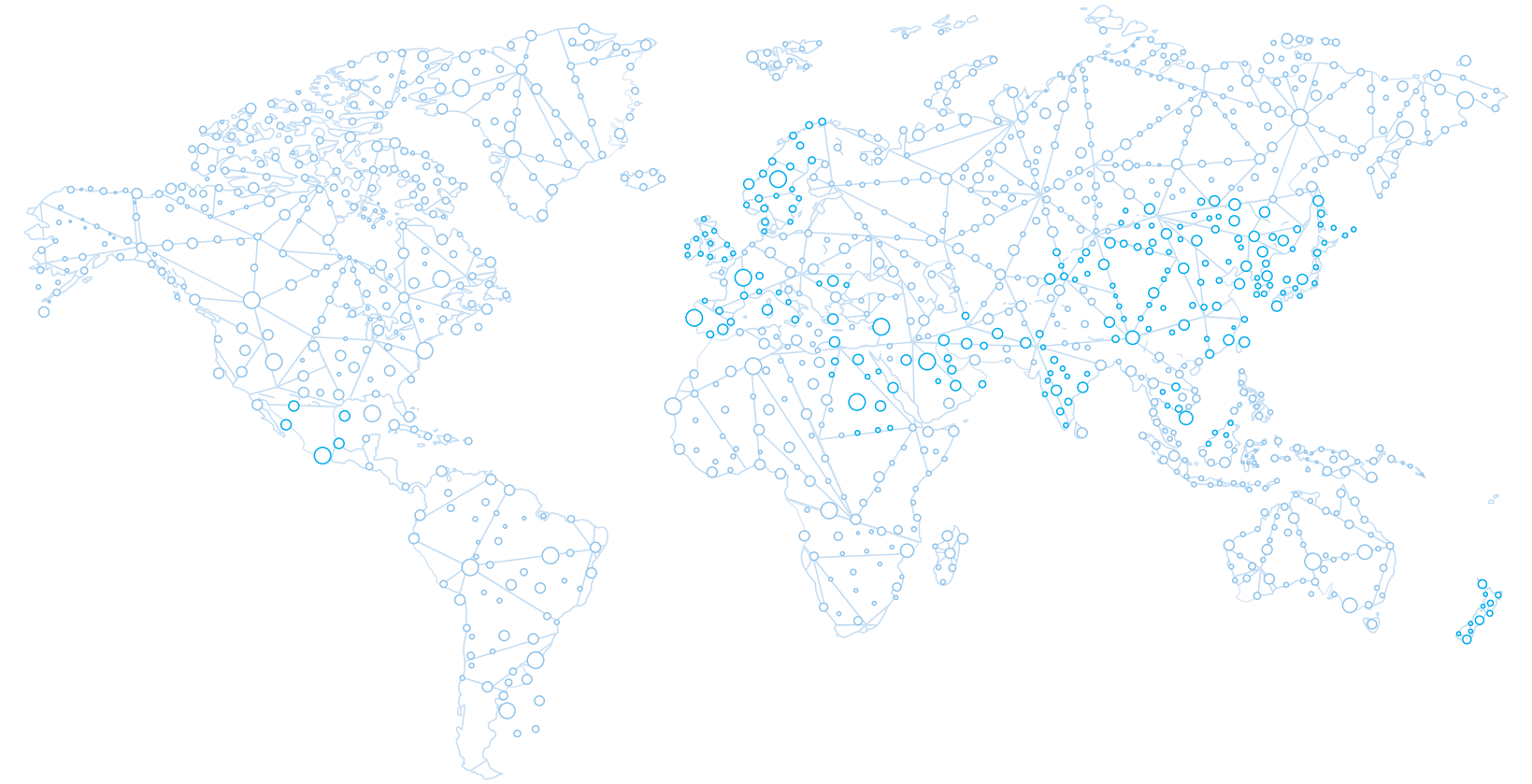




NanoPhos
*Pioneering
Nanotechnology*







With vast technical knowledge and experience, a product portfolio exceeding 54 products and numerous large scale projects all over the world, NanoPhos is focusing on top performance industrial coatings.

