

CREPEX[®], the Revolutionary Corrosion Solution

CREPEX[®] is a rust-stopping coating based on a chemical reaction that takes place under the paint film to form an anti-corrosion pigment firmly fixed in the surface. Tests at the Research Institute SYNPO, a. s., Pardubice show that combining CREPEX[®] with a proper topcoat can prevent corrosion from forming and spreading for 20-30 years.

Our coating system can stop the corrosion process that is already underway on the corroded surface. Together with a quality topcoat, the life of the treated surface can be extended several times.

CREPEX[®] saves and improves the environment, especially in energy and material costs for the production and maintenance of metal surfaces (e.g. replacement of galvanizing processes, anti-corrosion protection before powder paint application, etc., all without the need for surface preparation by abrasive blasting before application to clean or rusted surfaces).

Currently, new components and additives are being tested and selected for product manufacture to ensure that the coating's application and protective capabilities meet the specific needs of consumers from various industries.

We can create a full coating system for each unique application, based on their specifications, as well as the ideal coating system for certain applications and material types (iron, steel, aluminum, zinc, copper, etc.).

Particular Details on the Features and Applications of CREPEX[®]

Corrosion of metals is an electrochemical reaction that happens naturally on most metals and alloys and generates large financial losses annually. Since the nineteenth century, it has been known that one of the most effective ways to prevent the development and spread of corrosion is the presence of chromium in the metal or alloy, which is why, among other things, so-called "stainless steel" has at least 13% chromium. Because of the high chromium content, stainless steel is not suitable for a wide range of structures and applications (bridges, masts, reinforced concrete structures, armour steel, etc.).

CREPEX[®] is a water-soluble, dispersion-based anticorrosive coating which, after its application and subsequent chemical reaction, forms a stable, flexible layer on the surface, molecularly bonded to the substrate. This results in a compact, homogeneous material with sufficient active ingredients to prevent corrosion and spread. It interlocks with metal oxides on the previously corroded surface, passivating and stabilizing the rust that has formed while also preventing its spread. When used on corroded material, there is no need to clear the surface with abrasive blasting. Following mechanical damage to the surface, the abundance of active chemicals in the coating enables the following creation and spread of material corrosion from below the surface.

Tests in accredited testing institutes have proven that this coating, when combined with a proper topcoat, will actively protect the metal in a high corrosion hostile environment for at least 15 years. (tested in C3 and C4 corrosion aggressive environments).

History and Origin of CREPEX[®]

The original product was created in the 1970s with organic resins and organic solvents accessible at the time. Because the reaction only occurs in aqueous conditions, the water dilutable dispersions derived from these raw materials were unstable and did not secure the progression of the reaction,

so development was discontinued. After the Velvet Revolution, product development continued by testing a suitable water-based dispersion to ensure the chemical reaction below the surface of the coating film. Between 1992 and 1998, preliminary testing were conducted at the Research Institute of Coatings in collaboration with the State Testing Institute (later Lavis, Inc.). In parallel, anticorrosion issues based on waterborne dispersions were discussed at the University of Pardubice's Faculty of Chemical Technology, led by prof. Ing. Petr Kalenda, CSc.

In 2014, the development of a dispersion ensuring a smooth chemical reaction was finished, and a patent for the coating system's composition, a manufacturing technological process, a utility model, and a brand were registered. Our product is now being advertised.

The Uniqueness of CREPEX[®], the Rust-Stopping Coating and Its Main Benefits

The above-mentioned principle of chromium atoms protecting metals against corrosion has been known for 100 years. The technique of creating a protective covering containing chromium atoms was theoretically outlined in the 1970s, and scientists all over the world have since attempted to replicate it. Smaller metal items, for example, can be treated by dipping them in a chromium solution (a method employed in the automotive sector). Large structures, such as masts, wagons, containers, bridges, and car bodyworks, can only be treated with coatings or sprays. Thanks to the most recent research findings in organic chemistry and nanophysics, such a coating was developed and patented in the Czech Republic in 2014, for the first time worldwide.

This new rust-stopping coating, with the trade name **CREPEX[®]**, has several advantages over existing coatings. **CREPEX[®]**:

- can offer corrosion protection for 15 years or more, even in aggressive cat. C3 and C4,
- is incomparably and several times cheaper than all alternative and previously used methods,
- does not require surface preparation by abrasive blasting or sandblasting,
- reduces environmental impact, and saves human labour in protecting against the formation and spread of corrosion of metal surfaces,
- is 4-5 times thinner than previous coatings, resulting in lower loads on structures such as bridges, footbridges, cable cars, railways, train sets, airplanes, shipping containers, and masts.
- is very suitable for rusted surfaces without the need for sanding or grinding,
- is stable even at high temperatures (up to 350 °C),
- combines well with powder paints (e.g., komaxit) and enhances adherence in previously troublesome locations like welds and edges of treated materials,
- it is applicable to most metals – iron, steel, zinc, brass, copper, aluminum, and their alloys. Thanks to effective components within the material surface, mechanical damage (abrasion, impact, drilling, etc.) does not lead to the formation or spread of corrosion from the damaged area beneath the topcoat (so-called “undercorrosion”).

Applications of CREPEX[®]

CREPEX[®] is suitable for use wherever corrosion and its spread must be prevented. There is no other alternative solution that offers equivalent protection, features, and compatibility with all types of topcoats. Some production methods, such as barrier or electrophysical protection, phosphating of automobile bodywork, and hot-dip galvanizing of masts, may be utilized for years before they are replaced by **CREPEX[®]**.

