

Where Powder meets Power.

Admixtures for the drymix industry



SITREN®

SITREN AirVoid®

TEGO® Antifoam





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for specialty chemicals
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additives

Evonik

Your first choice for
specialty chemicals



Polymer & Construction Specialties

On the right track for future trends

What will tomorrow's world look like? What technologies can we expect and what possibilities will they offer? What challenges will the construction industry face in 10 and 20 years? Only those who raise these questions will be able to identify emerging trends and needs in good time, and develop future-proof solutions for their customers.

The Polymer & Construction Specialties (PCS) product line is part of **Evonik's** Interface & Performance business line, which strives to innovate, shape trends, and continuously improve and develop its product portfolio.

Interface & Performance, part of Evonik Operations, invests significantly in research and development to maintain and extend its advantage in key technologies.

In order to strengthen our position, our efforts are supported by five competence centers for manufacturing, applied technology, research and development and sales and marketing. These are located in Germany (Essen/Geesthacht), North America (Richmond, Virginia), China (Shanghai) and India (Mumbai). Investment in our manufacturing sites ensures global security of supply.



Face-to-Face Performance

Consulting, development and cooperation on an equal footing

We develop tailor-made solutions, and use our proven skills to support our customers with their specific tasks.

Our willingness to meet unique customer requirements is shaped by:

- An in-depth knowledge of each market's technical requirements
- An understanding of customer challenges and the corresponding tasks
- The ability to develop customer-specific products

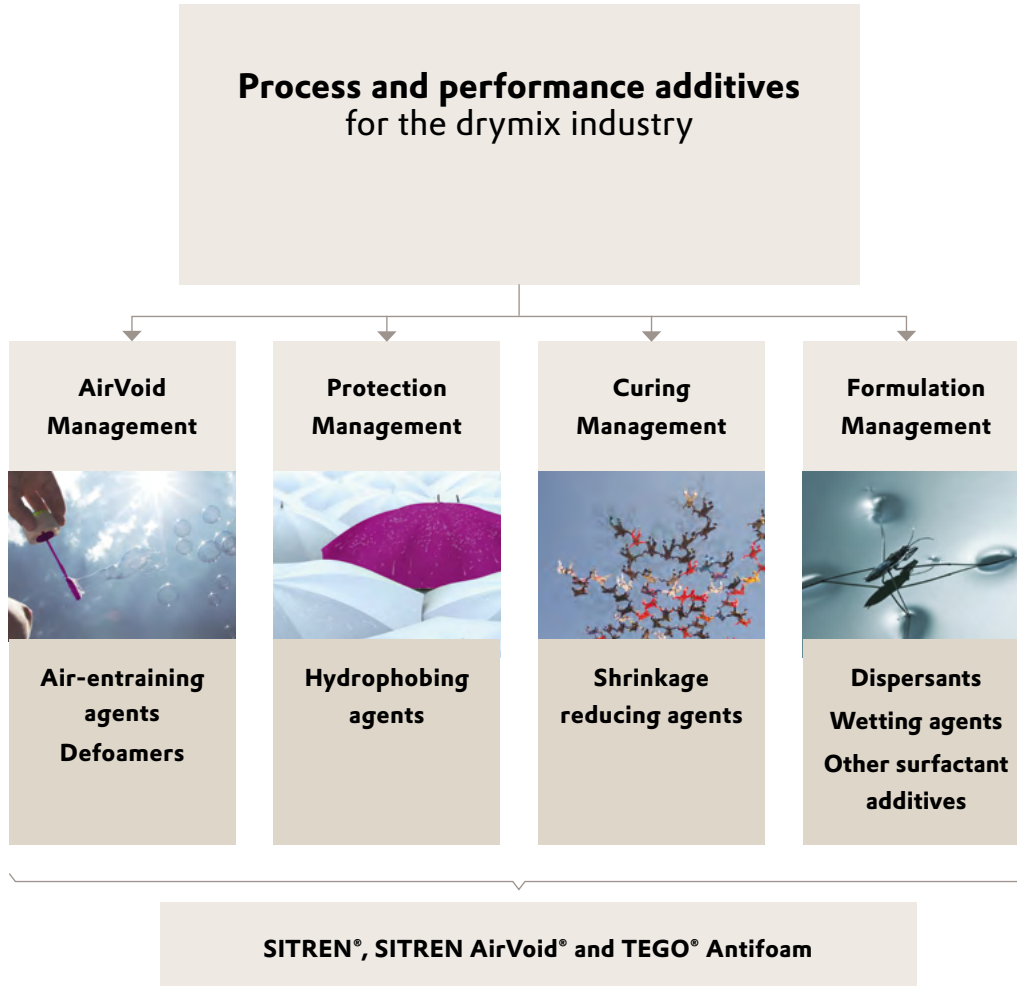
Experienced technical specialists and sales managers are available to assist and advise our customers throughout the world. In addition, we have regional laboratories and competence centers that enable us to deliver effective support at all times and in all locations. This gives us the ability to develop and deliver solutions specifically designed for the needs of each market.





Our management systems
for the drymix industry

At a glance.



All four management systems and their functions and products address the following application area:

- **Drymix**, admixture for the dry mortar industry

We understand our customers' challenges, including their manufacturing processes and the requirements their products have to meet. In addition, we offer a broad product portfolio, extensive experience and specialized technical expertise, plus our in-depth knowledge of applications and markets.

At the same time, we are dedicated to protecting the environment, and to sustainable socioeconomic development. With more than thirty years' experience in product design, we continuously improve and evolve our products. As a result, our solutions set new standards in terms of efficiency and performance.



New design scope.

Our drymix product portfolio

Simple and safe processing has been one of the main reasons for the increasing significance of drymix products over many years. With the correct admixtures, outstanding processing properties and excellent product features are no longer mutually exclusive.



These days, there are few construction related activities that don't in some way involve the use of drymix mortars or other drymix products. These represent one of the main trends in the construction industry.

As a key component of modern construction systems, drymix products contribute to improved energy and resource efficiency for new and existing structures. Further benefits include a reduction in climate-damaging emissions.

In addition to conventional drymix mortars, there is a wide range of specialty drymix products designed for the latest high-performance and cost optimized construction methods.

The drymix admixture product range from Evonik has been developed to meet the needs of these high-performance systems.

Our product range guarantees reproducible performance and processing every time – whether for masonry mortars, screeds, renders, tile cements, floor leveling compounds or waterproofing slurries.

To achieve and maintain these performance levels, Evonik uses state-of-the-art methods to develop, test and manufacture highly efficient chemistries which achieve an optimal interaction between diverse mineral substrates. From the very start of the process, every effort is made to use the most natural resource-saving and/or sustainable raw materials possible. Not to mention the avoidance of unnecessary VOC emissions.

Our four management systems in the specialty chemicals sector are a unique feature of Evonik, guaranteeing effective and specific product solutions for the wide range of demands.

THE FOUR MANAGEMENT SYSTEMS:

AirVoid Management

Air entrainers
Defoamers



Air has a significant impact on the performance of cement and gypsum based building materials and mortars in both positive and negative terms. The manufacturing process of mortars generally requires mixing with water. The application of shear force combined with surfactant components in the mortar mix leads to the distribution and stabilization of air in the fresh mortar.

Air in the right quantity and in the right form is essential for the end properties of mineral-based materials and has a direct impact on the

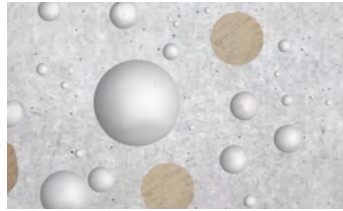
- **Workability**
- **Mechanical properties**
- **Durability**
- **Aesthetics**
- **Slump properties**
- **Insulation properties**
- **Density**

This results, for example, in the formation of a dense structure in self-leveling systems applied in thin layers to floors, while air renders improves workability and results in a lighter mortar.

Our **air entrainers and defoamers** can **actively control the quantity, the distribution and the size of the air voids** in cement and gypsum based building materials and mortars - we call this **AirVoid Management**.

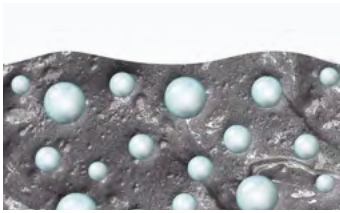
AIR ENTRAINERS AND DEFOAMERS IN OPERATION – AIRVOID MANAGEMENT

▼ Mortars without additives



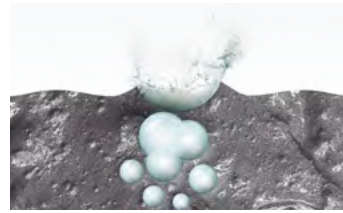
- Total porosity:
- gel pores
 - capillary pores
 - **air voids**

▼ Air entrainer

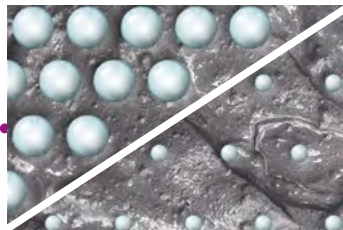


- Total air volume
- Air void size
- Air void distribution
- Air stability over time

▼ Defoamer



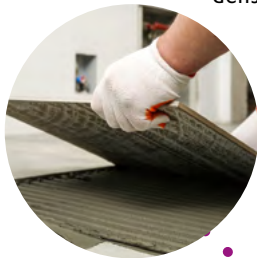
▼ Mortars with special properties



- freeze-thaw resistance
- processability
- density



- impermeability
- durability
- strength





AIRVOID MANAGEMENT

Air entrainers



AIRVOID MANAGEMENT – Air entrainers

Our air entrainers create stable and homogeneously distributed air voids. Their main purpose is to stabilize the air entrained with the water during mixing.