NanoPhos products are applied in:

The UK, Norway, Sweden, Denmark, Portugal, Spain, France, Germany, Italy, Finland, Romania, Cyprus, Egypt, K. of Saudi Arabia, Bahrain, UAE, Qatar, Kuwait, Oman, India, New Zealand, China, Japan, Mexico, Guatemala, Thailand, Malaysia, Indonesia and Singapore.

Since its establishment, NanoPhos has been studying, inventing and producing intelligent materials to solve everyday problems, by harnessing the power of Nanotechnology. High quality, reliable, top performing chemical formulations protect all kind of surfaces surrounding our living. We cover a broad range of applications, where “smart coatings” reveal their unique properties: From decorative paints that boost energy efficiency in buildings in construction projects to nano-formulated corrosion inhibitors and anti-fouling coatings for ocean going vessels.

NanoPhos has repeatedly won awards for the efficiency and ecological awareness of its products. International recognition ranges from the 2010 World Expo, the 100% Detail exhibition in London, UK and the prestigious GAIA awards. It was also recognized in January of 2008 by Microsoft’s Founder and Technical Advisor Bill Gates as one of the most innovative companies. NanoPhos has been selected as a National Champion representing Greece in the 2016/17 European Business Awards for Innovation. With vast technical knowledge and experience, a product portfolio exceeding 54 products and numerous large scale projects all over the world, NanoPhos is focusing on top performance industrial coatings. According to NanoPhos’ founder, Dr. Ioannis Arabatzis: “We internally remain small to be versatile – externally we grow big to serve any global demand”.



Tune the nanoworld to serve the macroworld

NanoPhos is endowed with a simple vision: «Tune the nanoworld to serve the macroworld». By harnessing the power of Nanotechnology, NanoPhos provides «smart» and proven solutions aiming at effectiveness, durability, eco-friendliness and energy efficiency.

Utilizing the benefits of nanoparticles for the end user, NanoPhos provides high quality, reliable products that vastly reduce operational and maintenance costs and boost the Life Cycle value of the surfaces protected.

NanoPhos' intelligent coatings, based on in-house proprietary (nano)technology, secure structures from environmental or operative threats (e.g. corrosion), while simultaneously enhancing functionality (e.g. abrasion resistance or friction coefficient decrease).

The effect of NanoPhos products and the leading role of NanoTechnology

Nanotechnology refers to the scientific discipline, which deals with very small structures, typically sized at 100 nm or smaller. One nanometre (nm) is one billionth of a meter (10⁻⁹ m) - it is so small that if earth was one meter in diameter, then one nanometre would have been the size of an apple! It is just as dividing a single millimetre in one million parts.

When conventional materials shrink down to nanoscale, they present innovative and unique properties. These materials are often known as smart or intelligent, due to their response in to external factors and stimuli. Responding to external input, «smart» materials develop different mechanical, chemical or electrical properties. That is how NanoPhos' products differentiate themselves to existing, conventional coatings: The near-infinitely small nanoparticles penetrate deep into the application surfaces to «dress» their application substrates, ensuring the protection and repulsion of intruding factors. In this way protection becomes more effective and is not affected by abrasion, friction or adverse weathering conditions.

Some of the advantages offered by NanoPhos through the science of Nanotechnology are: Coatings to prevent the development of marine biofouling even in static/idle conditions, nanostructured anticorrosive products for long-term protection that exceeds 15 years of operational life in the harshest environment and thermal insulating coatings for energy saving in heat exchange applications.



