



CORROSION PROTECTION FOR DECADES –
SINCE DECADES



INTELLIGENT PROTECTION FOR MAN AND MATERIAL

CARAPAX – ANTICORROSIVE

CORROSION PROTECTION FOR DECADES – SINCE DECADES

Corrosion protection is a matter of trust, the task being nothing less than a reliable protection of your property – and this with maximum durability.

As early as in the Seventies of the 20th century, i.e. more than 40 years ago, the company Leo Meyer Metallogal, as the first in the world, developed the so-called 1K moisture-curing corrosion protection systems, then as well as today revolutionary technology with unbeatable product benefits.



CARAPAX
ANTICORROSIVE

Today we, the SISTEC Coatings GmbH, carry forward this decade-long experience and tradition by offering original products/formulations with state-of-the-art technology under the brand “**Carapax**”.

Carapax – a name with symbolic character – since our corrosion protection is as solid and durable as the turtle’s protective shell.

Our products have proven themselves in heavy-duty corrosion protection across a wide range of applications in many countries all over the world up to the present – often for many decades.

CORROSION: DANGEROUS FOR ECONOMY AND ENVIRONMENT

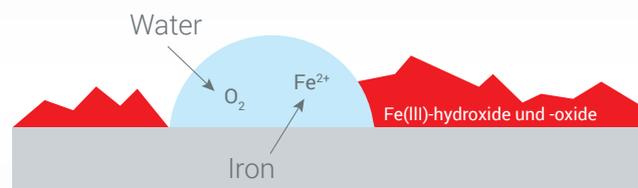
In many areas of public life no attention is paid to corrosion – until it causes a dramatic damage event. Only then does corrosion come into focus, although the costs incurred as a consequence of corrosion in industrialized countries add up to three to four percent of the gross domestic product – a multi-billion dollar amount! However, a current study by the World Corrosion Organization (WCO) shows that the resulting damage is not limited to economic loss: corrosion puts public safety at risk, lowers the quality of life and may cause damage to health and the environment. Leaking water pipes are one example, causing the seeping away of large quantities of drinking water. Corrosion may have negative consequences on the safety of bridges, road structures and buildings. Many technologies for regenerative energies such as offshore wind farms or turbines for tidal power plants depend on solutions for the respective corrosion problems being found.

CORROSION – A DEFINITION

Technically speaking, corrosion (from the Latin *corrodere*, “decompose, decay, gnaw”) is the reaction of a material with its environment, causing a measurable change to the material and possibly leading to a functional impairment of a component or the system.

Chemical corrosion can affect metals (DIN EN ISO 8044; previously DIN 50900).

RUST



The most commonly known type of corrosion is rusting, the oxidation of iron. The oxidant in this redox reaction is oxygen dissolved in water. The result, rust, is therefore an iron and oxygen compound. The corrosion reaction is significantly accelerated by the impact of stimulants such as chlorides and sulfates. Type and velocity of the reaction are also dependent upon the location of the building and the ambient conditions.

In geology, corrosion is perceived as the decomposition of rocks from exposure to water. Weathering processes of this kind also affect buildings, thus corrosion not only occurs in steel and iron, but can also be found in concrete, wood, plastics as well as in light and heavy metals. The causes are varied, e.g. humidity (water), oxygen (air), chlorides (maritime atmosphere), sulfates and nitric oxides (industrial atmosphere) as well as bacteria.

The specialized **Carapax** products are used to tackle all of these challenges, and have been for decades with proven worldwide success.



CARAPAX – CORROSION PROTECTION SYSTEMS IN A CLASS OF THEIR OWN

On freshly blasted steel surfaces corrosion can be observed even at low air humidity levels. Consequently, steel rusts if the surface gets in contact with water, oxygen and stimulators (chlorides, sulfates). This is exactly what the **Carapax** coating systems prevent.

A vast choice of pigments with a multitude of binding agents have been available for years, in order to counteract damages through corrosion. As the result of comprehensive trials, tests and developments, the 1K moisture-curing corrosion protection was designed by our predecessor company, Leo Meyer Metallogal, more than 40 years ago, an anticorrosive used as a basis for extremely versatile coatings evidencing unbeatable product properties:

