WOLFTANK
AUSTRIA

High Performance Linings, Coatings and Sealings for Refineries Tank Farms and Storage Facilities

www.wolftank.at

Our Mission

Our mission is the protection of air, soil and groundwater through appropriate technical solutions. Liquid storage tanks are used in many businesses: they represent a key asset that needs to be carefully managed across time. Our expertise is gained in the daily discussion with over 11.000 customers; among them are the major players in petrochemical industry.

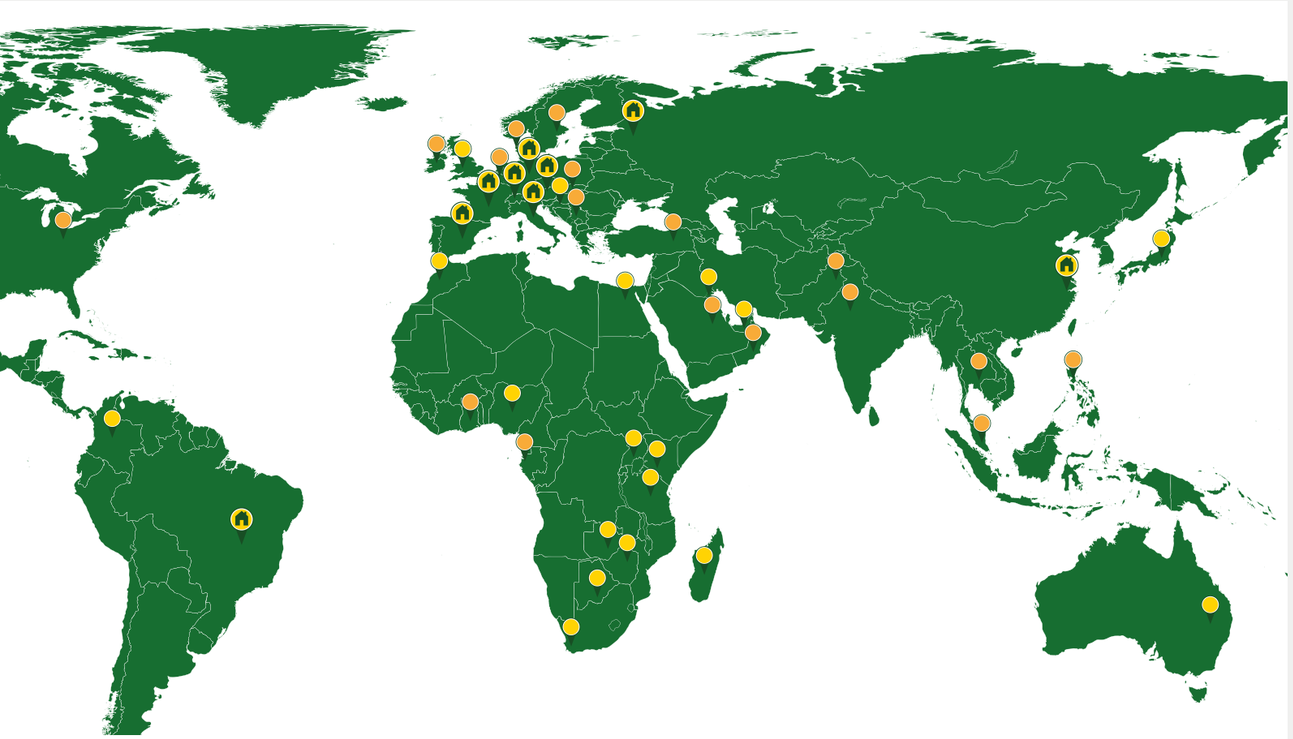
All our work procedures are certified according to ISO 9001: 2008, ISO 14001: 2004, OHSAS 18001: 2007. Furthermore resins production processes are monitored by the TÜV Süd, Munich to ensure to our customers the highest quality standards.

Customer proximity is essential to us: our team of engineers will be at your disposal for any request.

Our Key Figures

For almost 30 years, WOLFTANK ADISA systems have been designed to protect the environment. More specifically, we are teaming up with you to protect one of the most valuable resources on the planet: water.

- **Several Mil. m² coating with EPOFLEX® products**
- **More than 1 Mil. m² refurbished to double wall / floor with the DOPA® system**
- **Operating in more than 30 countries across all continents**
- **3,000 vacuum and pressure leak detection systems (class 1 acc. EN 13160) installed**
- **More than 11,000 satisfied customers**
- **More than 30 years of experience**
- **Worldwide certified solutions**



The durability of our systems grants to our customers important savings and the best possible total cost of ownership. A wide range of system solutions have to be developed and certified according to national and international product standards. For example in case of a storage tank, WOLFTANK ADISA has system solutions for:

- **Conductive and non conductive floor corrosion protections**
- **Mechanical reinforcement of steel floor with high performance laminates**
- **Outside surface sealing for secondary containments**
- **Internal double floor lining with the DOPA® technology**
- **Outside corrosion protection for C1-C5 environments**
- **Reinforcement of ring basements**

Product & System Solutions

WOLFTANK ADISA‘s product portfolio comprises special coatings for corrosion protection, highly advanced leak protection systems, sealing products, impregnations, and much more. These products are mainly used in aboveground and underground storage tanks, catching and bonding areas, ring wall, manhole chambers and many more surface areas. Furthermore, we provide solutions for the drinking water industry as well as highly sophisticated products for nuclear power plants. All our special coating and lining systems are adapted to local requirements.