A. MAINTENANCE, REPAIRS AND CLEANING

1. HMD Heavy Duty Degreaser

Biodegradable water-based cleaner that emulsifies and removes oil, grease and grime. Cleans and eliminates by dissolving heavy oil residues in engine rooms, motors, machinery and dock or industrial equipment. Ideal for removing grease, oil and sludge from the engine parts, tools, mechanical brakes, clutches, chains, cables, moldings, components, bearings, generators and compressors. Not Flammable. Significantly reduces the risk of fire caused by incidental contact with live electrical equipment or solvents trapped by insulating materials. Fast Evaporation. Minimizes downtime associated with "clean-in-place" cleaning methods. Non-toxic and biodegradable.

2. HEC Heavy Duty Electric Cleaner

High performance cleaner for electric components that suffer from dirt built-up. It can dislodge foreign elements and clean electrical components. Prevents electric contact failure. It leaves no residues. Quick-drying formulation (medium to fast type). Use on any exposed sensitive electronic components and contacts (engine controls, data sensors and wiring).

3. ARC Gel Rust Remover

ARC is a rust remover in GEL form. Despite the acidic character, contains no hydrochloric acid. ARC Gel effectively removes the rust off the surfaces to prepare them for protective coating application (primer and paint). It also contains flash rust inhibitors to protect early corrosion effects. Ideal cleaner for rust and hard water deposits. Applicable even with salty water. Gel forms makes ARC Gel Rust Remover easy to apply on vertical, inclining metal surfaces, steel bars or rails.

B. EPOXY PRIMERS & TOP COATS

1. ESP Epoxy Shop Primer

Two-component epoxy shop primer, pigmented with rust-inhibiting pigments. Type approved as a pre-fabrication primer. It is highly recommended as a thin coat for blast cleaned steel plate protection during its storage and machining period. Easily applicable with both spraying and roller (manual) application.

2. EPR Epoxy Primer

EPR is a universal two-component epoxy primer with anticorrosive long lasting action. It is suitable for application on fiberglass, or metal surfaces. It contains anticorrosive pigments. Conforms low fire spreadability requirements.

3. EZR NanoZinc Rich Epoxy Coating

Two-component, NanoZinc Rich, Corrosion Passivating Coating. The combination of high concentration level of the epoxy binder with the high surface area zinc nanoparticles results in the highest anti-corrosion performance, even in the harshest corrosive environments (e.g. Seawater ballast tanks). Ideal primer in combination with advanced anticorrosion coating systems, in C5-I or C5-M (ISO 12944) environment.

4. EHB High Build Epoxy

A two component high solids, tar free, epoxy tie coat, with premium anti-corrosive and adhesion properties. Its "High Build" composition can achieve thick coatings without sagging or application problems. It can be used as a tie coat, between primer, polyurethane or epoxy top coats, to improve anticorrosive protection in corrosive environments and in normal atmospheric conditions.

5. EEN Epoxy Enamel

EEN Polyamide Epoxy Enamel coating presents high gloss, excellent resistant against weathering and excellent abrasion resistance. EEN can be used as an epoxy finish coat in medium to severely corrosive atmospheric environment. A quick drying, hard, chemical resistant coating. Good adhesion properties in wet and dry exposure conditions. Approved by DBI (Danish Institute of Fire and Security Technology), in accordance with the requirements and the standards of IMO for low flame-spread (Reference to IMO 2010, FTP Code, Part 5).

6. FGE Food Grade Epoxy

Two-component 100% solids, high performance, food safe, epoxy coating. Ideally formulated for application as a protective liner for tanks and machinery in contact with food products. Zero migration of food contaminants. FGE can be applied on top of protective coating system to ensure food safety standards.

7. 2kMTI Metal Thermal Insulating

Two-component, thermal insulating coating. An innovative, thermal insulating coating utilizing spherical particles that impart exceptional insulate properties to a variety of substrates. Ideal for insulating pipes, valves, tanks, structural steel, or other substrates where thermal improvement and protection is desired. Part of a durable, corrosion-resistant coating system that bonds to the substrate, greatly reducing the issues associated with corrosion under insulation. Replacement solution for jacket insulation of steam/oil pipes that require thermal insulation combined with the robustness of an epoxy coating.