Depending on the requirements, our portfolio of air stabilizing additives can optimize the size, content and distribution of the air voids.

Influencing factors

Contrary to what the current name indicates, the function of air entrainers is not to generate air voids but to stabilize the mechanically entrained air during mixing. Therefore, air void content is dependent on the mixing process and can vary depending on mixing device, mixing duration, time of mixing, temperature and the additives used.

If the mortar, for example, is not mixed long enough during the production process, the mortar can contain unreacted air-entraining agents. With further mixing, these air-entraining agents are activated and the air content rises. Furthermore, the air void content is also temperature-dependent: It falls as the temperature increases.

Application areas:

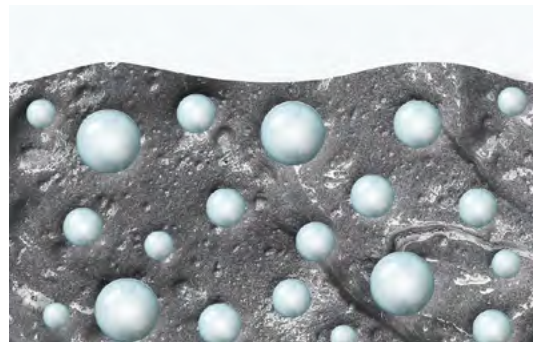
- Indoor and outdoor renders
- Insulating plaster
- Restoration render
- Skim coats or decorative renders
- Repair mortar
- Thermal insulation systems (EIFS/ETICS)
- Lightweight construction

Problems dissolve into thin air

Forming air voids and increasing work efficiency.

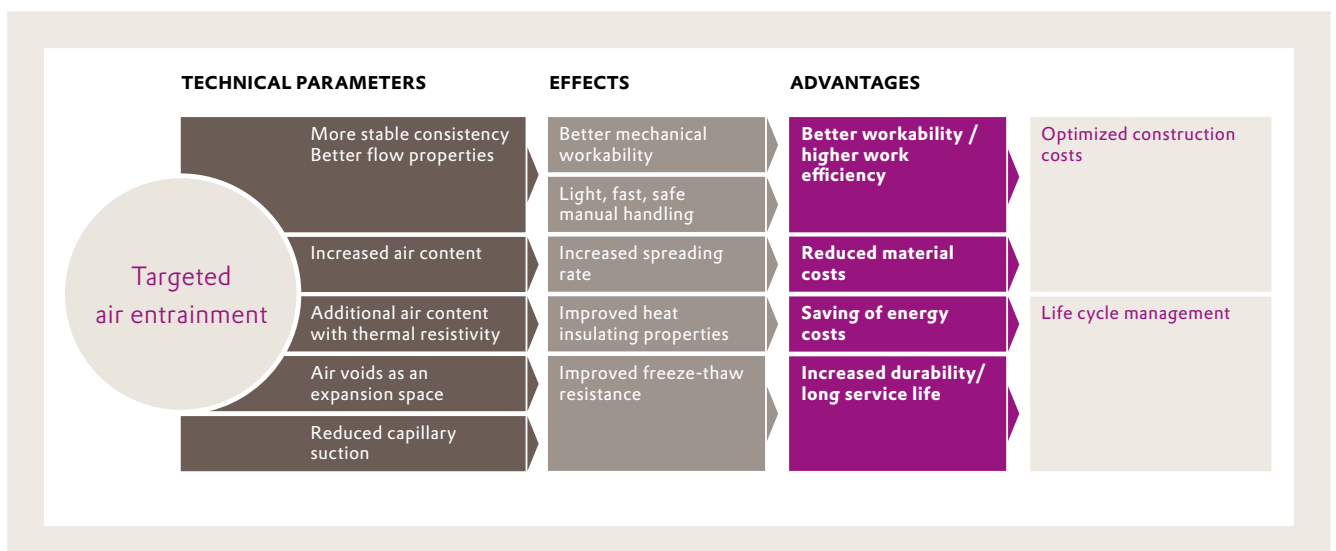
Advantages of synthetically produced air entrainers

There are a variety of different air-entraining agents on the market, consisting of natural active ingredients, synthetic surfactants and mixtures. **Our synthetically produced air entrainers do not suffer from quality fluctuations associated with natural active ingredients.** They offer **consistent quality**, are **more stable** and therefore **more reliable**. Synthetic air entrainers are characterized by the close correlation between dosage and volume of entrained air. In contrast, air entrainers based on natural active ingredients, when used at higher dosage typically increase the air content in a non linear manner. The increase in efficiency of synthetic air entrainers ensure **optimized construction costs and resource efficiency.**



Stabilization of air voids

AIR ENTRAINERS – AT A GLANCE



Improved workability – higher work efficiency

The everyday example of whipped cream shows: Only the correct quantity of added air ensures a creamy and stable consistency of mixtures.



The same applies to mortars and plaster mixtures – air voids play a major role. Air entrainers can be used to stabilize fine and evenly distributed air voids in the mixture, resulting in a **smooth and stable consistency** in the mortar or plaster. This is often described as the **ball bearing effect** of the air voids.

But what exactly is the practical benefit of this? The stable and more free-flowing consistency makes these types of mixture much more suitable for **mechanical processing**. Particularly important is the way that the air voids stabilize the mixture, reducing settling and separation of ingredients. There are also considerable advantages in terms of **manual processing**, as the fabricator can apply the products more quickly, easily and safely, thanks to the smoother consistency and better flow properties. This results in **more efficient** and therefore **more cost effective workability** of these products.

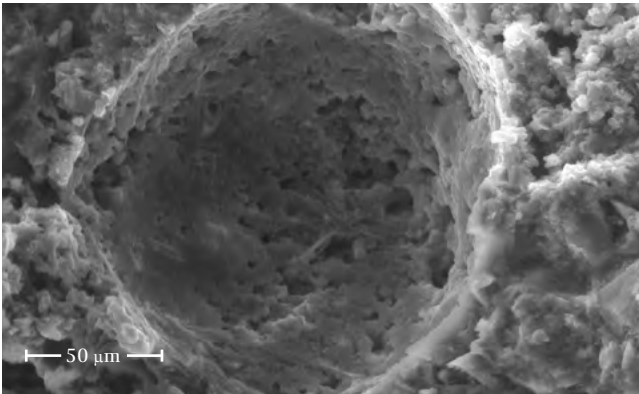
Air entrainers from the **SITREN AirVoid® range** provide significantly improved workability combined with increased durability and enable efficient light-weight construction. For example, our air-stabilizing additives enable the creation of mineral systems with an air void content of between 20 and 30%, considerably improving the thermal insulating properties.

SITREN AirVoid® air entrainers

The correct air content and void structure are critical when designing mortar or plaster compositions. In addition to workability, these key aspects have a significant impact on the basic material properties of the finished mortar.

SITREN AirVoid® 651 is a highly effective air entrainer for mineral plasters, fillers, masonry and base coat mortars. It creates particularly fine and stable air voids that improve frost-resistance. Due to its wetting and dispersing properties, SITREN AirVoid® 651 also helps to provide easier manual processing and better pumpability of mortar mixtures.

