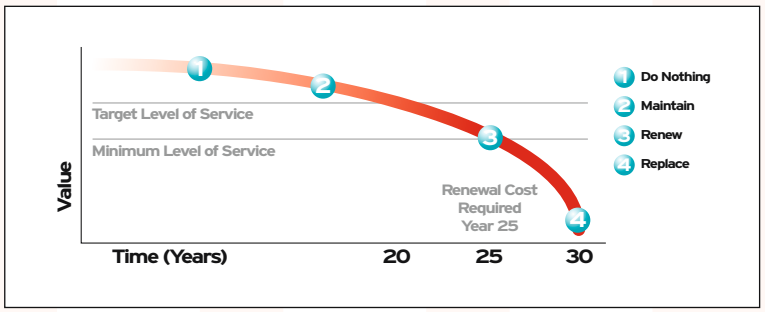
This success has been proven through partnerships with forward-thinking architects, consultants, engineers, application contractors, project managers and materials testing agencies. We believe in teamwork, respect and integrity.

Our primary focus is

- Floor Protection Systems
- Industrial Concrete Protection Systems
- Green Star Protection Systems
- Water and Wastewater Processing Protection Systems
- Foundation Protection Systems
- Extreme CAT (Corrosion, Abrasion and Thermal) Protection Systems

EpiMax: Expertise Applied, Answers Delivered

Typical Asset Depreciation



Applications

Water Treatment:

- Clarifiers
- Sedimentation, coagulation and flocculation systems
- Filtration systems
- Water storage
- Sludge tanks
- Chlorination
- Pump stations
- Chemical storage areas

Wastewater Treatment:

- Preliminary treatment areas
- Grit separators
- Launders and clarifiers
- Bio reactors
- Odour control bunds
- Oxidation ditch systems
- Effluent pump stations
- Primary settling tanks
- Sludge tanks
- Large diameter pipes
- Manholes
- Pump stations
- Chemical storage areas

EpiMax 225

A two-pack solventless epoxy binder system that can be used for a variety of applications in concrete construction, repair and maintenance.

- Multi-purpose use – aggregate extendible
- Excellent adhesion to wet or dry surfaces
- High mechanical strength
- Resistant to a wide range of industrial chemicals
- Potable water approved

EpiMax 330

New two-pack solventless high build epoxy coating system demonstrating excellent adhesion and general durability.

- Roller or airless spray application to 500 microns
- Resistant to a wide range of industrial chemicals
- Non-tainting during application
- Anti-microbial formulation
- Wide range of colours

EpiMax 333AR

A two-pack solventless novolac coating system demonstrating outstanding chemical resistance and adhesion.

- Roller or airless spray application to 300 microns in two coats
- Self priming
- Highly resistant to splashes and spills of mineral acids etc
- High Build Grade for 200 - 250 microns dft per coat
- Potable water approved

EpiMax 333WB

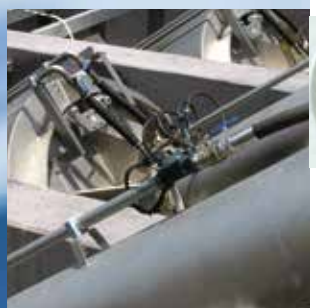
A two-pack water based epoxy coating system that provides excellent protection to all forms of concrete.

- Roller or airless spray application to 350 microns
- Hazmat free chemistry
- Long lasting durability
- Good adhesion to damp concrete
- Replaces solvent based systems in many applications

EpiMax 421HAR

A two-pack high solids novolac coating system which provides the highest level of chemical resistance to concrete, steel, and other surfaces.

- Tough and abrasion-resistant
- Latest high performance chemistry
- Highest chemical resistance
- Long lasting durability
- Excellent low temperature cure
- High build application



EpiMax 575

Easy-to-use, two-part epoxy system hardens after mixing with excellent properties ideally suited for many building and construction site applications. Available in Standard and Express grades.

- Excellent adhesion under adverse conditions (cold and damp)
- Good chemical resistance, Kevlar reinforced
- Non sag on vertical surfaces
- Good strength retention after prolonged immersion in water
- Tensile and compressive strength superior to concrete

EpiMax 655

A two-pack solventless epoxy coating system specially formulated and proven for UHB (ultra high build) application to all forms of concrete structures.

- Fast, airless spray, single coat application to 3000 microns on vertical surfaces
- Excellent adhesion
- Good chemical resistance
- Good low temperature cure
- High mechanical strength

EpiMax 655AR

Exceptional two-pack solventless novolac system specially formulated and proven for UHB (ultra high build) application in the harshest of environments.

- Rapid cure to 3000 microns per coat on vertical surfaces
- Provides very fast return to service
- Resistant to the harshest wastewater environments
- Provides excellent protection to all concrete structures
- Proven performance over many years

Case Study - protection from commissioning

The $188 million plus Cleaner Seas Project was delivered by an alliance between Cairns Water and Waste, Cairns Regional Council and an expert team involving United Group Limited Infrastructure, CEC Construction, GHD and Sinclair Knight Merz (SKM). The project delivered significant environmental benefits by reducing the load of nutrients discharged to the Great Barrier Reef by up to 80%.

More than 17,000 square metres of the of the project infrastructure is protected with ***EpiMax protection systems.***

Corrosive wet space environments – what are the issues?

All concrete deteriorates over time. The rate at which concrete deteriorates is a function of two factors: the quality of the concrete and the environment to which the concrete is subjected.

The quality of concrete refers to the properties incorporated into the original concrete mix design such as water/cement ratio, cement type, size and hardness of the aggregate and air entrainment. Quality is also dependent on the construction practices used to place the concrete such as proper consolidation, cover and curing.

The second factor affecting the rate of deterioration is the environment. Water and wastewater treatment plants provide a severe environment for concrete. Concrete structures can be subjected to wet-dry cycling, chemical attack and abrasion. Even high quality concrete will deteriorate under these harsh conditions.
For this reason, it is wise to protect concrete, even good quality concrete, to increase durability.

The best time to protect concrete is when it is new, before harsh chemicals like acids, salts and sulphates have had a chance to get inside the concrete and cause damage. Unfortunately, there are many structures that were built twenty to thirty years ago that were not adequately protected. Once these problems develop, the deterioration of the concrete is accelerated because aggressive substances now have an unobstructed passageway into the concrete itself.

Acid attack in wastewater – what is the mechanism?

Wastewater contains bacteria, sulphate, and organic matter, so it has the elements required for sulphide generation. In wastewater of normal pH value (6.5 to 8), sulphide may be present partly in solution as a mixture of H_2S and HS^-. H_2S that escapes as a gas from solution in a sewer may be oxidized on exposed surfaces. If the surfaces are dry, free sulphur may be formed, but under moist conditions a species of bacteria named Thiobacillus concretivorus oxidizes it to sulphuric acid by the reaction:

$$H_2S + 2O_2 \rightarrow H_2SO_4$$

This free acid causes corrosive damage to vulnerable materials.

Environmentally sustainable

Resistance to abrasion and impact

Durable

High adhesion

Resistance to chemicals

Potable water approved (drinking water)

EpiMax

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