Refineries & Depots:
Your Ideal Partner For Tank Protection

WOLFTANK ADISA is extremely effective in protecting the most important parts of every bulk storage tank such as the roof, mantle and tricharine from corrosion and in insulating the containment basins, transfer stations and wells.

With our personalized solutions you are able to:

Protect the investment and keep life of the equipment as long as possible

Avoid leakages and loose products thus get affected financially and operationally

Be compliant with local le-gislations, standards and best practices

A safe choice to upgrade your facilities

DOPA® systems help you achieve the above goals, bringing sensible financial and risk savings while keeping your operations smooth and safe.

Wolftank Adisa is one of the very few international companies able to personalize solutions operating both in above and underground environments across various businesses. Wherever there is a liquid, wherever you are, we can help you keep it safe.

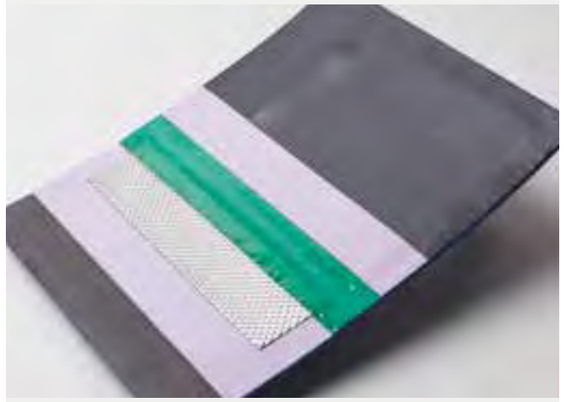


Figure 1. DOPA® layer system application example

The exclusive DOPA® system for converting single to double-walled tanks is the result of our experience, consolidated over more than 30 years of activity. It can be applied to tanks of any non-pressure (atmospheric) size, both above ground and

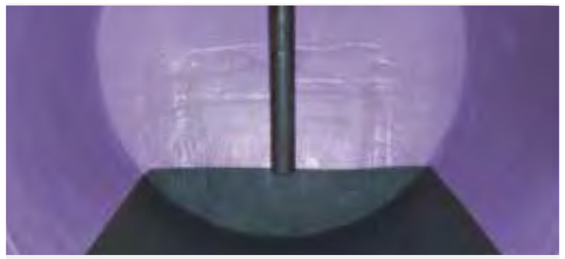


Figure 2. DOPA® system in an underground storage tank

underground, for the storage of potentially polluting raw, intermediate and finished liquids in the oil and chemical sector.

It creates a cavity in the vertical tanks at the bottom to detect the integrity of the double bottom and prevents pollution from leaks by continuously monitoring the depression. Remote monitoring is carried out on a Wolftank leak detector, which operates autonomously and continuously 24/7 and cannot be deactivated without causing an alarm. This allows the tank to be classified with the highest environmental safety standard (EN 13160 class 1).

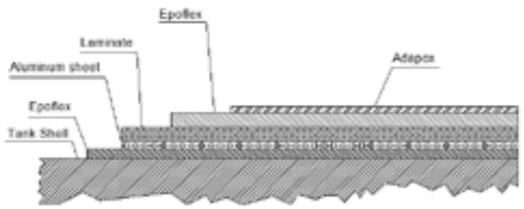
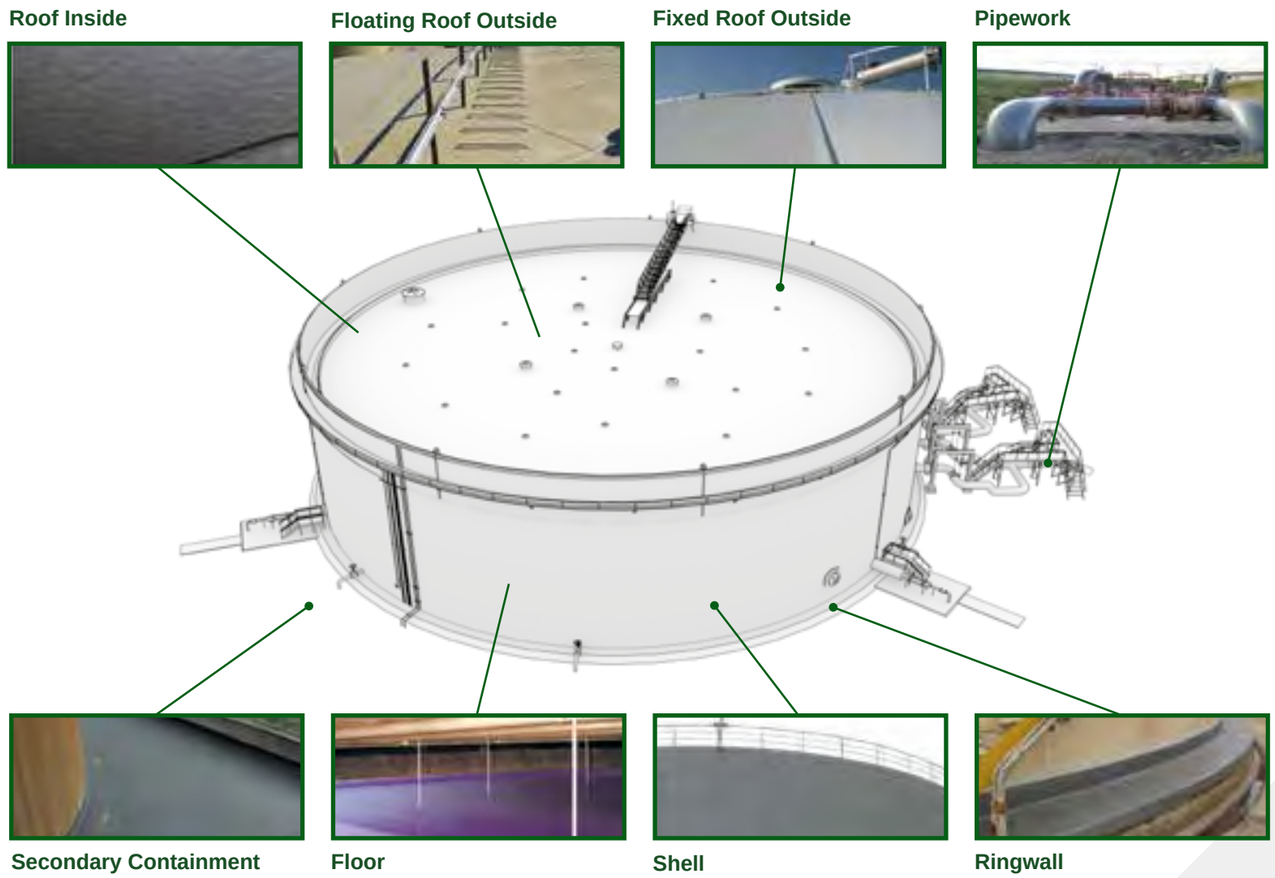