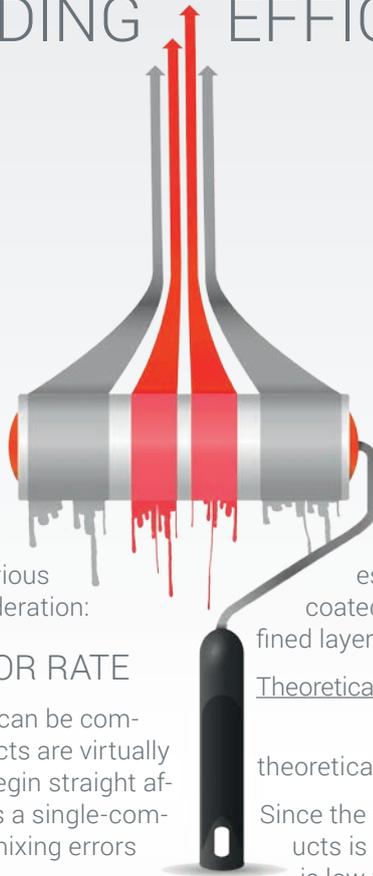
- **Carapax** is based on polyurethane, acknowledged as the most durable coating material
- **Carapax** is state of the art technology today and has at the same time proven itself in practical use for decades, as confirmed by prestigious references from all over the world
- **Carapax** is a system that guarantees custom-made corrosion protection with a few layers only
- **Carapax** is based on high-performance coats exceeding the performance of conventional coatings despite a low layer thickness. This is why **Carapax** is also extremely cost-efficient.

Carapax coatings are used for the long-term corrosion protection of metal surfaces and concrete, in particular for objects whose protection by coating is rendered difficult due to adverse environmental and climatic conditions (e.g. industrial areas with high humidity and aggressive atmospheric conditions or coastal/offshore areas with high salinity) and they naturally fulfill the requirements of corrosion protection class C5-I/-M.

TYPICAL FIELDS OF APPLICATION

structural steel engineering	industrial facilities and conveyor systems
	bridges, cranes
	electricity pylons
	structural steelwork
	onshore wind power plants
steel construction for hydraulic engineering :	harbor facilities, sheet piling
	locks and dock facilities
	offshore wind power plants
marine coatings	ships
	offshore platforms
pipeline and plant construction	external pipeline coatings
	internal pipeline coatings (oil, gas, water, chemicals)
	sewage plants
	tank systems, recipients, containers

CARAPAX CONVINCES WITH OUTSTANDING EFFICIENCY



For a realistic and valid comparison of corrosion protection systems various factors need to be taken into consideration:

PREPARATION TIME/ERROR RATE

With **Carapax** the preparation time can be completely disregarded since the products are virtually ready to use. The application can begin straight after a thorough stir-up, and since it is a single-component product, there is no risk of mixing errors either.

PROCESSING WINDOW

Non-productive interruptions of work due to damp and cold weather or fog and the resulting costs are a thing of the past, since **Carapax** can be processed without any problems at temperatures between -10 and +60 °C and an air humidity of up to 98 %. Thus drying can easily take place outside, shortages of indoor storage space and air conditioning thereof are no longer an issue.

NUMBER/DRYING TIMES OF THE COATINGS

Whereas the completion of conventional alkyd resin build-ups or 2K coatings may take up to 100 hours, the **Carapax** system can be reduced to a maximum of three coats, i.e. the application can easily be completed within 15 hours, in extreme cases **Carapax** systems can be exposed to sea water after only 2 hours.

YIELD

Considering the significant differences in prices for coating systems, the decisive factor for cost effectiveness often is the volume of non-volatile matter (VNV), since it determines the productivity of the system.

This productivity calculation is designed to establish how many m² of surface can be coated with 1 kg of a coating system at a predefined layer thickness (dry).

$$\frac{\text{Theoretical dry layer thickness} \times \text{density} \times 100}{\text{VNV}} =$$

theoretical material consumption in g/m²

Since the volume non-volatile matter in **Carapax** products is relatively high, their theoretical consumption is low whereas their profitability (price/ m²) is high.

Example: Carapax Zinc M

VNV = 68 %

density at 20 °C = 2.8 kg/l

dry layer thickness: 50 µm

$$\text{calculation: } \frac{50 \times 2.8 \times 100}{68} = 205 \text{ g/m}^2$$

Important: When comparing prices with other coating systems, not the price per kg but rather the consumption per m² must be taken as a basis, in order to obtain a realistic comparison of costs

DURABILITY

As far as productivity is concerned, the durability of the coating is one of the key aspects!

