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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®

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 provide corrosion protection for a minimum of 15 years or more, even in aggressive environments cat. 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,
- makes full use of all input resources for its production; its production is therefore waste-free,
- is about 4-5 times thinner than other coatings and the load on the entire structure is much lower (suitable for high-rise buildings and structures, bridges, footbridges, cable cars, railways, train sets, aircraft, shipping containers, masts, etc.),
- is flexible, when the material is bent and stretched, the coating film does not crack, as it is molecularly bonded to the substrate, with which it forms a homogeneous material,
- 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, and materials treated with it can be welded and subsequently their surface treated only at the joints,
- is applicable to most metals – iron, steel, zinc, brass, copper, aluminium and their alloys. Due to the abundance of active ingredients anchored in the surface of the material, no corrosion is formed and spread from the point of damage under the topcoat after mechanical damage (abrasion, impact, drilling, etc.),
- can be applied for the treatment of reinforcing steel – before pouring concrete (reinforcement cages in reinforced concrete) – and thus prevent corrosion and its further spread in reinforced concrete structures and subsequent erosion of the concrete itself,
- with its active ingredients can soon be used for the treatment of reinforced concrete. For this purpose, it is necessary to remove the damaged layer from the reinforced concrete and apply a new wire/fibre concrete with the additive **CREPEX® CONCRETE**, which prevents the recurrence of corrosion and subsequent surface damage to the concrete, which is currently being tested in the laboratories of the CTU. Unless the reinforcing steel and reinforcing cages

are treated with a coating CREPEX® before pouring the concrete, which is more effective but at the same time more demanding, it will soon be possible to add a new patented anti-erosion additive CREPEX® CONCRETE, containing active ingredients against corrosion (CREPEX® CONCRETE additive), to the water during mixing of the concrete itself.

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 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 new CREPEX UV® coating prevents the effects of sunlight on corrosion even without topcoat. It is suitable for protecting materials during transport, for example by sea.

CREPEX UV® protects metal components, including beams, bridges, building structures, car bodies and chassis, pipes, railings, and ship surfaces, during transport to the destination for final surface and design treatments after assembly. These materials should be coated shortly after being produced in ironworks, wireworks, or foundries. In this case, there is no need to treat them with any other simultaneously applied and, in particular, short-term corrosion protection. These short-term protections protect the material against corrosion in a matter of hours, which does not even cover the loading time before transporting them to their destination after production. It is common on construction sites for reinforcing steel to be brought to the site after it has been attacked by corrosion and then poured with concrete.

The combination of CREPEX UV® coating with TEMADUR topcoat (with 7590 hardener) from the Finnish manufacturer TIKKURILA was tested in a high corrosion aggressive C4 environment.

The coating system was evaluated and found to be highly durable for over 15 years and more, with long-term anticorrosive performance in an environment categorized as C4 according to ČSN EN ISO 12944-2.

Replacing corrosion protection currently used in the marine, rail, aviation, automotive or construction industries with a new coating CREPEX® is inexpensive. In addition, most manufacturing companies already possess the technology needed to apply the CREPEX® protective coating. The application of topcoats and final coatings on finished products can also remain unchanged, as their adhesion to the materials treated with the CREPEX® coating is the same or, as with the application of powder paints (comaxit), even much better. The application of topcoats and final coatings on finished products can remain unchanged, as their adhesion on materials treated with CREPEX® is the same or, as with the application of powder paints (comaxit), much 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 and corroded metal structural elements, the treatment with CREPEX® will significantly extend their service life, increase the safety of use, and improve the structural properties such as load-bearing capacity or flexibility of the structures without the need to replace them with new ones, which also reduces the environmental impact on the planet to a large extent.

Typically, the critical situation is in the sphere of rail transport, urban furniture, linear buildings, ports, and all infrastructure such as:

- steel structures of municipal furniture (footbridges, railings, crossings, bridges and waiting rooms),
- transport structures (bridges, crossings, barriers, fences, port facilities, shelters, traffic signs and tunnels),
- ground structures (fire and common staircases, lifts, steel structures in factories and halls, fences, roofs, chimneys, parapets, lightning rods, reinforcements, noise barriers, barriers to prevent landslides and snow, reinforcements to channel river flows),
- linear structures (electricity masts and mobile operator networks),
- means of transport (ISO containers, railway wagons and ship hulls).

In any city, residential area, industrial facility, port or other infrastructure, it is possible to find dozens of specific applications for CREPEX® coating on various metal structures or surfaces that need to stop corrosion that has already occurred and is spreading, without having to replace them with new ones.

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 second alternative, which does not require interruption of service, dismantling, transportation and reinstallation, is to treat these masts with a newly developed coating CREPEX® and then with a suitable topcoat according to the final properties and design requirements. In this way a better result can be achieved, with much lower financial costs, incomparably faster feasibility, while saving human labour and with a lower ecological burden on the planet. (Confirmed by the Czech Technical University in Prague, State Research Institute SVÚOM, s.r.o., who were present during the testing of the CREPEX® coating system on the high-voltage column of the Dukovany nuclear power plant in the Czech Republic.)

For transport vehicles, the application of the CREPEX® coating will not only increase corrosion resistance, but also lead to a significant weight reduction compared to currently used protective

coatings, which is particularly important for air, ship and rail transport, which are considered to be the largest sources of greenhouse gases.

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 other anticorrosive paints in the above mentioned environment leads to very rapid spread of corrosion under the surface of these coatings from the place of damage, subsequent tearing off of the paint film and complete corrosion of the material. The uniqueness of corrosion protection by coating **CREPEX®** lies in the firm anchoring of the protective film in the surface of the treated substrate during the course of a chemical reaction and the subsequent formation of a homogeneous, flexible material with unique cohesion and adhesion of topcoats or other protection. The material is then resistant to the formation and spread of corrosion when bent, stretched, twisted or damaged on the surface (suitable for container transport and construction).

Health Implications of Using CREPEX®

CREPEX® has been tested for health concerns in compliance with EU legislation. The amounts of potentially harmful chemicals in **CREPEX®** are up to 100 times lower than the applicable limits allow. According to the ADR shipping conditions, the product is not a hazardous substance, and hence its producer is not required to issue a safety data sheet for it.

Evaluation of the Test Result

The Evaluation and Testing Department of the Research Institute SYNPO, a. s., Pardubice, assessed the expected service life of the coating system in outdoor conditions as well as in the environment of corrosion aggressiveness C3 and C4, and the attached certificates confirmed the high service life of **CREPEX®** in combination with commonly available topcoats for 15 years or more. After tear and grid tests, the **CREPEX®** coating remained intact, with only the topcoat affected. We are currently preparing additional tests to determine the most appropriate topcoats for each specific application, based on the needs of customers in various sectors, and which, when combined with **CREPEX®**, will form the optimal coating system for selected applications, types of materials (iron, steel, aluminium, zinc, copper, etc.), and customer or end-user requirements. The combination of **CREPEX UV®** coating and TEMADUR 10 topcoat (with hardener 7590) from Finnish manufacturer TIKKURILA was evaluated in a high corrosion hostile C4 environment.

The outcomes of the testing for the combination of the coating with the trade name CREPEX UV with the topcoat TEMADUR 10 (with hardener 7590) from the Finnish manufacturer TIKKURILA have repeatedly confirmed the high and incomparable in all respects effectiveness of the corrosion protection and are available at www.crepex.eu.

The manufacturer of the selected topcoat can also be listed in the lifetime certificate of the coating system, which is the only one in the world that provides the corrosion protection described above, so we are considering an international tender for cooperation with topcoat manufacturers.

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