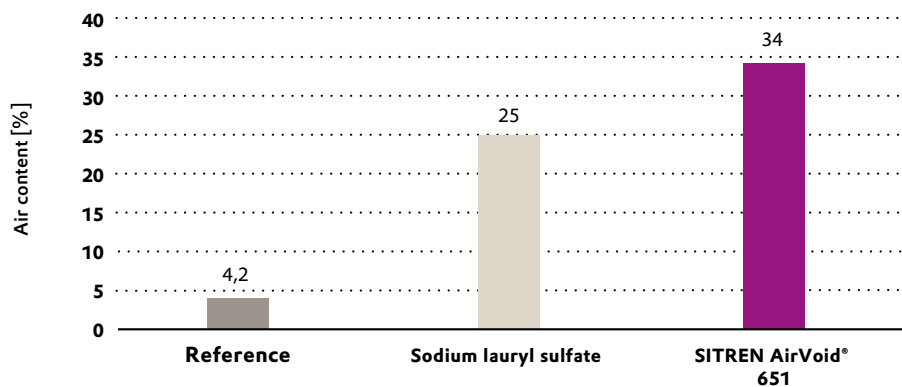
Image of a stabilized air void seen through a scanning electron microscope



SITREN AirVoid® 651 creates particularly fine air void structures

ADVANTAGES OF SITREN AIRVOID® 651 IN AIR CONTENT

Air void content in accordance with DIN 18555-2



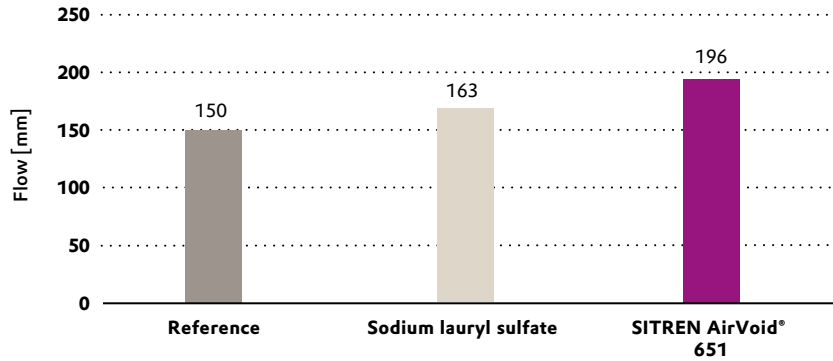
Dosage:
0.05 % based on total
drymix

Mix design:
Standard mortar according
to DIN EN 196; w/c: 0.5

SITREN AirVoid® 651 helps the formation of fine and evenly distributed air voids.

ADVANTAGE OF SITREN AIRVOID® 651 FOR SPREAD IN FLOW

Flow in accordance with DIN 18555



Dosage:
0.05 % based on
total drymix

Mix design:
Standard mortar according
to DIN EN 196; w/c: 0.5

The entrained air ensures faster and better workability.



Comparison: without (above) and with (below) SITREN AirVoid® 651



Application of a render, modified with SITREN AirVoid® 651 to an exterior facade

Our modern air entrainers from the **SITREN AirVoid®** series for the construction chemistry sector consist of a **combination of highly effective specialty surfactants**.

Product overview

PRODUCT	CHEMICAL CHARACTERIZATION	RECOMMENDED DOSAGE* [%]
SITREN AirVoid® 651	Amphoteric surfactant	0.01–0.5

*referred to total dry mortar

More information about air entrainers and additional products is available in our product overview or on request.

AIRVOID MANAGEMENT

Defoamers





AIRVOID MANAGEMENT – Defoamers

The entrainment of uncontrolled air into cement and gypsum based mortars is unavoidable and leads inevitably to a loss of quality in high performance systems. **Undesired air voids weaken the system** resulting in lower mechanical strength and reduced abrasion resistance.

In addition, surface air voids often compromise the desired quality requirements of a product.

Defoamers are preferably used for the prevention and removal of large air inclusions at the concrete's surface and for rapid foam collapse in aqueous formulations. If, on the other hand, it is necessary to remove finely distributed air from a system, deaerators are the preferred alternative. However, practice has shown that a clear differentiation between defoamers and deaerators is usually not possible. Most defoamers also have a deaerating effect to some extent and vice versa.



Application areas:

- Floor systems (e.g. leveling compounds, screeds and decorative coatings)
- Tile adhesives
- Grouts
(e.g. masonry mortars and joint fillers)
- Grouting and repair mortars
- Thermal insulation systems (EIFS/ETICS)

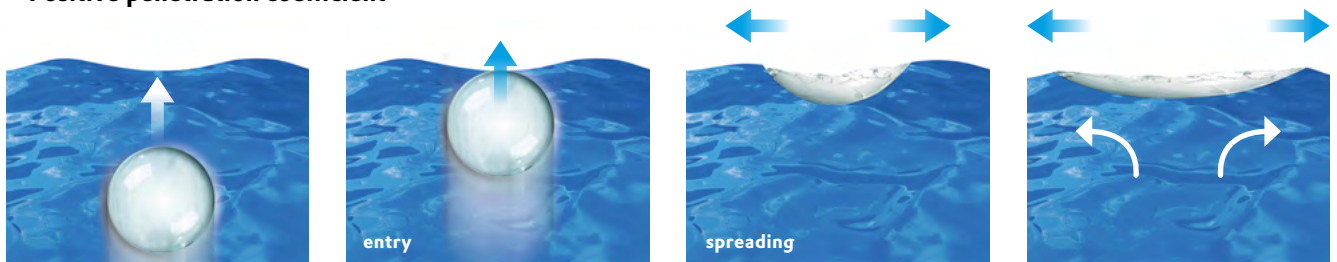
Not just hot air

Stay strong with our defoamers.

How defoamers work can be best explained in the images below. Defoamers and deaerators are active at the air/water interface; they cause the stabilized structure of air voids to rupture in a liquid medium, thus allowing air to escape.

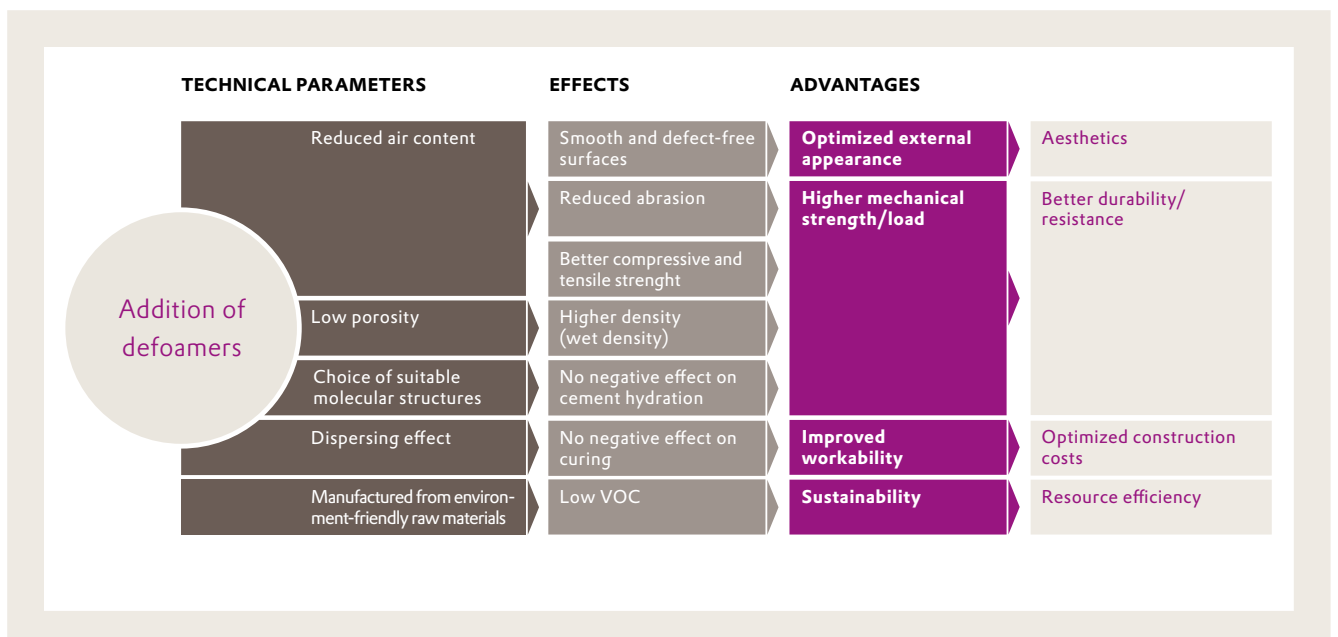
Defoamers are characterized by:

- **Low surface tension**
- **Insolubility in the formulation to be defoamed**
- **Positive spreading coefficient**
- **Positive penetration coefficient**



The working mechanism of a defoamer is a three-step process. First, a defoamer droplet enters the foam lamella. Second, it spreads and destabilizes the surfactant. Third, the foam lamella becomes less elastic and finally ruptures.

DEFOAMERS – AT A GLANCE



Optimized aesthetics with improved durability

External appearance and mechanical strength play a crucial role nowadays, with architecture being more sophisticated and creative than ever.



Particularly in the area of self-leveling flooring, **smooth, compact and defect-free surfaces** are a seal of quality. Our powder defoamers remove surface defects due to unwanted air voids such as cavities and material build-up whilst their wetting and their dispersing properties ensure homogeneous, even surfaces.

In relation to applied loads and mechanical stability, the use of defoamers ensures **increased density** of the mortar system due to its reduced porosity. The reduction in air content results in **higher flexural, tensile and compressive strengths** combined with greater abrasion resistance at the surface. The selection of the correct defoamer chemistry ensures that **neither cement hydration nor the cement's early strength are adversely affected**.