Considering that only 15 – 20 % of the total coating costs can be allotted to the coating material and that the main cost is split between scaffolding, site facilities, cleaning, pretreatment and wages, there is great potential in this particular area:

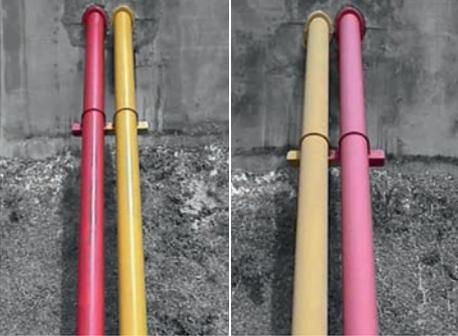
$$\text{Annual expenditure} = \frac{\text{material price} + \text{additional costs}}{\text{lifespan}}$$

Carapax products possess a significantly higher lifespan and thus reduce the annual expenditure by at least 20 %!

CARAPAX – SECOND TO NONE

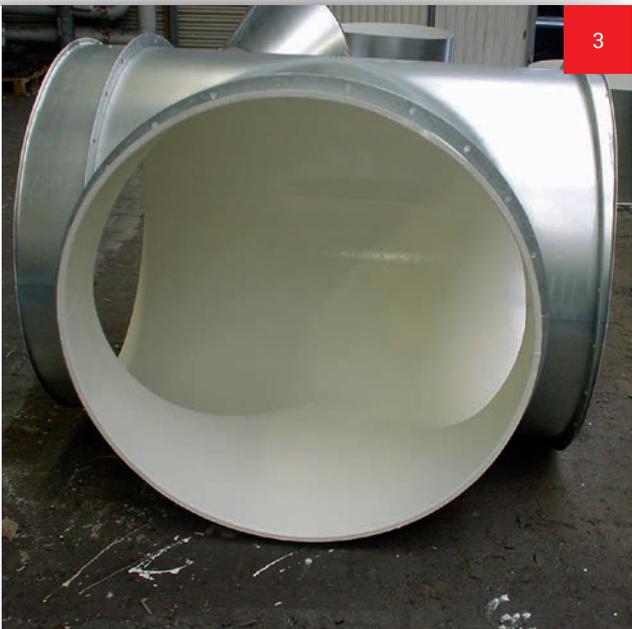
Compared with conventional systems (e.g. 2K epoxy, 2K PUR, chlorinated rubber, PVC-systems, synthetic resins) **Carapax** products provide unbeatable advantages thanks to their unique formulation:

	CARAPAX	EPOXY
PROCESSING	1K (single-component) easy handling and application, ready to use, no mixing errors, shorter preparation time (stirring well is all it takes)	2K (two-component) risk of mixing errors longer preparation time
RECOATABILITY	Quick-drying: Carapax can already be recoated after 45–60 minutes, the second layer is resistant after only ca. 24 hours. No maximum time limit for further recoating, which can take place without prior sandblasting after more than a year.	Can only be recoated after 5–16 hours, but no later than after 10–24 hours, otherwise fresh sandblasting is required
REPAIR-FRIENDLINESS	Carapax is repair-friendly thanks to the good wettability combined with a very dense film formation – even after several years, both with itself as well as on other coatings!	Simple overpainting is not possible, extensive preparation (e.g. sandblasting or roughening of the surface) is required.
AIR HUMIDITY	Air humidity is not an issue for Carapax products, since they are moisture-curing, i.e. no interruption of work in critical weather conditions, drying and curing even at temperatures around freezing point and air humidity of up to 98 % (e.g. tropical conditions).	Epoxy systems can only be used up to a certain air humidity (usually to a maximum of 90 %)
	<p>Temperature in °C</p> <p>Air humidity in %</p> <p>Carapax</p> <p>Epoxy</p>	
PROCESSING TEMPERATURE	Surface temperature – no problem. Carapax can be applied at temperatures from below 0 °C to 60 °C.	As a rule, epoxy systems require a temperature of at least 10 °C but not more than 35 °C.

ADHESION	Polyurethane as a binder possesses an outstanding wettability, thus perfect adhesion, excellent resistance to chemical products and solvents, which results in an above-average durability, even in the challenging field of corrosion protection. Carapax even adheres to damp steel surfaces, e.g. ice-cold gas pipelines in tropical regions, which are always damp.	Very poor adhesion to moist and damp surfaces.
FLEXIBILITY/ STABILITY	Carapax is permanently tough-elastic and highly resistant. This enables the complete absorption of any deformation through material tension, temperature change, vibrations and mechanical impact. No cracks, no bursting. The excellent adhesion and the permanently tough-elastic structure ensure corrosion protection with extreme mechanical stability and abrasion resistance.	Due to their crystalline molecule structure, epoxy coatings tend to embrittle over time and crack as a result of mechanical strain, material tension through temperature change or vibration.
NON-POROSITY	Even thin coats of 60–70µm are free of pores.	
SEA/SALT WATER UV RAYS	Carapax shows an excellent resistance to sea/salt water and UV rays.	 <p>Epoxy resin coatings embrittle if exposed to salt water or UV rays.</p>
ECO-FRIENDLINESS	The high volume of non-volatile matter in Carapax products combined with their longevity results in a considerably lower environmental impact, from application onwards, since the products are usually ready to use and do not require the use of thinners (except for the cleaning of tools and equipment).	Epoxy resin products are two-component coatings and require thinners. Due to the significantly lower durability they also need to be re-coated much more frequently.
ECONOMIC EFFICIENCY	Thanks to the extreme longevity combined with the excellent processing properties (preparation time, drying time, etc.) Carapax is unbeatably efficient!	