Figure 3. DOPA® 6N layer system application example

Advantages of the DOPA® Technology

- **Corrosion protection and continuous monitoring of tank bottom tightness by extending the maintenance period and extending the service life of the tank (10 year warranty)**
- **Up to 50% shorter intervention times compared to traditional fund renovation**
- **Redundant monitoring in case of pressure loss in the double wall to detect any leakage**
- **No significant volume loss**
- **The double bottom with DOPA® technology is configured as a cold operation (i.e. without welds) and does not require a hydraulic test of the shell.**
- **The technology complies with the EU Directives on environmental protection, is assimilated to a double containment bottom and complies with the EU BAT (Refinery) Conclusions and BREFs*.**
- **In some countries, it has a tax incentive with over-evaluation of the investment as a technology enabling the transformation into a 4.0 industry standard.**

Coating Protection of Storage Tank on demand



Modern Floor Lining Concepts for Storage Tanks, based on Innovative Material and Lining Concepts

In countries with a highly developed petrochemical sector, the market trend shows less investment in new storage capacity, but an increasingly focused allocation of budgets on strategic preservation and maintenance.

Figure 1. A bulk storage tank, monitored for over 10 years with smart double floor technology (Trecate, Italy).

Sustainable maintenance investments and plant upgrade have become a decisive aspect for future business operation and assets value preservation. Alongside new design solutions and traditional periodic maintenance, innovative concepts are promising to reduce the risks of integrity issues on storage tanks. In this context, topics such as double floors with interstitial vacuum monitoring, preventive maintenance and smart linings are increasingly discussed today. These aspects are even more relevant for storage tank floors., which are difficult to inspect during normal operational time; every traditional floor inspection requires an expensive interruption of operations.

Furthermore, in case of negative results, a floor substitution, or even a soil remediation, of the contained underground becomes necessary, which takes the tank out of service for a long time, leading to investments that, typical, may not have been considered in budgets.

Therefore, when comparing the investment cost and maintenance costs of the different parts of bulk storage tanks (shell, floor, roof, ring wall), the maintenance cost of the tank floor is the highest compared to its initial installation cost.

This is explained by the fact that the floor is highly exposed to corrosion and degradation, and that any maintenance operation on the floor requires not only an interruption of service but also the complete draining and cleaning of the tank.

Moreover, a leakage from the floor can directly cause environmental pollution and the corrosion and/or degradation of statically relevant components such as the annular ring or the foundation.

We have intensively studied innovative and long-lasting lining systems that not only stop internal corrosion, but are also able to contribute to the integrity of the tank floor in case of advanced corrosion. Especially in the case of pitting and corrosion originating from the underside of the steel floor, these types of linings are able to maintain the tightness and integrity, even in cases where pitting and corrosion have completely crossed the steel floor.

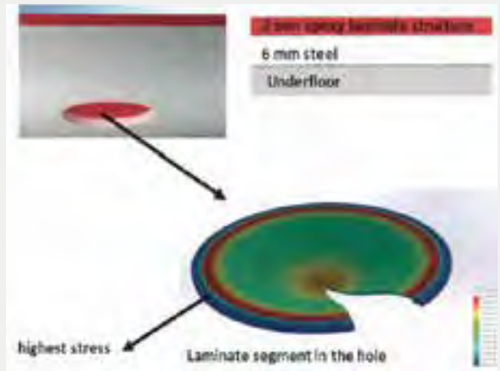


Figure 2. Deformation of laminate due to a hole in the steel as a result of underfloor corrosion.