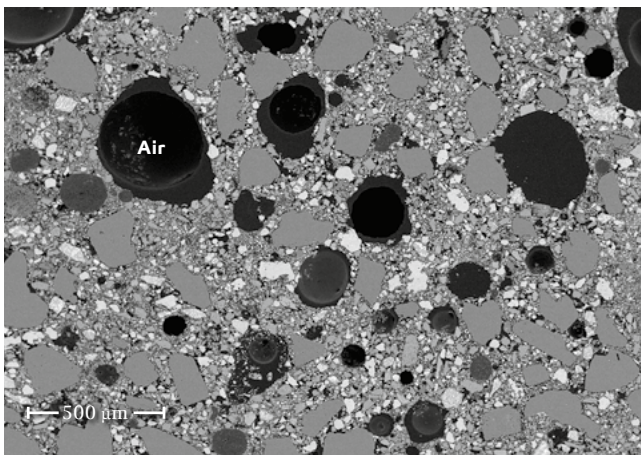
With the **SITREN AirVoid® brand**, we offer high-quality defoamers that allow air voids to be selectively removed from the system. This not only results in easier workability and an optimized surface finish but also in higher mechanical strength. Mortar systems defoamed with our products meet the highest demands of aesthetics and durability.

SITREN AirVoid® defoamers

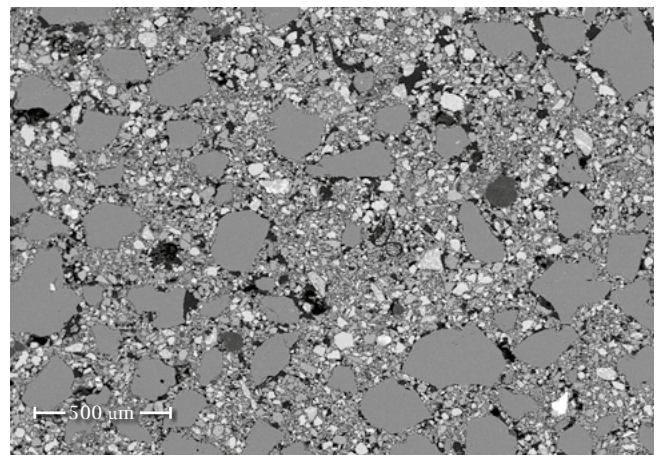
These days the world of drymix applications is broad and versatile. Whether repair mortars, tile adhesives, grouts, leveling compounds or renders – an increasing number of construction products are being offered in more easily applicable and practical powder form. In many of these application, air voids are undesired from both a technical and aesthetic perspective.

Uncontrolled air voids can have a considerable functional impact, particularly for thin layer applications. At the same time, the aesthetic aspect should not be underestimated. Air voids at the surface can result in a very unattractive crater landscape, which often undermines the desired quality requirements of a product. This is where our SITREN AirVoid® defoamers come into their own.

Thin-section of a compound with and without defoamer



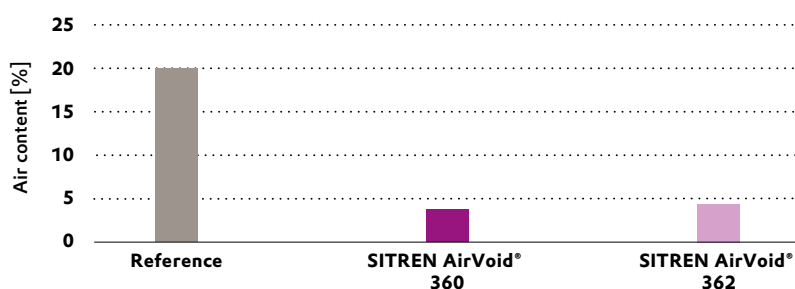
Compound without defoamer:
High levels of entrapped air and unevenly distributed air voids



Compound with defoamer:
Considerable reduction in the air void content with the addition of SITREN AirVoid® 360

SITREN AIRVOID® DEFOAMER – HIGH PERFORMANCE, STRONG DEFOAMING

Effect of SITREN AirVoid® on the air content of a cement mortar



Formulation

Standard sand (EN 196-1):	1,350 g
CEM I 42.5 R:	450 g
PCE plasticizer:	9 g
SITREN AirVoid® 360/362:	4.5 g
w/c:	0.40

Surface finishing with SITREN AirVoid® 354



Smooth surfaces, no material build up, high surface hardness with SITREN AirVoid® 354 – Comparison: left with, right without SITREN AirVoid 354°

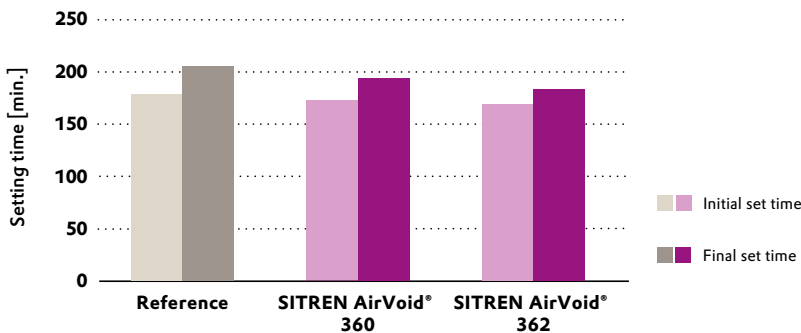
A lower air content means:

- Very good mechanical properties
- High flexural and compressive strength
- High adhesive strength
- High abrasion resistance

Our defoamers have no or very little impact on curing and early strength – **guaranteeing fast work procedures.**

MINIMAL IMPACT ON CURING WITH SITREN AIRVOID®

Setting time (Vicat)



Formulation

Standard sand (EN 196-1): 1,350 g
 CEM I 42.5 R: 450 g
 PCE plasticizer: 9.0 g
 SITREN AirVoid® 360/362: 4.5 g
 w/c: 0.40

Product overview

PRODUCT	CHEMICAL CHARACTERIZATION	RECOMMENDED DOSAGE* [%]	FOAM CONTROL	SURFACE FINISH
SITREN AirVoid® 360	Polyether on inorganic substrate	0.05–0.3	★★★	★★★
SITREN AirVoid® 362	Polyether on inorganic substrate	0.1–0.3	★★★	★★★
SITREN AirVoid® 354	Organomodified siloxane on substrate	0.1–0.3	★★★	★★★

*referred to total dry mortar ★★★ = good ★★★ = outstanding

Information about additional defoamers and products is available in our product overview or on request.

Protection Management

Water repellents



In many countries, moisture and water are amongst the main causes of damage to building structures, requiring considerable maintenance and repair work year on year.

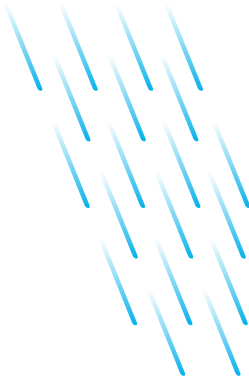
Water infiltrates building structures in different ways and can trigger a variety of different processes that have a **considerable influence** on the **functionality**, the **appearance** and the **durability** of structures.

In nature even hard rocks can turn into sand. One prominent example is the formation of the Grand Canyon through erosion/ surface abrasion in combination with the force of the water. Therefore, it is crucial to understand the different mechanisms of water absorption and to control moisture effectively, thus preventing water induced damage.

POTENTIAL CAUSES AND EFFECTS OF EXTERNAL INFLUENCES ON MORTARS AND RENDERS

CAUSES

efflorescence



driving rain

splashing water



rising damp



EFFECTS

spalling

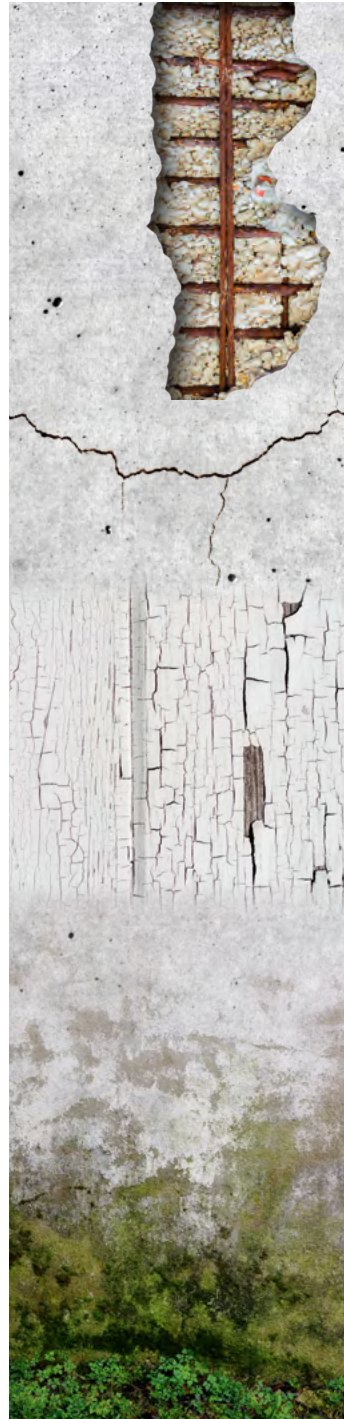
corrosion of the reinforcement

cracking

flaking paint

surface soiling

fouling by algae, lichens and fungi



Potential damage includes cracking, spalling, efflorescence, biological fouling by algae, lichens and fungi, corrosion of concrete reinforcements, deteriorated insulation of exterior walls, surface soiling and flaking paint.