8. CTE Coal Tar Epoxy

Two-component epoxy coal tar coating. Ideal for metallic surfaces as final coat, providing long-term anti corrosive protection and excellent durability especially in constructions exposed to high humidity environments or intended to be placed into the ground, such as pipes, tanks etc. It has excellent durability and is a high gloss top coat.

9. EPN Phenolic (Novolac Type) Epoxy Coating

Two-component phenolic epoxy (novolac) coating. It has very good adhesion with chemical resistance against corrosive factors, such as sea water, hydrocarbons, crude oil, ketones, esters alcohols, halocarbons, acids (including sulphated/sulphurated environment) and bases. Engine room shields, fuel tanks (gasoline, crude oil, jet fuel), oil and hydrocarbon piping are among potential application areas.

10. GFE Glass Flake Epoxy

Two-component epoxy coating, which is formulated with Glass Flakes. It has high impact and abrasion resistance with corrosion protection properties. It can be used as a self-primed, high build coating primarily for areas subject to abrasion and/or to a highly corrosive environment.

11. MEF Epoxy Filler

MEF Chemical Resistant, Thermal Insulating Epoxy Filler is a low density, solvent free, novolac-type, epoxy filler that combines thermal insulating properties with chemical resistance against corrosive factors, such as sea water, hydrocarbons, ketones, esters alcohols, halocarbons, acids (including sulphated/sulphurated environment) and bases. It is considered a high build epoxy filler, as it is applicable in thick coats (up to 8mm) without sagging. Due to its absolute volume solids content and the absence of solvents, it cures without volumetric change, making it applicable as a filling agent. It develops significant mechanical strength and endurance. Ideal for operational temperatures from sub-zero to 120°C. Recommended as a high-performance filler, in cases thermal insulating properties and chemical resistance should be combined.

12. EENova Abrasion Resistant Epoxy Coating

EENova is unique among its kind for incorporating silicon elastomer nanoparticles. Its structure is described by a soft, elastomer core that can adhere on the epoxy resin binder. The core competency of the resulting coating is that energy storage/absorbing particles are introduced in the formulation, without any durability sacrifice. The energy absorbing particles promote the abrasion resistance and absorb acute abrasive forces protecting the integrity of both coating and substrate.

13. SKG SeaKing Fouling Release Epoxy

The ultimate epoxy fouling release coating. Low friction, superior release and long-lasting nanotechnology driven coating. Contains no tin (IV). Based on PolyDiMethylSiloxane modified epoxies, as the latest advance in marine coatings. Apart to their amphiphilic behavior and enhanced durability, they are coupled with glycol units to finely tune surface tension values that repel proteins or microorganism biological anchors. Even though a fouling release coating, elements of antifouling performance are evident, without self-polishing erosion. Ideal for immersed coating on offshore platforms.

C. POLYURETHANE PRIMERS & TOP COATS

1. CGU Cool Glossy Stain Resistant PU Enamel

CGU is an acrylic/polyurethane coating with outstanding colour retention abilities. This coating has exceptional resistance to weathering, staining and corrosive environment. Can be used in exterior or interior applications, or wherever a superior gloss and colour retention finish is desired. Special Nanostructured ingredients reflect incident heat radiation. CGU presents high durability and high yellowing resistance due to UV radiation, high color stability even after prolonged exposure, and resistance to acidic industrial environment. Ideal for the external protection of steel structures like fuel/chemical storage tanks in power generation plants, petroleum refinery, nuclear stations etc.

D. QUICK DRYING PRIMERS & TOP COATS

1. ACQ Anticorrosive Quick Dry

One-component, corrosion inhibitive, high quality alkyd primer for steel exposed to a soft or moderately corrosive environment. Quick drying and easily applicable. It presents excellent adhesion, flexibility and high anti-corrosive protection due to its special pigments of zinc phosphate and zinc oxide. It contains no lead compounds. Non-toxic.