One long lasting solution is a coating system that creates an interstice, corresponding to a double floor with a 24/7 vacuum monitored interstice. The pressure measurement device of the interstice is connected to a local or remote leak detection system that identifies variations by registering the surveillance pressure. The system analyses precise variations automatically and allows the preview of deviations from the default operative conditions, such as a loss of the interstice monitoring pressure, and can even identify when the system is being manipulated.

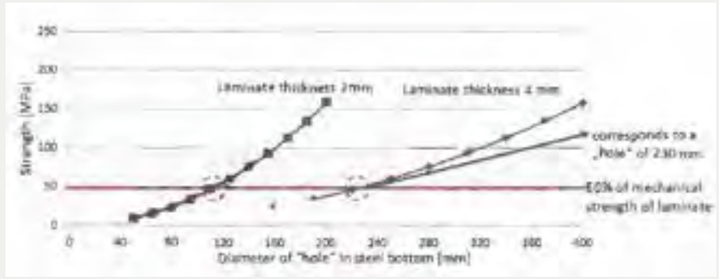


Figure 3. Diameter of a hole in steel, which laminate can resist.

This type of intelligent floor is built directly onto the internal steel floor, creating a flexible inner structure in the form of a double floor, which is not exposed to any steel corrosion as it is plastic in nature. It does not depend whether the steel underfloor is new or old as the integrity function is completely taken over by the lining, while the steel entering into a compound with the lining is limited to its structural function.

The analysis of the vacuum development of a static vacuum monitoring system in such a double floor system is an excellent example of preventive maintenance because it can forecast any damage, movements of the tank and ageing effects. Furthermore, the vacuum loss in the interstice does not indicate an integrity loss of the tank. Instead it indicates a leakage from one of the system layers due to its design. This means that compared to traditional drainage systems, no integrity loss has occurred in the tank. From a preventive maintenance perspective, the floor monitoring receives a type of pre-alert that indicates the possibility of a future risk of tightness and loss of tank integrity.

This floor monitoring approach is an internationally acknowledged concept, recognized by multiple international oil companies. Early versions of the system were installed 30 years ago and are still in use today, showing the possibility of lifetime extension and the sustainability of the original investment.

Alongside such intelligent concepts, which are able to create monitoring solutions directly in the tanks, there is also continuous development to the construction materials in order to improve their mechanical properties.

There are two technical solutions for floor coatings: manually applied laminates and machine-applied sprayable coatings. Traditionally, sprayable coatings have been used as corrosion protective layers, which have a thickness between 200 and 500 µm. However, new approaches with highly thixotropic coatings and layer thicknesses of 2 - 4 mm have been found on the market, which offers the advantage of a sprayable system in a fast and convenient way. Such thick coatings are essentially solvent free and pose no risk of density loss due to solvent emissions, leading to a chemical attack of the coating.

Furthermore, these coatings have structurally rigid properties and do not risk failure as a result of no pinhole corrosion and successive flaking. Coatings should be highlighted not only for their thickness but also their mechanical properties. High solid thixotropic coatings can be designed with high elasticity, high tensile strength and crack bridging properties. Epoxy coatings that contain sprayable microfiber not only offer chemical resistance and a high adhesion of epoxy, but also offer mechanical properties that are comparable with laminates.

Figure 4. Double floor technology based on epoxy coating

Finite element method (FEM) studies have been carried out with thick film coatings and epoxy-based laminates to show how they are able to prevent the lass of tightness in cases where there is pit corrosion on the steel. As the internal corrosion rate

can be considered as zero (000 mm/y) after the application of such a lining, the only corrosion mechanism to be considered for steel plates is the underfloor corrosion. Underfloor corrosion is a chemical steel corrosion that appears as pit corrosion, making such simulation conditions representative for a coated steel floor.

Figures 2 and 3 show the stress the laminate is exposed to when the hydrostatic pressure of the storage liquid is affected by a hole in the steel below, and for different diameters of such a hole. It can be seen that a laminate thickness of 4 mm can easily resist right up to a hole of 230 mm, and in the presence of such a hole, the mechanical load the laminate is exposed to corresponds only to 50% of the tensile strength of the laminate itself.

The application of such a laminate can be considered as a preventive measure, which avoids any integrity issue, even in a case where the steel floor corrodes.

Figure 5. Application of smart double floor technology

In terms of risk-based maintenance, such smart concepts allow not only for the extension of the maintenance intervals but also eliminates some of the main risk factors of covering them with preventive intelligent solutions. This can help to significantly reduce the costs for non-regular maintenance. As non-regular or urgent maintenance, which can increase site productivity. The unexpected service interruptions are hard to manage and can lead, in a worst-case scenario, to the risk of supply continuity, especially for strategic storage sites. The mechanical properties of these lining materials make them applicable for steel tanks as well as for concrete tanks. The structure of concrete storage facilities is exposed to severe degradation when in continuous contact with fuel. The degradation and tightness of the concrete tanks is much more difficult to inspect compared to steel type tanks and can hardly be predicted with calculations. Furthermore, reparation of concrete is significantly more difficult, expensive and time-consuming.

Conclusion

All of the concepts presented in this article are recent approaches to preventive maintenance, designed for bulk storage tanks with smart lining
lining solutions that aim to make operations safe andforecastable. They reduce the risk of service interruption and make maintenance predictable, even in the case of long maintenance intervals reducing the maintenance costs.