PROTECTION MANAGEMENT

Water repellents



Water is fundamental to our life. But for buildings, water can present a real challenge. Repeated exposure to freezing cold weather and the pollutants and dirt associated with water can cause considerable damage. Our **water repellents provide effective protection against these adverse effects.**

Typical reasons for the penetration of water and moisture into buildings are:

- **Technical and manual application errors, which can cause cracks to appear**
- **Driving rain with wind speeds of up to 150 km/h (95 mph)**
- **Leaking or missing horizontal barriers, facilitating the absorption of groundwater**
- **Splash water**

Wetting angle of a water droplet on a hydrophobic surface



One unit of measurement for the hydrophobic effect on a surface is the contact or wetting angle, a method of measuring the wettability of a surface. This is determined by means of water droplets applied to the surface. Surfaces with a wetting angle of $> 90^\circ$ are referred to as being hydrophobic. If the contact angle is $< 90^\circ$, the surface is described as being hydrophilic.

Application areas:

- Floor compounds (thin and thick flooring)
- Decorative overlays
- Tile adhesives
- Stucco and render
- Skim coats
- Grout (e.g. masonry mortar and joint filler)
- Technical grouts
- Repair mortar
- Thermal insulation systems (EIFS/ETICS)
- Waterproofing membranes

Water simply rolls off

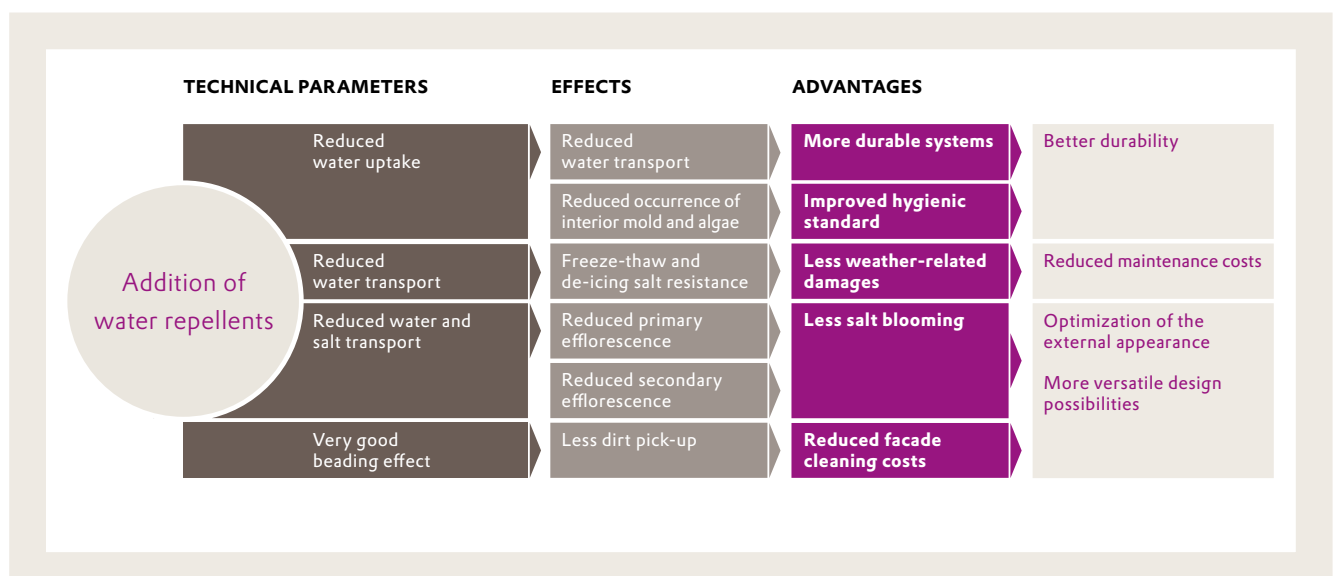
No room for water or moisture with our water repellents.

Water repellents are used to provide mortar and rendering systems with durable protection against water and moisture. Our modern water repellents **minimize the infiltration of water** and dissolved pollutants, while maintaining the **water vapor permeability at the same time.**

Important requirements for water repellents:

- **High degree of alkaline stability**
- **Permeability to gas and water vapor**
- **Low surface tension**
- **No sticky surfaces**
- **Deep penetration depth**

WATER REPELLENTS – AT A GLANCE



Higher hygiene standards and reduced penetration of pollutants

Modern water repellents offer effective surface protection and ensure a lasting attractive appearance.

Stains: These days Grandma's secret tips for removing stubborn stains and dirt fill whole books and internet portals. However, these secret tips and tricks are no longer needed if modern materials are made to be as stain-resistant as possible from the very start, meeting everyday risks head on.

With the help of modern water repellents, even the notorious red wine stain holds no fear. In the same way, for example, the grout of the freshly tiled kitchen can be cleaned after small mishaps without leaving stains behind, as the hydrophobized grout prevents penetration of different substances and the related stubborn stains. In the development of water repellent products, the test methods used are based on real-life scenarios, investigating the precise effect of red wine, coffee and other household liquids.

In addition to this clear example of reduced soiling, for many indoor and outdoor applications water repellents also provide improved durability, a more attractive appearance, easier cleaning, and therefore increased hygiene by preventing the penetration of various media. Ultimately, the use of high-quality additives pays for itself as these considerably increase the lifetime of the treated systems.

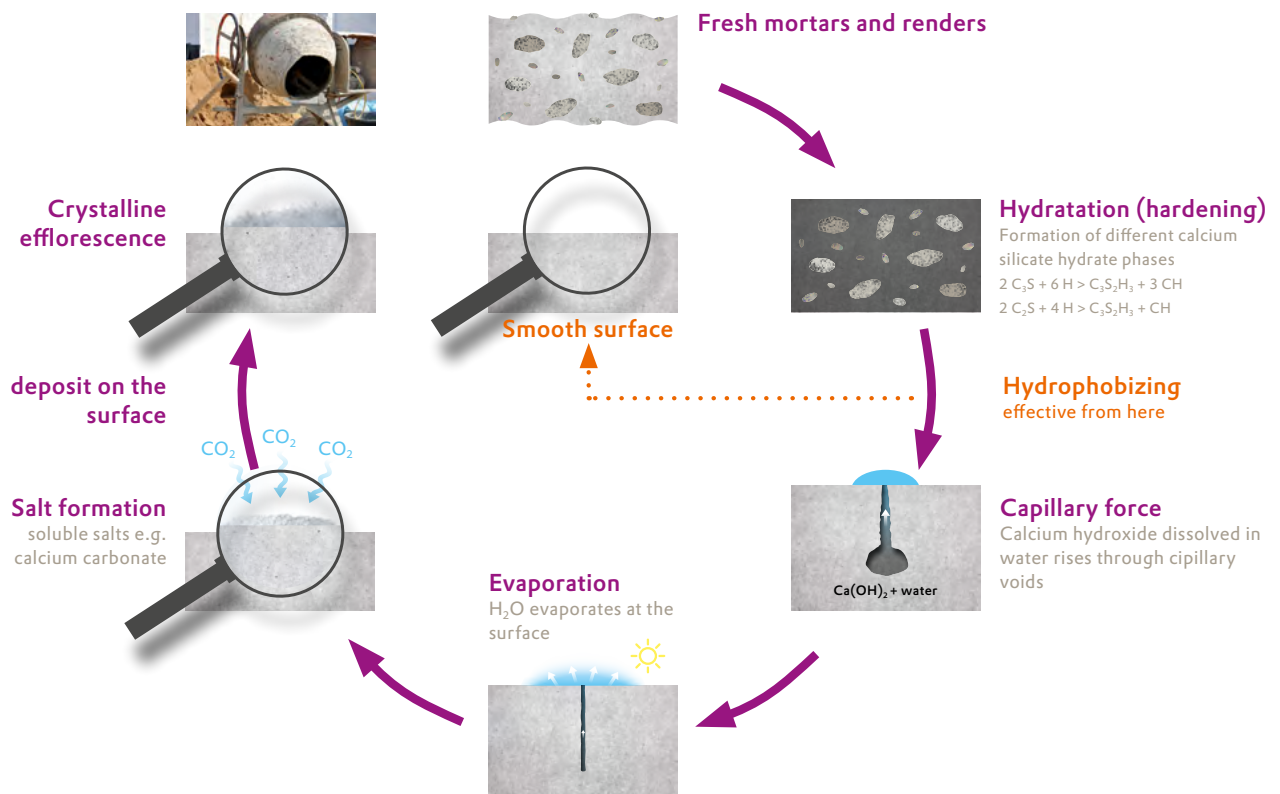
Under the brand name **TEGOSIVIN®** we offer high-performance water repellents for the manufacture of long-life systems. A heavy reduction in water absorption as well as excellent beading properties ensure reduced penetration of pollutants and therefore reduced cleaning requirements. Improved freeze/thaw resistance minimizes weather-related damage, which in turn has a positive impact on restoration costs and durability.