2. SUP SurfaMix Universal Primer

One-component acrylic primer, based on a special engineered, low viscosity and fast-curing resin that can anchor on the most demanding surfaces: galvanized ferrous, aluminium surfaces or vitrous, glazed and low porosity surfaces. SurfaMix Universal Primer exhibits good wetting and low touch-dry / curing time. Extremely weathering and UV resistant coating. Its application results in a elastic membrane that can withstand temperature expansion/contraction and prevent cracking. Provides a perfect substrate for final coating.

3. ENM Enamel Alkyd

ENM Enamel is a high gloss alkyd finish coating, possessing excellent color stability and gloss retention for interior and exterior applications. Engineered for application over alkyd primers. ENM offers long-lasting performance and anticorrosion protection. Optimized rheology makes it easy to apply on vertical surfaces, even in presence of high moisture levels. Excellent adhesion to most conventional top-coatings.

4. ASD Antislip Coating

One-component self-priming alkyd coating. Exhibits high wearing resistance and near zero gloss. Fast drying and low-dirt pickup. Does not yellow or flake, even in harsh weathering conditions. Protects against corrosion. Applicable in adverse environmental conditions. Used as an abrasion resistant and final anti-slip coating on metal, concrete surfaces and industrial floors.

5. EZS NanoZinc Rich Ethyl Silicate Primer

Two-component, self-healing inorganic zinc ethyl silicate primer. It has excellent chemical resistance. It is heat resistant up to 600oC. Offers cathodic anticorrosion protection even in paint spots that have suffered abrasive failure. EZS is recommended for long-term protection in moderately to severely corrosive environment. Ideal primer in combination with advanced anticorrosion coating systems, in C5-I or C5-M (ISO 12944) environment.

E. STOVING PRIMERS & TOP COATS

1. HRA Aluminum Heat Resistant Coating

One-component silicone resin coating with aluminium pigments. It is a heat resistant industrial coating to offer excellent resistance in high temperature environment (up to 600oC), combined with anticorrosive protection.