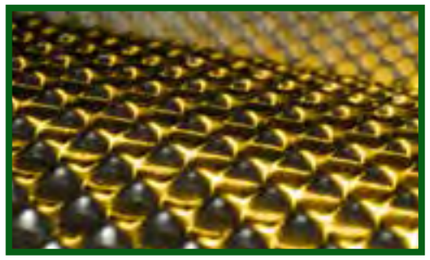
Nowadays, the focus is turning away from the construction of new storage capacities to the preservation or existing structures. Modem floor lining concepts that are based on innovative materials and lining systems can make a significant contribution to the sustainable operation of bulk storage tanks, combining financial and ecological benefits and formulating a valid alternative to traditional steel construction and reparation solutions.

Technical contribution of Wolftank Adisa GmbH in 2018 for the Hydrocarbon Engineering Magazine.

Application Example: Double Floor

WOLFTANK ADISA‘s over 30 years experience in refurbishing tanks has leaded to the creation of the unique DOPA® single to double floor transformation system, that can be used for non-pressurized underground tanks used to store potentially hazardous liquids, such as automotive fuels or chemicals.

DOPA® the smart way to make your tank last longer



The DOPA® system improves contamination protection by continuous vacuum monitoring of the interstitial space. The technology permits the transformation of the entire inner surface or just the creation of a second floor of a flat bottom tank, so that there is no need to replace the tank. The interstitial space is created on the bottom of vertical tanks to ensure integrity of the double bottom. This allows the system to achieve the highest standards of environmental safety (EN 13160 class 1).

The DOPA® remote monitoring system works with Wolftank leak detectors, which provide automated and continuous 24/7 monitoring, so that the device may not be deactivated without causing an alarm to sound.

Application Example: Double Wall Tank Transformation

WOLFTANK ADISA‘s more than 30 years experience in refurbishing tanks has leaded to the creation of the exclusive DOPA® single wall to double wall transformation system, that can be used for non pressurized underground tanks and store potentially hazardous liquids, such as automotive fuels or chemicals.

DOPA® the smart way to make your tank last longer

The DOPA® system is a solution technically equivalent to replacing a single wall tank with a double wall tank, allowing the system to achieve the highest standards of environmental safety (EN 13160 class 1) and provide continuous remote 24/7 monitoring with an intelligent and automated leak detector.

The DOPA® leak detection system is automated and tamper-resistant, meaning that an alarm sounds when one of the two walls is compromised or the device is tampered with or shut down.
This technology has been used by the major oil and gas companies for over 30 years and more than 17.000 tanks have already been transformed.

Application Example: Tank Lining

WOLFTANK ADISA provides targeted corrosion prevention solutions for underground and flat bottomed tanks for storage in the chemical and petrochemical field. Our solutions make it possible to avoid degradation of the bottom and the walls of tanks.

Blocks corrosion and extend the life cycle

Storage tanks for potentially polluting liquids require a high initial investment and during their life cycle they are exposed to severe conditions, such as weathering and highly aggressive chemicals. Proper plant operation requires periodic maintenance to monitor corrosion trends and prevent product loss and resulting environmental pollution, thereby preserving the value of the investment.

Aggressive chemicals, such as sulfur concentrate on the bottom of the tank, making it the most vulnerable due to fatigue, stress corrosion, static breakage, chemical aggression and similar situations that can lead to the decay of a storage facility of potentially polluting liquids.
The bottom, by its very nature, is the most difficult part to be inspected and such inspections typically require tank cleaning operations.

Application Example: Laminates

WOLFTANK ADISA provides corrosion prevention and refurbishment solutions for floors of chemical and petrochemical storage tanks. Laminates are a solution specially recommended for steel floors already attacked by corrosion.

Reinforce floor, block corrosion and boost life time

EEMUA 159, the European standard for maintenance of flat bottom tanks specifies the criteria for the determination of the lifetime of storage tanks. The rejection limit for the bottom is defined as following: „Rejection limits for the thickness of the tank bottom can only be prescribed in relation to the probability of leakage due to corrosion…“

Based on this statement the standard recommends the application of laminates for tank bottoms with an advanced corrosion. They are completely resistant against any chemical attack. Long term experience for more than 20 years as well as FEM simulations have shown that laminates can eliminate any risk of leaking even in case the a steel floor perforated by corrosion.

Application Example:
Lining of Concrete Tanks

WOLFTANK ADISA present a new DOPA® based technology to built double wall concrete tanks which can be monitored on the entire surface independently of the shape of the tank and is resistant to chemical and petrochemical storage products.

Monitoring your petrochemical or chemical concrete tank

The system consist of a base layer which creates the gas tightness of the concrete surface preventing infiltrations and structural degradations of the entire concrete structure. Subsequently, an inner lining system is applied with the DOPA® technology.

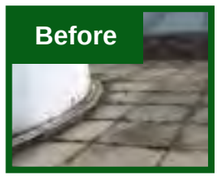
The interstice between the inner lining and the outer wall, like for conventional DOPA® installations, is created in conformity to EN 13160 and can be continuous vacuum.

The monitoring data can be transferred to a remote monitoring with a Customer Web access to the real time monitoring.