TEGOSIVIN® water repellents

Primary efflorescence refers to the transport of soluble salts out of the binders of the mortar (e.g. cement or lime) to the surface. As a result of evaporation or chemical reactions, calcium carbonate, for example, is deposited as a white film on the surface.

How to avoid efflorescence formation



Primary efflorescence

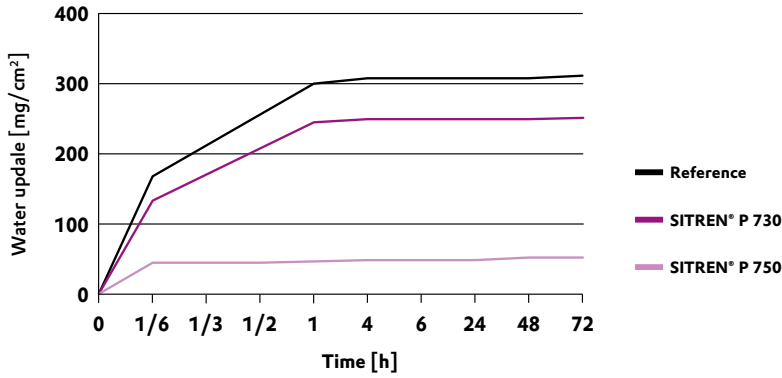
Primary efflorescence is problematic above all in the production of mortar and rendering systems, as it can result in a loss of color intensity, and also unattractive, white-gray stains. The typical cool and wet climate of spring and fall is the ideal environment for the occurrence of efflorescence.

Secondary efflorescence

Secondary efflorescence can also be minimized by internal hydrophobing. Secondary efflorescence occurs primarily by subsequent penetration of moisture (e.g. defect in the seal) and drying of the mortar/render system.

SITREN® water repellents are based on our organically modified silane and siloxane chemistry. Due to their chemical composition, **our water repellents ensure an excellent beading effect and reduced soiling tendency in conjunction with outstanding long-term hydrophobing for mineral renders and mortars. Furthermore, our water repellents provide sustainable protection in relation to freeze/thaw resistance and crystallization pressure.**

SITREN® P 750 SIGNIFICANTLY IMPROVES THE WATER RESISTANCE OF DRY MORTARS

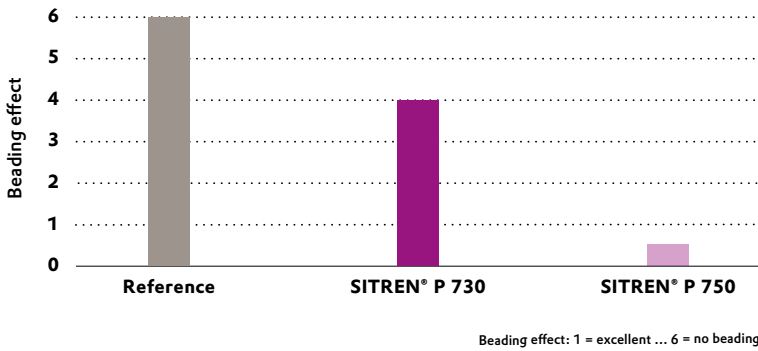


Formulation

Standard mortar in accordance with DIN EN 196
 w/c: 0.5
 Dosing SITREN® P 730/P 750:
 0.5 %, in rel. to total mortar

SITREN® P 750, with its optimized combination of silane and siloxane, provides outstanding and **long-term water-repellent properties** for a wide range of cement-based dry mortar applications.

EXCELLENT BEADING EFFECT WITH SITREN® P 750



Formulation

Standard mortar in accordance with DIN EN 196
 w/c: 0.5
 Dosing SITREN® P 730/P 750:
 0.5 %, in rel. to total mortar

The heavily reduced water absorption and excellent beading effect ensure low levels of soiling and long service life.

Product overview

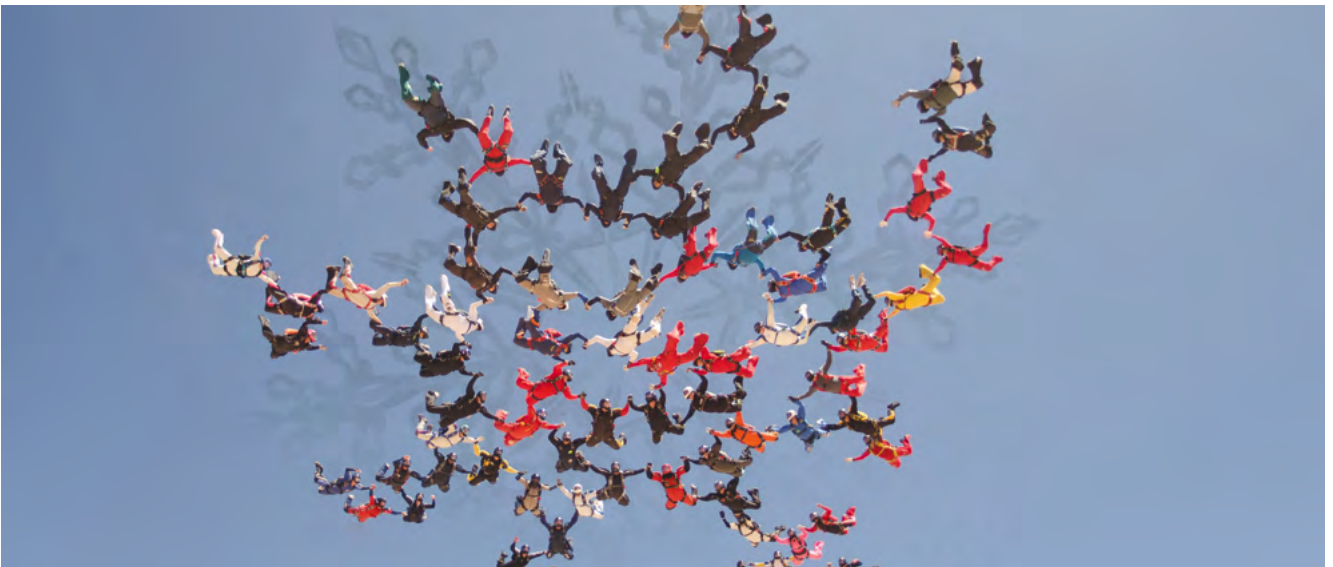
PRODUCT	CHEMICAL CHARACTERIZATION	RECOMMENDED DOSAGE* [%]
SITREN® P 730	Based on organosiloxanes	0.2–1.0
SITREN® P 750	Modified silane/siloxane	0.2–0.5

*referred to total dry mortar

More information about water repellents and other products is available in our product overview or on request.

Curing Management

Shrinkage reducing agents

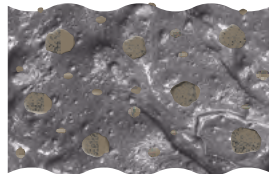


The final properties of cement-based building materials and mortars are largely determined by **controlling the water content**. Errors made at the beginning cannot be corrected later. The loss of moisture from fresh mortar results in a reduction in volume and can lead to shrinkage cracking which can occur within a few hours.

A lack of water may prevent the cement from fully hydrating which may result in loss of mechanical strength, reduced abrasion resistance and susceptibility to chemical attack which can all have adverse effects on its durability.

SHRINKAGE REDUCING AGENTS IN USE

ready-mixed mortar

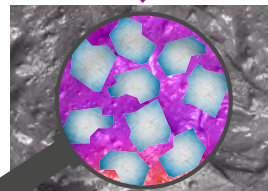


fresh mortar

▼ without shrinkage reducing agents

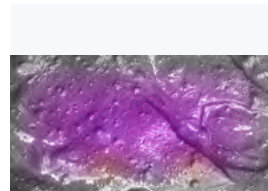
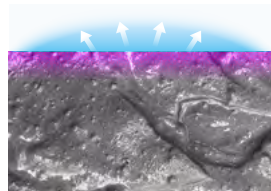
▼ with SITREN® SRA P 260

• Reduced wettability



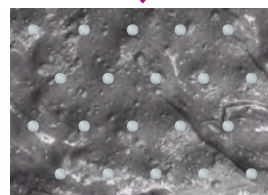
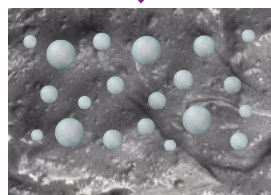
• Reduction of the surface tension with SITREN® SRA P 260
• Good wettability of the cement with the pore solution

• Water evaporates



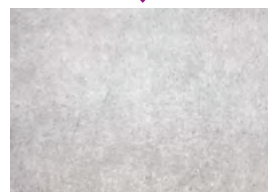
• Water is available for cement hydration

• Coarse pore structure



• Fine pore structure
• High amount of gel pores
• Better entanglement of mineral crystal needles

• Crack formation
• Poor durability



• Smooth surface
• Excellent durability

CURING MANAGEMENT

Shrinkage reducing agents

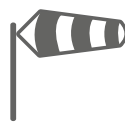


Shrinkage describes a volume reduction of cementitious based products due to a change in the water content.