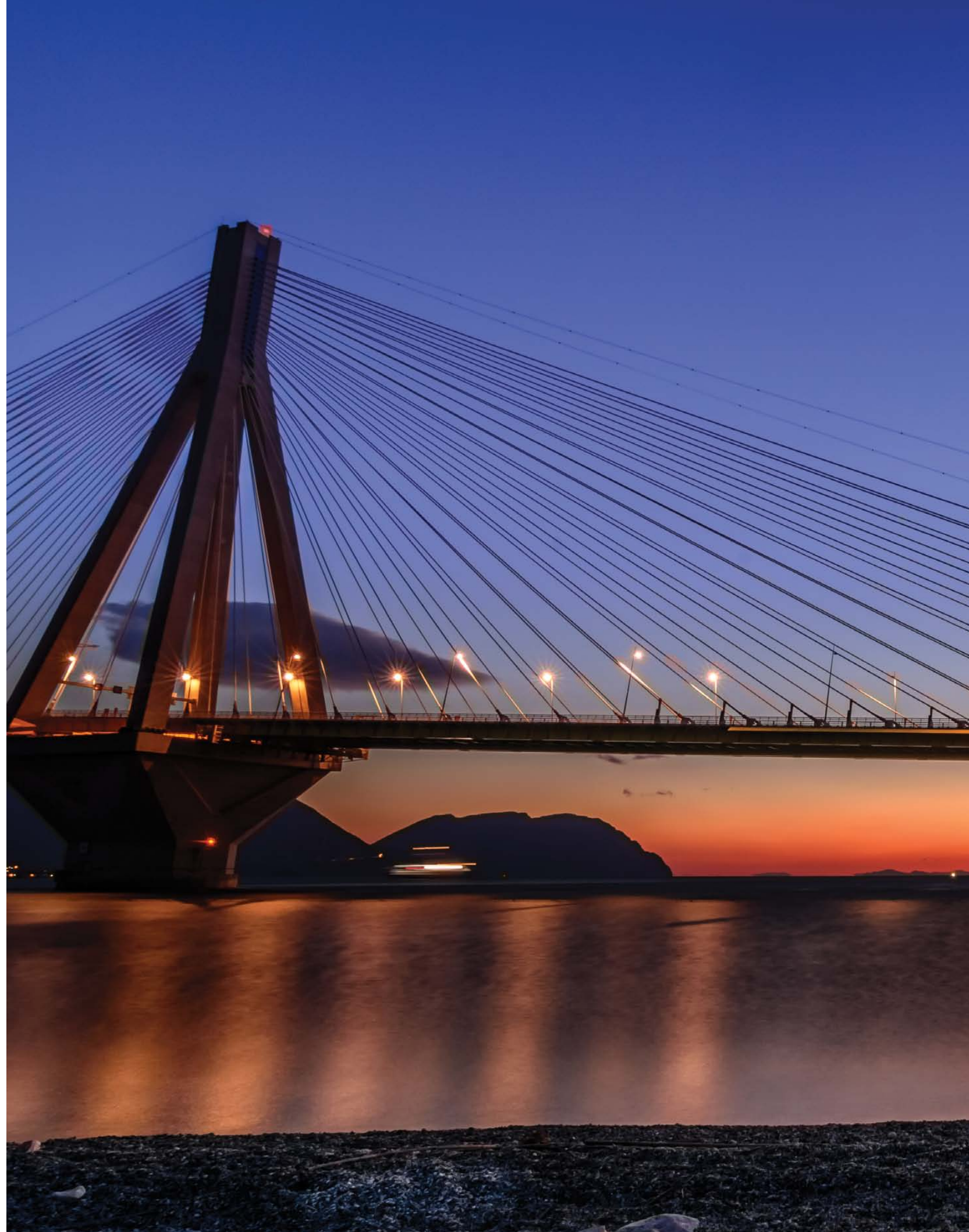
F. THINNERS

1. NPTA NanoPhos Thinner A

Organic, solvent based thinner for epoxy paint systems.

2. NPTB NanoPhos Thinner B

Organic, solvent based thinner for alkyd/acrylic/ zinc ethyl silicate / polyurethane, paint systems.



How to select the right paint systems

When selecting a paint system, it is crucial to evaluate the conditions in which the application substrate of a structure, facility or installation is to operate.

Important factors must be considered:

- Surface preparation
- Humidity and condensation development on coated surfaces
- Service temperature range and relevant gradients
- UV Exposure and expected Weathering fatigue
- Salinity and/or proximity to marine environment
- Chemical exposure (e.g. seawater immersed areas, continuous fuel contact or high sulphur content atmosphere)
- Mechanical wear challenges (e.g. abrasion, impact, friction coefficient requirements)
- Service life expectations

The above-mentioned criteria define:

- the Type of Coating System
- the total Nominal Dry Film Thickness
- the recoating intervals and Life Cycle Analysis of the Coating System

The paint systems proposed in the tables that follow have been selected to the best of NanoPhos' experience to meet application requirements and standards in an optimum combination of performance and bill of materials. The loss factor LF, i.e. the percentage volumetric loss of paint during application, ranges from 15% to 35%, depending on application method, size, shape and roughness of the application substrate, physical losses. Each Bill of Materials also includes thinning and cleaning media. NanoPhos technical team always remains available to assist in developing the right coating system to a project's needs. Please contact info@NanoPhos.com or info@NanoPhos-Marine.com