These methods are significantly more expensive, their implementation is vastly more difficult, and often even impracticable. All of them demand additional human labour, harm the environment, and do not provide long-lasting a high-quality corrosion protection. It is only a matter of time before they are replaced and the use of **CREPEX®** coating to protect against the formation and spread of corrosion becomes widespread worldwide.

The **CREPEX®** coating is suitable for use during the transport of metal components and structures, for example by sea; however, for this purpose a new **CREPEX® UV** coating is being tested, which prevents the effects of solar radiation on corrosion formation even without a topcoat. **CREPEX® UV** provides comprehensive protection of materials during transport to their destination.

Replacing the currently used corrosion protection systems in the maritime, railway, aviation, automotive, or construction industries with the **CREPEX®** coating is cost-effective. Moreover, most manufacturing companies already possess the technology required to apply the **CREPEX®** protective coating. The application of topcoats on finished products can also remain unchanged, as their adhesion to materials treated with the **CREPEX®** coating is the same—or, as in the case of powder coatings (e.g., komaxit), even significantly better. **CREPEX®** is extremely useful due to its simplicity of application, offering a significantly longer period of protection against the onset of corrosion in new products while stopping the spread of the corrosion process where it has already begun.

For older metal structural elements affected by corrosion, treatment with the **CREPEX®** coating significantly extends their service life, increases operational safety, and improves structural properties such as load-bearing capacity or flexibility, without the need to replace them with new ones. A typically critical situation occurs in the railway sector, urban infrastructure, linear and civil engineering structures, ports, and transport equipment such as ISO containers and ship hulls.

In the world around us, dozens of specific applications can be found for the **CREPEX®** coating on various metal structures or surfaces that require stopping existing and spreading corrosion.

Typical examples are poles of high-voltage systems and distribution systems made of steel alloys (COR-TEN , Atmofix), treated with hot-dip galvanizing and surface coating. Most of the masts of high-voltage transmission systems in the Czech Republic and Slovakia (or in the former RVHP) are currently reaching or have reached the end of their service life. In order to repair, maintain or replace them, it is necessary to interrupt the electricity supply, dismantle the masts, transport them for re-galvanisation, then reinstall and commission them. The other alternative, which does not require interruption of service, dismantling, transportation and re-installation, is to treat these masts with the newly developed **CREPEX®** coating and then with a suitable topcoat according to the final properties and design requirements. This makes it possible to achieve better results with significantly lower financial costs and incomparably faster implementation. (Confirmed by the Czech Technical University in Prague, tested on a high-voltage column of the Dukovany nuclear power plant in the Czech Republic.)

For means of transport, the application of the **CREPEX®** coating not only increases corrosion resistance but, compared to currently used protective coatings, also leads to a significant reduction in weight, which is particularly important in aviation, maritime, and railway transport – typical sources of greenhouse gas emissions.

Another unique feature of **CREPEX®** is that the suitability of its application and the functionality of the corrosion protection provided is more evident in "salty environments" such as seaports, coastal cities, ships, shipping containers, and anywhere where the effects of previously used corrosion

protection products are significantly reduced. In these circumstances, mechanical damage to materials treated with different anti-corrosive coatings allows corrosion to spread rapidly beyond the surface of these coatings away from the point of damage, resulting in paint film ripping and complete material corrosion. The **CREPEX®** anti-corrosion coating is unique in that it secures the protective film to the substrate's surface during the chemical reaction. This creates a homogeneous, flexible material that is resistant to bending, stretching, and twisting before topcoat application and subsequent use.

Health Implications of Using CREPEX®

The **CREPEX®** coating has been assessed for health risks in accordance with EU regulations. The concentrations of potentially hazardous substances in the **CREPEX®** product are below regulatory limits, and the product itself is not classified as hazardous. The product is also not considered a dangerous substance under ADR transport regulations, and the manufacturer is not required to issue a safety data sheet for the product.

Evaluation of the Test Result

The Evaluation and Testing Department of the SYNPO Research Institute, a.s., Pardubice assessed the expected service life of the coating system under outdoor exposure conditions, as well as in corrosivity categories C3 and C4, and in the attached certificates confirmed the high durability of the **CREPEX®** coating in combination with commonly available topcoats for at least 15 years or more. After pull-off adhesion tests, the **CREPEX®** coating remained on the treated surface, with only the topcoat being removed, confirming the molecular bonding of the coating to the substrate.

Currently, we are preparing further tests with various topcoats for specific purposes according to the needs of customers from different industries. These tests, together with the **CREPEX®** coating, will form an optimal coating system for selected applications and types of materials.

The combination of the **CREPEX® UV** coating with the TEMADUR 10 topcoat from the Finnish manufacturer TIKKURILA was tested under high corrosivity conditions (C4). The results of these tests repeatedly confirmed the high and, in all respects, unmatched effectiveness of corrosion protection compared to other methods. The results are available at www.crepex.eu.

The manufacturer of the selected topcoat can also be listed in the coating system service-life certificate, which is the only certificate in the world providing the above-described corrosion protection. Therefore, we are considering launching an international tender for cooperation with topcoat manufacturers.

All available certificates, patent, **CREPEX®** Coating Safety Declaration, Technical Data Sheet, and Application Sheet are available at www.crepex.eu.