In addition to **environmental influences** and **internal dehydration, chemical/mineral reactions** have a major impact on the quality of the final product. Depending on the application area, this volume reduction can play a decisive role in the final product. Therefore, in the case of large-area and thin-layer applications (e.g. floor compound systems) or strong bonding to the substrate, free shrinkage is hampered, resulting in the build-up of internal forces and tensions. These **internal tensions** can lead to a considerable **impairment of the durability and functionality** due to the formation of **cracks, deformation** or **damaged** bonding to the **substrate**.

Influence factors of shrinkage

The most important **factors influencing shrinkage** are **low humidity, wind, solar radiation** and **unfavourable temperatures** as well as the **respective formulation composition** and **the thickness of the applied layer**.



Application areas:

- Floor compound systems such as SLU's, thick flooring and decorative overlays
- Stucco and plasters (e.g. restoration render and decorative plaster)
- Skim coats
- Grouts such as masonry mortar and joint filler
- Technical grouts
- Repair mortars
- Sealing slurries

Keeping in shape!

Ensuring stability with our shrinkage reducing agents.



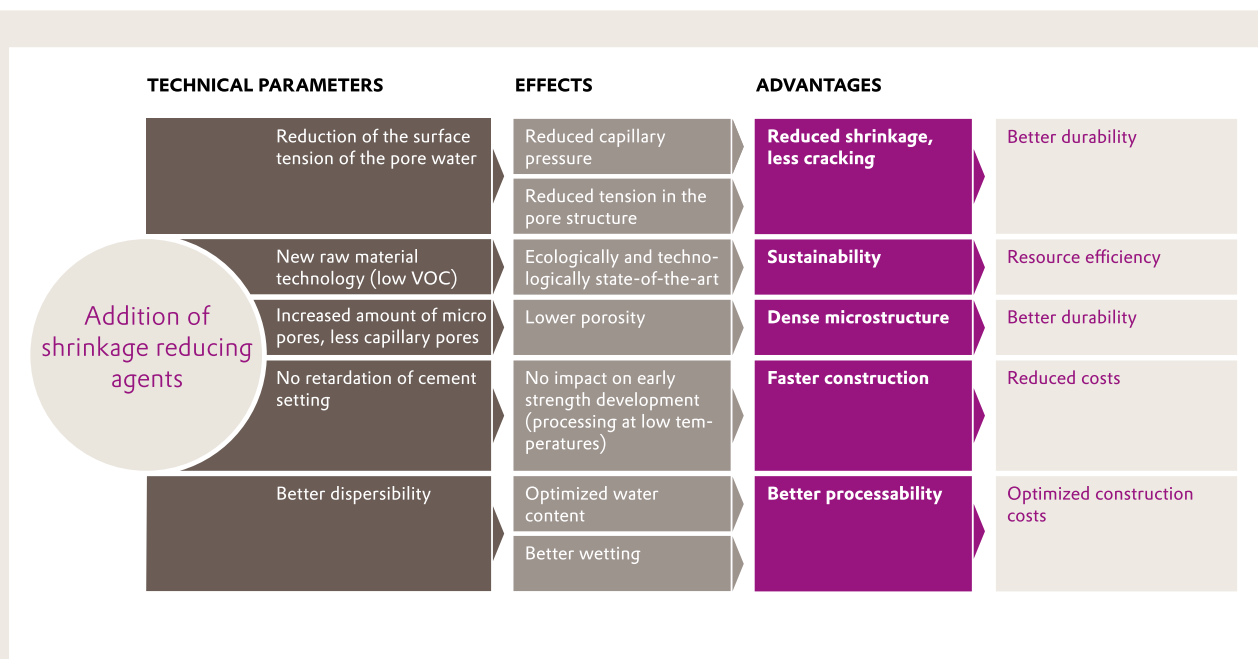
Evonik recognizes that sustainability is of utmost importance for all our futures. As a result, our product development focuses on high performance products that are friendly to our environment.

Clean air is essential for a healthy living environment, therefore emissions from construction and insulation materials should be minimal.

With this in mind, Evonik has developed a new generation of **SITREN® shrinkage reducing agents**. Thanks to their **extremely low VOC content**, SITREN® shrinkage reducing agents allow mortars to meet the **most stringent eco label requirements** such as **EMICODE EC1^{PLUS}** – and without any dosage restrictions.

This is becoming increasingly important, specifically for **indoor applications**. Using a combination of innovation and **modern molecular design**, we have been able to significantly **improve the efficacy** compared to more traditional systems, while simultaneously eliminating the high VOC content, which is the main disadvantage of well-known systems.

SHRINKAGE REDUCING AGENTS – AT A GLANCE



Minimize shrinkage – increase durability

Today's architecture places the highest demands on the aesthetics of construction products. Requirements such as smooth surfaces with high resistance to abrasion are frequently specified for indoor surfaces. The control of shrinkage reduction is essential to meet these criteria.

The **composition of cementitious materials** and mortars has a considerable **influence on their final properties**. There are various ways to **minimize shrinkage** and **avoid cracking**, however, technical and economic restrictions often don't allow for these practices to be implemented.

Our new generation of shrinkage reducing agents frequently out-perform other commercially available products. They can **reduce drying shrinkage** as well as **plastic shrinkage**, and **enhance the workability** of the cementitious system whilst having **no effect on the setting process**.

Our **SITREN® shrinkage reducing agents**, developed in close cooperation with the dry mortar industry, stand out ecologically as well as technically. The reduction in the capillary pressure and the stress in the pore structure, results in markedly reduced shrinkage and thus, in the prevention of crack formation.



SITREN® shrinkage reducing agents

Shrinkage refers to the volume reduction of cement-based materials and mortars over time. The water balance in these systems plays a central role, since the shrinkage processes or the subsequent drying of these materials are promoted by the chemical reaction of the binders with water.

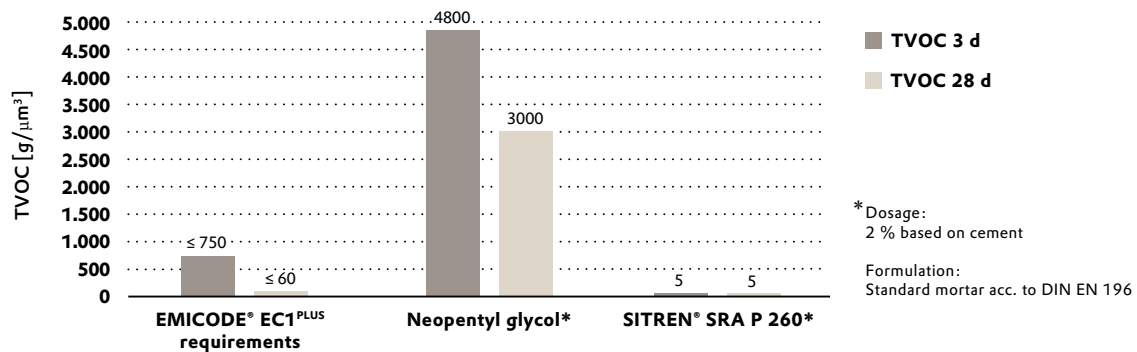
There are basically three types of shrinkage:

1. **Chemical or autogenous shrinkage** – through water removal in the chemical reaction between water and cement.
2. **Plastic shrinkage** – resulting from the evaporation of the excess water as long as the cement-based building material can still be processed.
3. **Long-term shrinkage or drying shrinkage** – as a result of the drying out of cement based building material over time.

Our novel SITREN® shrinkage reducing agents are based on the latest raw material technologies and are a key factor in the process of plastic and drying shrinkage. SITREN® SRA P 260 is a powder based shrinkage reducing agent based on modified polyethers to prevent cracking of cement based materials.

SITREN® SRA P 260 RELEASES ALMOST NO VOC

TVOC (Total Volatile Organic Compounds) acc. GEV test method

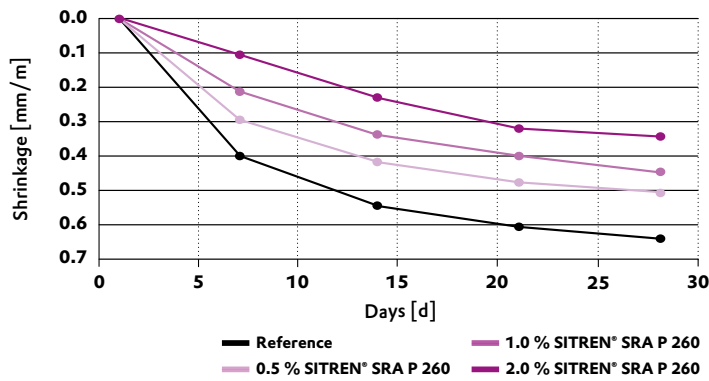


Low VOC with Sitren SRA P 260

With SITREN® SRA P 260, dry mortars can be formulated to meet the highest requirements for emission levels of building materials which significantly contribute to **room air quality**. Due to the increasing number of hours we spend at home, the **indoor air quality** is of the **utmost importance**. Therefore, emissions from building material such as those used in walls and flooring should be minimal. The data (cf. values in tables) show the positive performance of SITREN® SRA P 260.