Carbon Steel/Low Alloy Steel (External) – Shop Piping Paint Job Atmospheric Exposure @ -35°C to +120°C LC1-N System – min. total NDFT 300 µm (Shell DEP 30.48.00.31)						
Product	Application Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	1000	120	83%	6.92	20%	180.72
EPR Epoxy Primer	1000	110	75%	6.82	20%	183.33
CGU Cool Glossy Stain Resistant Polyurethane Enamel	1000	70	60%	8.57	20%	145.83
NPTA NanoPhos Thinner A						43.69
NPTB NanoPhos Thinner B						17.50
Nominal Total Dry Film Thickness (NDFT, µm):		300				571.08

Stainless Steel (External) – Field Piping Paint Job Atmospheric Exposure @ 200°C to 450°C LS3-N System – min. total NDFT 50 µm (Shell DEP 30.48.00.31)						
Product	Application Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
HRA Aluminum Heat Resistant Coating	1000	50	75%	16.00	25%	88.89
NPTB NanoPhos Thinner B						10.67
Nominal Total Dry Film Thickness (NDFT, µm):		50				99.56

Galvanised Steel (External) – Field Piping Paint Job Duplex Anti-Corrosion System. Atmospheric Exposure @ -35°C to +120°C LO1-N System – min. total NDFT 200 µm (Shell DEP 30.48.00.31)						
Product	Application Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
SUP SurfaMix Universal Primer	1000	120	65%	5.42	25%	246.15
CGU Cool Glossy Stain Resistant Polyurethane Enamel	1000	80	60%	8.13	25%	177.78
NPTB NanoPhos Thinner B						50.87
Nominal Total Dry Film Thickness (NDFT, µm):		200				474.80



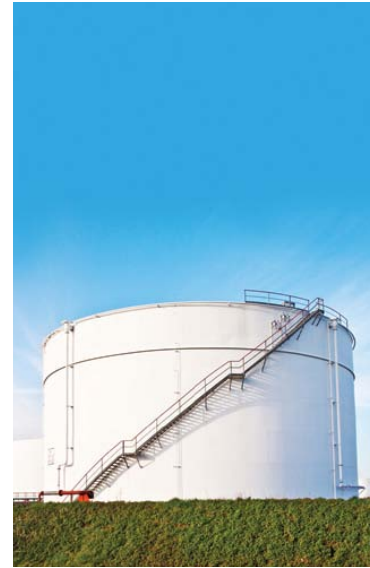
Enclosed Areas Steel Structure Coating (e.g. Interior of storehouses) ISO 12944 C2 Urban or Rural Areas of medium Condensation Durability > 15 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
ACQ Anticorrosive Quick Dry	1000	80	55%	6.88	20%	181.82
ENM Enamel Alkyd	1000	50	55%	11.00	20%	113.64
NPTB NanoPhos Thinner B						35.45
Nominal Total Dry Film Thickness (NDFT, µm):		130				330.91



Exposed Areas Steel Structure Coating (e.g. Metal Buildings Exterior) ISO 12944 C3 Industrial or Urban Areas of high Condensation, Contamination and low Salinity Durability > 15 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
SUP SurfaMix Universal Primer	1000	140	65%	4.64	25%	287.18
CGU Cool Glossy Stain Resistant Polyurethane Enamel	1000	80	60%	7.50	25%	177.78
NPTB NanoPhos Thinner B						55.79
Nominal Total Dry Film Thickness (NDFT, µm):		220				520.75



Open Areas Steel Structure Coating (e.g. Bridges, Repair Yards) ISO 12944 C4 Medium Salinity Industrial Areas Durability > 15 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	1000	80	83%	10.38	25%	128.51
EPR Epoxy Primer	1000	40	75%	18.75	25%	71.11
CGU Cool Glossy Stain Resistant Polyurethane Enamel	1000	80	60%	7.50	25%	177.78
NPTA NanoPhos Thinner A						23.96
NPTB NanoPhos Thinner B						21.33
Nominal Total Dry Film Thickness (NDFT, µm):		200				422.69