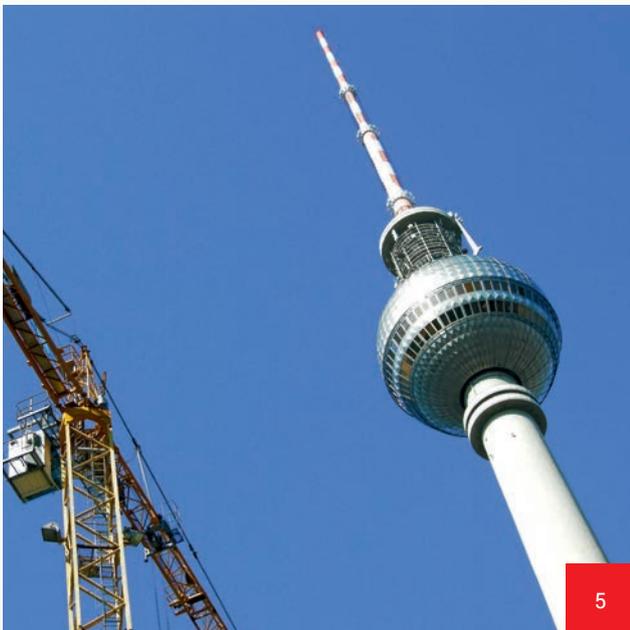
CARAPAX REFERENCES THAT SPEAK FOR THEMSELVES

Since 1968, **Carapax** systems (formerly under the brand name Leo Meyer Metallogal) have been extremely successfully put to use all over the world. The great number of references has continued to grow in recent decades with the addition of countless new objects from many different sectors. This is only a short extract:

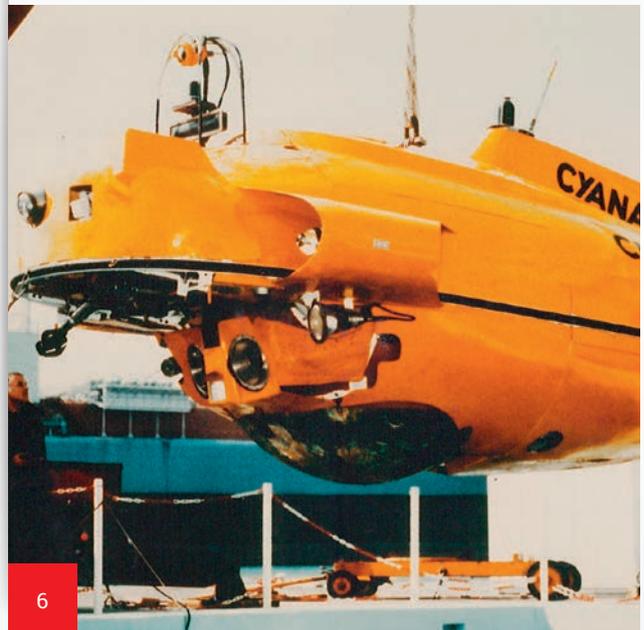


- 1** Steel structure commercial building **30 years**
- 2** Screw conveyor **more than 5 years**
- 3** Exhaust pipe biogas plant **more than 10 years**
- 4** Silos **more than 30 years**

- 5** TV tower, Berlin **more than 40 years**
- 6** Submersible Jacques Cousteau **more than 30 years**
- 7** Screw conveyor **more than 5 years**
- 8** Container quay, Bremerhaven **more than 30 years**