SIGNIFICANT REDUCTION OF DRYING SHRINKAGE BY USING SITREN® SRA P 260

Shrinkage according to DIN 52450



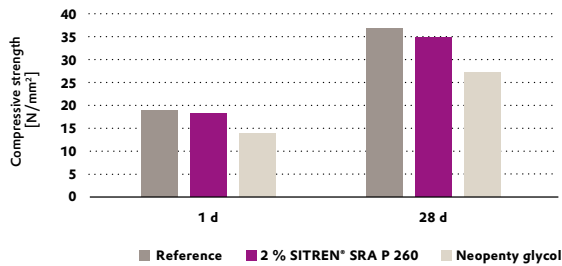
Formulation

Self-levelling compound
 Water demand: 25 %
 Dosage SITREN® SRA P 260:
 - 0.5 %
 - 1.0 %
 - 2.0 %
 based on total dry mortar
 Test condition: 23 °C/50 % RH

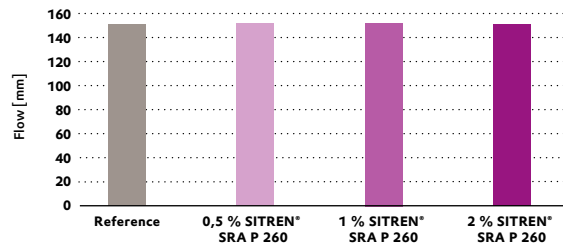
SITREN® SRA P 260 is a **powerful, efficient shrinkage reducing agent** for the reduction of drying shrinkage.

ALMOST NO REDUCTION OF COMPRESSIVE STRENGTH WITH SITREN® SRA P 260

Compressive strength after 1 day / 28 days



Flow



SITREN® SRA P 260 does not affect the workability, regardless of the dosage. At a dosage of 2 %, both the early strength and the 28-day strength effects of SITREN® SRA P 260 are insignificant. **Neopentyl glycol** has a **significant influence** on the **hardening** and sometimes makes a re-formulation necessary or **delays the application**.

Product overview

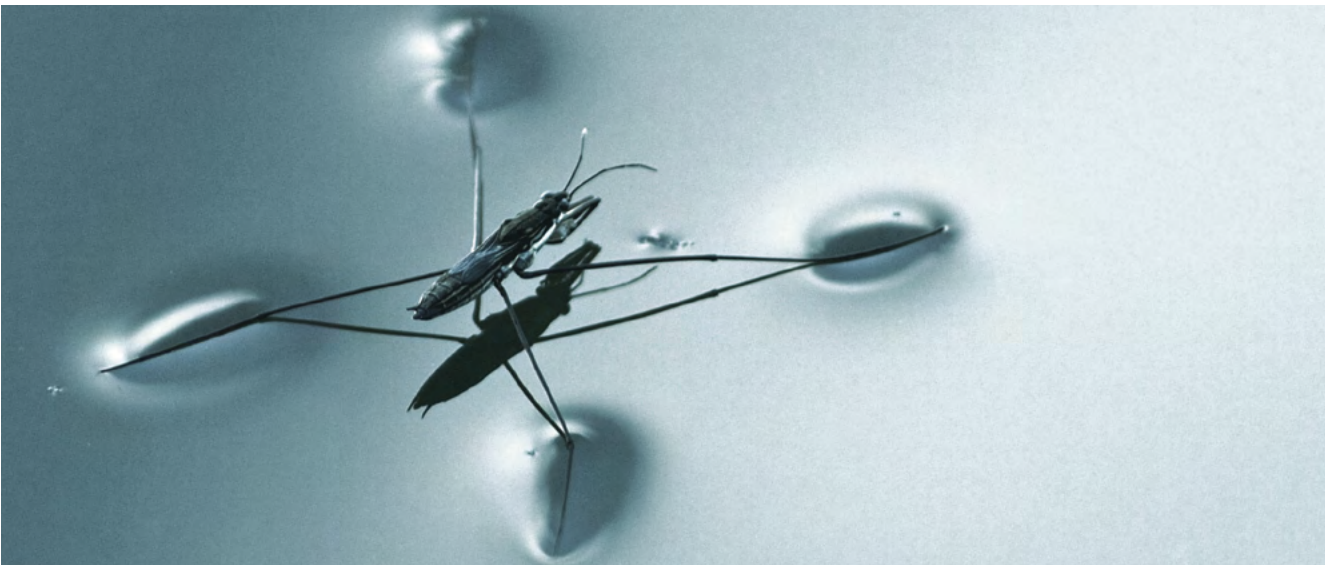
PRODUCT	CHEMICAL CHARACTERIZATION	RECOMMENDED DOSAGE* [%]
SITREN® SRA P 260	Modified polyether on an inorganic carrier	0.2 – 2.0

* based on total dry mortar

Additional shrinkage reducing agents and further information are available in our product overview or on request.

Formulation Management

Wetting and dispersing agents, process defoamers



Today's **formulations** for the construction industry often consist of a **complex combination of a wide range of different raw materials, admixtures and additives**. To meet technical and economic demands placed on modern building products, **all components have to be optimally matched**, enabling all the "wheels", no matter how small, to engage with one another accurately and reliably. Process or performance additives – perform a wide range of critical functions during manufacture, processing or final product finishing.

The fundamentals of formulation management are the foundation for our extensive product portfolio and our expertise in surface-active substances.

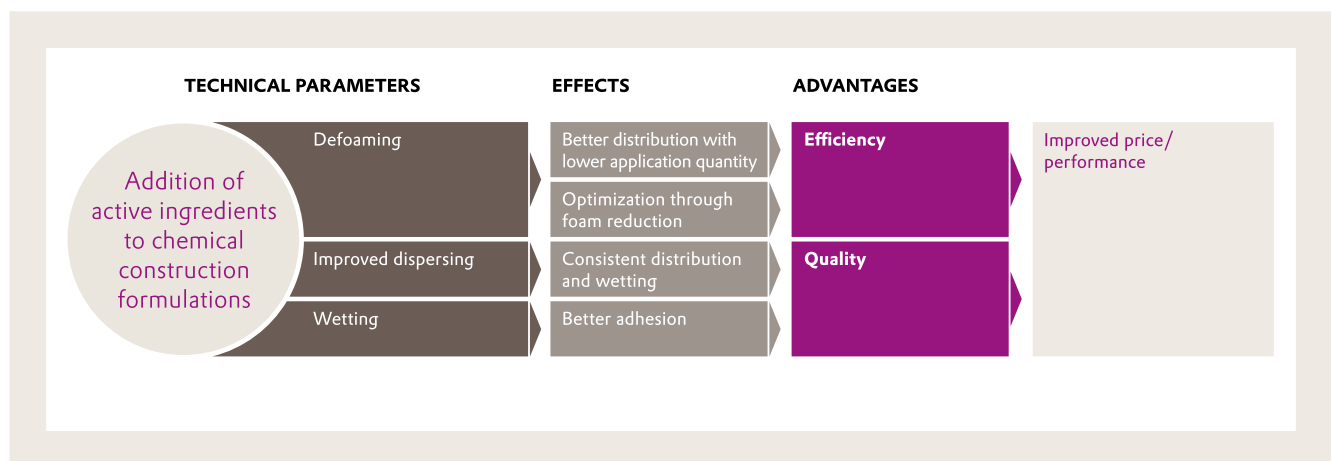
Our additives influence the interaction of the different components within chemical formulations used in the construction industry and as a result improve the efficiency and performance of these systems. Evonik's product range offers a wide range of additives that enable our customers to achieve numerous objectives including:

- **Increased efficiency and compatibility of compounding ingredients**
- **Optimized mixing and processing procedures**
- **Improved adhesion properties**
- **Increased storage stability**

Properties can be adapted within a formulation through the direct addition of additives such as wetting or dispersing agents; alternatively, individual formulation ingredients such as fillers or pigments can be pre-modified by means of surface treatment, providing them with an optimized property profile within the formulation.



WETTING AGENTS / DISPERSING AGENTS / PROCESS DEFOAMERS – AT A GLANCE



Interaction of surface-active substances

In addition to the results reported here, our broad chemical portfolio of organically modified siloxanes, oleochemicals, polyethers, polyacrylates, nonionic, amphoteric and cationic surfactants enables us to offer our customers innovative, tailor-made and solution-oriented products and concepts created through our targeted molecular design.



Our solution-oriented process and performance additives increase both the efficiency of industrial production processes significantly as well as enhancing the performance characteristics of the materials used within the construction industry.

Modified surface properties

Additives can also specifically change surface properties, modifying the performance profile to match the desired application. Surface tension, for example, can be modified to match specific needs.

The wettability of the surface is one of the typical property profiles that are changed in this way. Here, the interfaces can be modified from heavily hydrophobic or lipophilic to particularly hydrophilic and lipophobic. Our additives thus enable modification of surface wettability, essentially affecting the bonding properties of surfaces.



Regardless of the specific objective, our product portfolio aims to achieve solutions of the highest quality and optimal efficiency.



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