Application Example: Secondary Containment Basin

WOLFTANK ADISA offers targeted solutions for the maintenance of areas surrounding aboveground storage tanks for oil and chemical industries, waterproofing uncovered areas, refurbishing containment areas and protecting ring foundation.

The surface which resists all weather conditions



These areas are usually exposed to weathering and tanks can be subject to damage or decay, resulting in leaks and groundwater contamination. The products we use to solve these problems are the result of many years of research in the field of composite materials, specially designed for the type of product stored and the weather conditions such as exposure to UV radiation.

Treatment with these technologies are protecting your plant, the environment and – last but not least – your assets. In fact, the absence of both spills and accidents, ensures the safety of your facility and compliance with regulations.

Application Example: Sump Sealing

Wolftank Adisa‘s experience in refurbishing oil facilities now makes it possible to avoid replacing containment sumps that are no longer liquid-tight. The use of this system helps to prevent soil and groundwater contamination.

An additional life for the sump

Sumps are a critical element of all storage facilities for potential contaminating liquids. This is especially important during the product transfer of the liquids, where the liquids can get in contact with the walls of the sump. If the sump walls are not liquid proof, the problem can now be solved with our sump refurbishing system.

Using specifically designed and certified composite materials, the sump can become a liquid- tight container to protect the soil from leaks. This also reinforces the sump‘s structure and protects the metal parts inside from corrosion.

Application Example: Industrial Flooring

Wolftank Adisa`s over 30 years of experience in development of high technology resins has lead to a broad portfolio of coating systems for industrial flooring of warehouses, offices, production facilities, parking areas, garages, laboratories and may other surfaces.

Outstanding Chemical Properties

Especially in the field of epoxy and polyurethane flooring systems Wolftank Adisa offers interesting solutions which are optimized for the most common challenges in industrial flooring: easy cleaning, anti slip finishing, abrasion resistance, hardness, crack bridging, able to resist very high loads and heavy traffic.

Due to the experience of Wolftank Adisa with resins used for the storage of chemical liquids, the industrial flooring products show outstanding chemical properties and can be particularly suggested for chemically aggressive environments and floors which can get in contact with chemicals.

A range of different adhesion primers allows to have a perfect adhesion at different humidity conditions and on different surfaces such as concrete, asphalt and metallic surfaces.

Application Example:
Outside Corrosion Protection

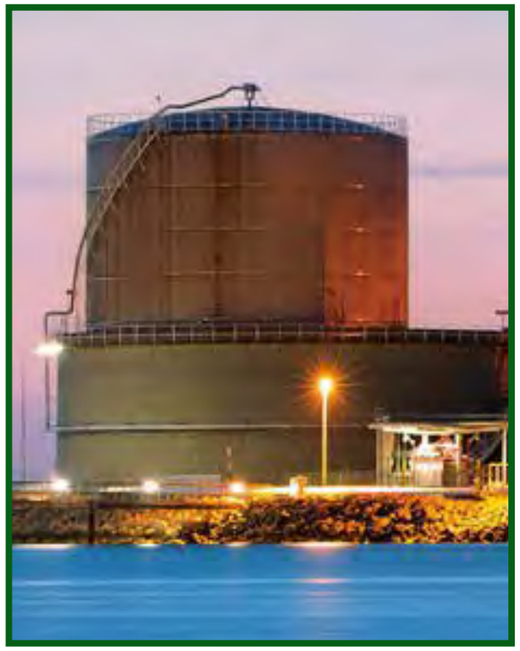
Atmospheric Corrosion

Atmospheric corrosion is a long term process that takes place in form of moisture on steel metal. The following three factors can accelerate the corrosion process:

- High relative humidity
- Condensation (when the temperature is below or at dew point)
- Air pollution leading to a chemical reaction with steel

Our experience has shown that significant corrosion is likely to take place with a humidity level above 80% and at a temperature around 0°C. If pollutants and salts are in the air, the corrosion process is higher and much more aggressive.

Structures which are immersed in water



It is a big difference if the structure is build in salt, brackish or fresh water and also the oxygen quantity which contains the water is a really important factor how fast and aggressive the corrosion is going to proceed.
We define three different zones for structures built in water:

- The underwater zone, which is constantly immersed in or near water
- The intermediate zone, in which the water level changes due to natural or artificial effects. Thus giving rise to corrosion due to the combined impact of water and atmosphere
- The splash zone, is the area which is wetted by waves and spray action. It can cause exceptional high corrosion stresses, especially with sea water.

Structures which buried in soil

Corrosion in soil depends on the minerals which contained in the soils, however, also the organic material. The corrosion in soil is strongly influenced by the degree of aeration. The oxygen content will vary and corrosion spots are created, where major steel structures pass through the different types of soil.

Atmoshperic Corrosion Categories with Example of typical Environments

The following table defines the corrosion categories by the term of mass / thickness loss after the first year of exposure.