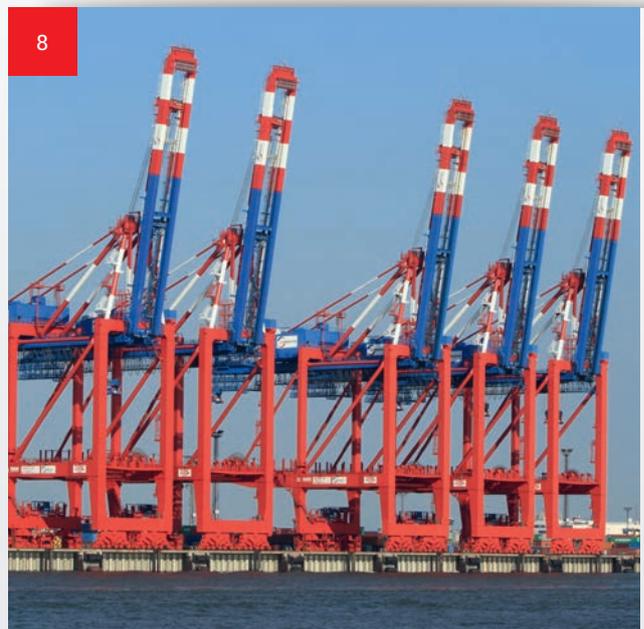
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CARAPAX – PRODUCT OVERVIEW

Steel and concrete can be protected against corrosion with **Carapax** coatings in a perfect way. Our coating systems consist of several layers performing different functions as prime, intermediate or finishing coats.

If the best possible endurance of the protection is to be obtained, corrosion protection systems need to be customized according to the substrate and its surface preparation, the ambient conditions and the specific requirements of the particular application. SISTEC Coatings offer a wide range of specific anticorrosives from our **Carapax** product line. An extract from our extensive range of special coatings:

PRIMERS

- **Carapax Zinc M** is a 1K moisture-curing PU primer with 92 % zinc content, perfect for sandblasted steel structures, pipelines, but also for sheet pile walls and plant construction. It can be recoated with any intermediate and finishing coating.
- **Carapax PI** is a zincphosphate primer, suitable for short-term corrosion protection of steel parts still to be welded. It does not release any toxic fumes during welding.
- **Carapax Fix** is a 1K moisture-curing polyisocyanate for the priming of mineral surfaces such as concrete, plaster, etc. Ensures excellent moisture protection and serves as sealing.

INTERMEDIATE OR FINISHING COATINGS

- **Carapax Ferro Grey** is the moisture-curing 1K PU intermediate coating with micaceous iron ore. The special lamellar structure of the pigments in combination with the polyurethane binder produces coatings with outstanding water resistance and excellent corrosion protection, e.g. for steel structures, chemical plants, steel constructions for hydraulic engineering, bridges or pylons.

FINISHING COATINGS

- **Carapax Cover RAL** is a 1K moisture-curing finishing coating with outstanding resistance to UV, weather and chemical impact, ideal for bridges, cranes, pylons, pipelines and steel structures. Available in many RAL colors.
- **Carapax Non Abrasive** is one of the most resistant products, perfectly suited to shipbuilding (incl. submarines), but also for industrial facilities which are exposed to a strong climatic impact (maritime climate). Suitable for particularly thick layers of up to 400 µm, applicable also on vertical surfaces and extremely resistant to abrasion and chemical impact.
- **Carapax Tar 21** is a PU anticorrosive with iron and tar, which is particularly suited to long-term use, e.g. underwater applications, plant construction (sewage plants), shipbuilding or high-pressure pipelines. **Carapax Tar 21** is highly resistant to abrasion and chemicals and possesses a low water and water vapor permeability.



CARAPAX – EASY AND RELIABLE APPLICATION

Carapax is easy to use – thanks to its convincing product properties.

The storage stability of at least 1 year enables optimum warehouse management and reduces efforts and expenditure for planning and scheduling.

As a basis for a flawless coating, a thorough surface preparation is required – with **Carapax** usually by blasting.

Carapax systems can be applied with all the customary methods:

- Painting with a brush
- Painting with a roller
- High- and low-pressure spraying
- Airless spraying
- Electrostatic airless spraying

CARAPAX – PRODUCT ADVANTAGES AT A GLANCE

- No mixing of different components required
- Can be applied at an air humidity of up to 98 %
- No restrictions at dew point
- Curing possible even below 0 °C
- Can be applied to damp and humid surfaces
- Quick drying for additional coats
- Recoating possible without sanding off/ blasting/sweeping
- Solid durable surface, yet elastic and flexible

CORROSION PROTECTION TESTS

It goes without saying that all **Carapax** products have passed the usual and – according to the respective category – required test procedures for anticorrosive systems, including

- Chemical impact (ISO 2912-1)
- Immersion in water (ISO 2812-2)
- Condensation of water vapor (ISO 6270-1)
- Exposure to neutral salt spray



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