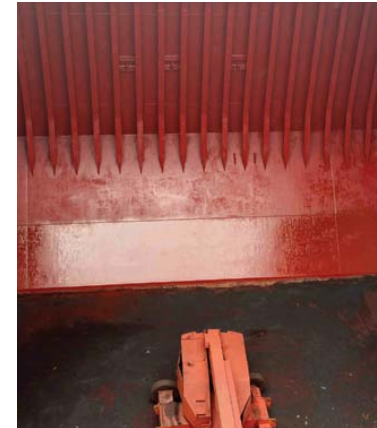
Refinery Tank Steel Structure Coating (External) ISO 12944 C5-I Industrial Buildings of High Humidity & Aggressive Atmospheric Exposure Durability > 10 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	1000	100	83%	8.30	25%	160.64
EPR Epoxy Primer	1000	40	75%	18.75	25%	71.11
CGU Cool Glossy Stain Resistant Polyurethane Enamel	1000	80	60%	7.50	25%	177.78
NPTA NanoPhos Thinner A						27.81
NPTB NanoPhos Thinner B						21.33
Nominal Total Dry Film Thickness (NDFT, µm):		220				458.68



Offshore Open Areas, Steel Structure Coating ISO 12944 C5-M Inshore/Offshore Structures in High Salinity, Contamination and Condensation Durability > 15 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	1000	80	83%	10.38	25%	128.51
EPR Epoxy Primer	1000	90	75%	8.33	25%	160.00
CGU Cool Glossy Stain Resistant Polyurethane Enamel	1000	80	60%	7.50	25%	177.78
NPTA NanoPhos Thinner A						34.62
NPTB NanoPhos Thinner B						21.33
Nominal Total Dry Film Thickness (NDFT, µm):		250				522.25



Seawater Immersed Steel Structures Coating Applicable on Offshore Platforms with Fouling Release Properties Durability > 15 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	1000	150	83%	5.53	25%	240.96
EPR Epoxy Primer	1000	100	75%	7.50	25%	177.78
SKG SeaKing Fouling Release Epoxy	1000	150	75%	5.00	25%	266.67
NPTA NanoPhos Thinner A						82.25
Nominal Total Dry Film Thickness (NDFT, µm):		400				767.66



Abrasion Resistant, Cargo Holds Steel Structures Coating Not Applicable on Chemicals/Fuels Cargo Durability > 6 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	1000	150	83%	5.53	25%	240.96
ENV EENova Abrasion Resistant Epoxy	1000	150	80%	5.33	25%	250.00
NPTA NanoPhos Thinner A						58.92
Nominal Total Dry Film Thickness (NDFT, µm):		300				549.88



Helipad Flooring on Marine/Offshore Platforms ISO 12944 C5-M Inshore/Offshore Structures in High Salinity, Contamination and Condensation Meets NATO STANAG 4698 / AEP 63 (Ed. 01/2009) Durability > 5 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	100	300	83%	2.77	25%	48.19
ENV EENova Abrasion Resistant Epoxy (Type I Fine or Type II Coarse)	100	2000	85%	0.43	25%	313.73
EPN Phenolic (Novolac Type) Epoxy	100	80	87%	10.88	25%	12.26
NPTA NanoPhos Thinner A						44.90
Nominal Total Dry Film Thickness (NDFT, µm):		2380				419.08



Interior Tanklining for fuels (Crude Oil, Jet Fuel, Gasoline) Meets IMO MSC.288(87) Performance Standard for Protective Coatings for Cargo Oil Tanks Durability > 15 years						
Product	Area (m²)	Nominal DFT (µm)	Volume Solids	Coverage (m²/L)	Loss Factor	Quantities (L)
EZR nanoZinc Rich Epoxy Primer	1000	100	83%	8.30	25%	160.64
EPN Phenolic (Novolac Type) Epoxy	1000	200	87%	4.35	25%	306.51
NPTA NanoPhos Thinner A						56.06
Nominal Total Dry Film Thickness (NDFT, µm):		300				523.21



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