Corrosivity Category	Mass loss per unit surface/thickness loss (after first year of exposure)				Example of typical environments in a temperate climate (informative only)	
	Low Carbon steel		Zinc		External	Interior
	Mass Loss	Thickness Loss	Mass Loss			
C1 very low	≤ 10	≤ 1,3	≤ 0,7	≤ 0,1	-	Heated buildings with clean atmospheres e.g. offices, shops, schools.
C2 low	> 10 to 200	> 1,3 to 25	> 0,7 to 5	> 0,1 to 0,7	Atmospheres with low level pollution. Mostly rural areas.	Unheated buildings where condensation may occur e.g. depots, sports halls.
C3 medium	>200 to 400	> 25 to 50	> 5 to 15	> 0,7 to 2,1	Urban and industrial atmospheres, moderate sulfur dioxide pollution. Coastal areas with low salinity.	Production rooms with high humidity and high air pollution, e.g. food-processing plants, laundries, breweries.
C4 high	> 400 to 650	> 50 to 80	> 15 to 30	> 2,1 to 4,2	Industrial areas and coastal areas with moderate salinity.	Chemical plants, swimming pools, coastal ship- and boatyards.
C5-I	> 650 to 1.500	> 80 to 200	> 30 to 60	> 4,2 to 8,4	Industrial areas with humidity and aggressive atmospheres.	Buildings or areas with almost permanent condensation and with high pollution.
C5-M	> 650 to 1.500	> 80 to 200	> 30 to 60	> 4,2 to 8,4	Coastal and offshore areas with high salinity.	Buildings or areas with almost permanent condensation and with high pollution.

Examples for Corrosion Protective Coating Systems

	Primer	Intermediate Coating	Top Layer	Recomendations
Corrosion protection of new plants (30-300µm)	Adacor Aktiv Primer	Adacor Aktiv Glimmerfarbe	Adapur ACR	≤ C5
	Adacor Zink	Adapur WR Glimmer	Adapur WR	≤ C4
	Etoplate Masters	Adapur HS		≤ C5
	Adapur 109 (1-2 Layers)			≤ C3
	Adapur ES (1-2 Layers)			≤ C4
Refurbishment of plants (30-300µm)	Adacor Aktiv Primer	Adacor Aktiv Glimmerfarbe	Adapur ACR	≤ C5
	Adacor Grund	Adapur WR Glimmer	Adapur WR	≤ C5
	Adamastic		Adapur HS	≤ C5
	Adamastic		Adapur 109	≤ C4
	Adapur ES (1-2 Layers)			≤ C4
Thixotopric solid coatings (1-4mm)	Epoflex 6N*			≤ C5
	Epoflex 6N*		Adapox L	≤ C5
	Adacor KS-A			≤ C5
	Epoflex DS*			≤ C5
High abrasion resistant thixotropic coatings (1-4mm)	Adapox DSF*			≤ C5
	Adalyt GF*			≤ C5

*Non conductive coatings: Absence of pinholes can be tested with a holiday test at 20 kV.

Case Study 1: 1995 Switzerland

The floor of the storage tank has been lined with DOPA® in 1995.

Tank still in operation with continuous 24/7 floor tightness vacuum monitoring and since 22 years no maintenance cost.

Case Study **2: 2006 Italy**

The floor of this tank has been lined and transformed to double wall and has been opened after 10 years of continuous operation of legal inspection.

No aging or damages have been found despite no maintenance costs after 10 years of operation.

Case Study 3: 2010 Czech Republic

Strategic fuel storage tank with total storage capacity of 1.8 mil. m^3

Underground double wall concrete tank with a diameter of 48 m and a height of 22 m

Rigid roof covered with soil and grass concrete wall thickness 0.6 m

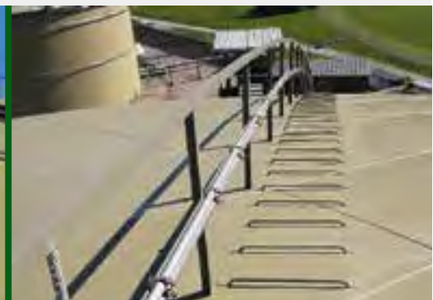
Application of double-walled composite lining completed in 2011

Case Study 4: 2018 Austria

Tank roof lining for high corrosion (>C4) environment

Application of three different layers to sustain the C4 corrosion category: Ground-, Interme-diate and Top layer

Executed with cleaning technology and material structures to reach 20 years of lifetime



Extract of Historical Reference List of DOPA® Installations in Bulk Storage Tanks

Final Customer	Lining Systems supplied to Local Installation Partner	Max. Tank Size	Const-ruction Year	No. of Tanks
Vopak AG Switzerland	DOPA® Double Floor Transformation of Aboveground Storage Tanks and installation of vacuum detection system	⌀ 18 m	2000	17
BP Auhafen Switzerland	DOPA® Double Floor Transformation of Aboveground Storage Tanks and installation of vacuum detection system	⌀ 8 m	1999	5
Alma Petroli Italy	DOPA® Double Floor Transformation of Aboveground Storage Tanks and installation of vacuum leak detection system.	⌀ 18 m	2014	3
PetroTank Germany	EPOFLEX® Laminate Floor Lining for Storage Tank	⌀ 24 m	2015	1
Oiltanking Germany	ADALASTIC® Sealing of Ring Wall and Secondary Containment	⌀ 25 m	2011	2
Total Italy	DOPA® Double Floor Transformation for Leak Detection for Aboveground and Underground Storage Tanks and installation of vacuum leak detection system	⌀ 23 m	2006	2
Varo Energy Switzerland	DOPA® Double Floor Transformation of Aboveground Storage Tanks and installation of vacuum detection system	⌀ 32 m	1998	1
ENI Italy	DOPA® Double Floor Transformation for Leak Detection for Aboveground and Underground Storage Tanks and installation of vacuum leak detection system.	⌀ 17 m	2012	5
Alpe Adria Pipeline Austria	Tank Roof Lining for Crude Oil Storage Tank	⌀ 43 m	2017	3
Miro Germany	EPOFLEX® Tank Floor Lining and Tank Inside Roof Lining for Storage Tank containing Ethanol	⌀ 32 m	2010	2
Maxcom Petroli Italy	DOPA® Double Floor Lining for various Storage Tanks	⌀ 28 m	2017	42
Cepro Czech Republic	Concrete Tanks Internally Lined with DOPA® on Floor and Shell	⌀ 44 m	2012	7

How does continuous monitoring protect your investment in storage capacity?

Interview excerpt from Oil & Gas Technology Magazine.

Oil a Gas Technology: Why is the tank an asset to be maintained?

Markus Lechthaler: The construction of a new storage tank is a high investment in an asset that, over the entire lifecycle, is exposed to harsh conditions such as environmental influence and storage of chemically aggressive goods. The operation of a storage tank therefore requires periodic maintenance to avoid steel corrosion, product lass as weil as safety and environmental risks.

1

OGT: What does the 24/7 monitoring consist of?

Markus Lechthaler: In order to enable the launch of a leak detection system it is necessary to have a tank with an interstitial surveillance space created by a double wall. We have developed a system to install a second wall that we call DOPA®. The interstice we connect to a local or remote leak detection system that identifies variations by registering the surveillance pressure.

The system analyses these variations automatically and allows the preview of deviations from the default operative conditions, such as a lass of the interstice monitoring pressure, and can even identify manipulation of the system.

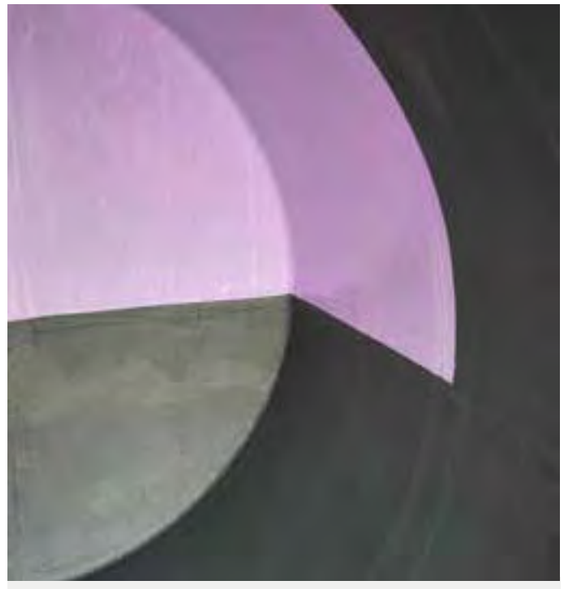
2

OGT: How can I ensure that my asset does not lose its value?

Markus Lechthaler: Alongside periodic maintenance, we recommend that tanks are equipped with an automatic and continuous 24/7 monitoring system. This provides detailed information and ensures a constant knowledge and awareness of the integrity of your tank.

3

Dr. MBA.
Markus Lechthaler
Managing Director
Wolftank Adisa GmbH



OGT: What exactly is the DOPA® system?

Markus Lechthaler: DOPA® is a solution to build an additional wall inside a tank, al- the transformation of the tank into a double wall structure with a monitorable interstice without building a secon steel wall and any welding operations is an internationally acknowledged sy m, weil recognised by multinational oil ompan s. Early versions of the system re in l- led 30 years ago and are still use to showing the possibility of lifet... ... and sustainability of the investment.

4

OGT: Can the double-wall DOPA® system only be installed in new tanks?

Markus Lechthaler: No, it can also be applied in older tanks later in the lifecycle. The installation requires only a few weeks of downtime, thus the process can be carried out in combination with a scheduled standard maintenance.

DOPA® can even be installed in
ready severely attacked by corrosion
long as the static requirements for the me
chanical stability are fulfilled. It is possible for single-walled tanks and even for leaking double-walled tanks.

OGT: Which tank types can be transformed or retrofitted?

Markus Lechthaler: Any atmospheric or underground storage tank, any steel or
cete tank, either new or in use, examples go from of 5m³ up to of 100m in diameter. Generally, it can be applied on the entire tank surface. However, the most corrosion affected part in above ground flatbottomed tanks is the bottom itself. As this area can normally not be inspected visually du ring operation without emptying the tank, DOPA® enables its constant monitoring. In case of underground tanks, such as tanks at petrol stations, the European standard require a 360‘ double wall installation.

OGT: Who can carry out the installation?

Markus Lechthaler: Basically, the installation of our system can be made directly by our technicians and engineers as weil as by local partners that are trained and certified by our training department. Our network of installation partners is already extended over various countries in the world and is constantly growing. The service covers all main steps, from site assessment up to project planning, installation and the final handover of the safe tank.

Austria

plant retrofitting line with the market trend?

In countries with a highly developed petrochemical sector, the market trend shows less and less investment in new storage capacity, but an increasingly focused allocation of budgets in strategic preservation and maintenance. Therefore, such maintenance investments and plant upgrades become an additional decisive aspect for the future business Operation and asset value preservation.

WOLFTANK AUSTRIA

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