



MINERAL PAINTS – THE PHOTOCATALYTIC DIFFERENCE

KEIM MINERAL PAINTS

AIR QUALITY

Poor outdoor air quality, as result of air pollution, has negative impacts on both human health and the natural environment. Whilst levels in some areas have been declining, there are more measures which need to be taken, specifically with regard to Nitrogen Oxides.

Nitrogen Oxides are produced by combustion as emissions from cars, trucks, buses and power plants. Nitrogen Oxides contribute to the formation of ground-level ozone, fine particle pollution and are linked with a number of adverse effects on the respiratory system.

Whilst outdoor air pollution is important, we also need to consider the potential health effects of poor indoor air quality. Indoor air quality can have negative impacts on building occupants, particularly for groups of people with specific sensitivity to pollution including the young, elderly and those who suffer with existing respiratory health conditions.

The impact of air pollutants on human health depends on their toxicity, concentration and exposure period, but with research suggesting that, on average, people spend 90% of their time indoors, the effects can range from odour, to irritation, to more serious toxic effects. In working and learning environments such as offices and schools, poor indoor air quality can significantly impact productivity and impair learning.

Indoor air pollution is created by a mixture of pollutants generated from inside the building and external pollution which migrates indoors.

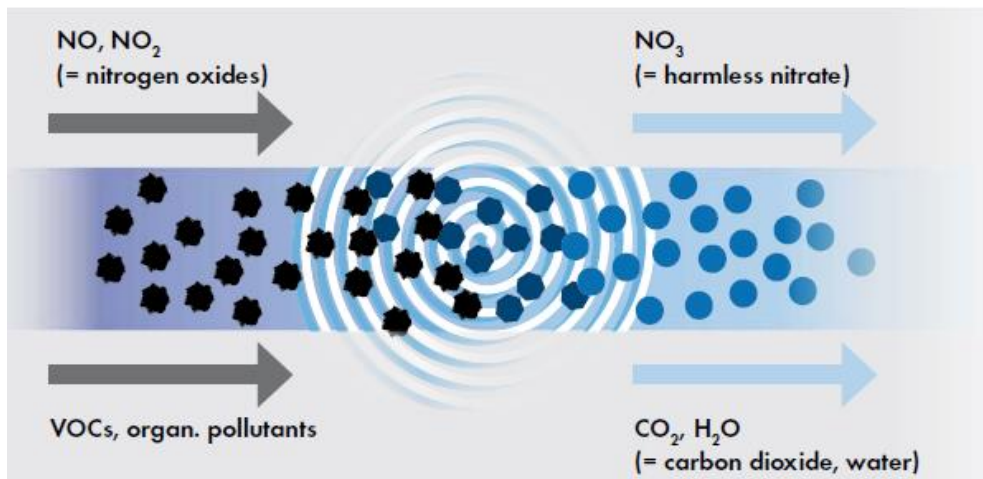
Poor outdoor air quality, as a result of air pollution, has negative impacts on both human health and the natural environment.



PHOTOCATALYTIC PAINTS

In terms of the paint industry, the effects on air pollution should be considered from the manufacture of the materials i.e. the impact of the production process itself, through to the resultant affects of material application i.e. the release of VOCs (Volatile Organic Compounds). In the presence of Nitrogen Oxides, it is VOCs which, in addition to being respiratory irritants and strong smelling, result in the formation of harmful ground level ozone.

The photocatalytic reaction converts Nitrogen Oxides and other harmful pollutants including formaldehyde and acetaldehyde into harmless nitrates. The reaction helps to breakdown organic material and contaminants, keeping surfaces cleaner. When titanium dioxide is used in conventional paints it can breakdown the organic paint itself, reducing the lifespan of such paints.



Photocatalytic mineral paints use light energy to neutralise pollution. Whilst mineral paints already contain only environmentally friendly and sustainable materials, titanium dioxide is also added as a catalyst which enables the photocatalytic reaction. The catalyst is not used up by the reaction and will continue to react for the life of the paint.

KEIM SOLDALIT-ME & KEIM ECOSIL-ME

- KEIM Soldalit-ME and KEIM Ecosil-ME are high performance photocatalytic mineral silicate paints
- KEIM Soldalit-ME - External; KEIM Ecosil-ME - Internal
- ME = MiNox effect - reduces noxious gases and odours, transforming them into natural substances
- Contain a high-quality photocatalyst - Anatase Titanium Dioxide
- Improve air quality (both internal and external)
- Suitable for people with allergies
- Benefits for both health and the environment
- Long life protective and decorative finish

WHAT KIND OF POLLUTANTS ARE REDUCED?

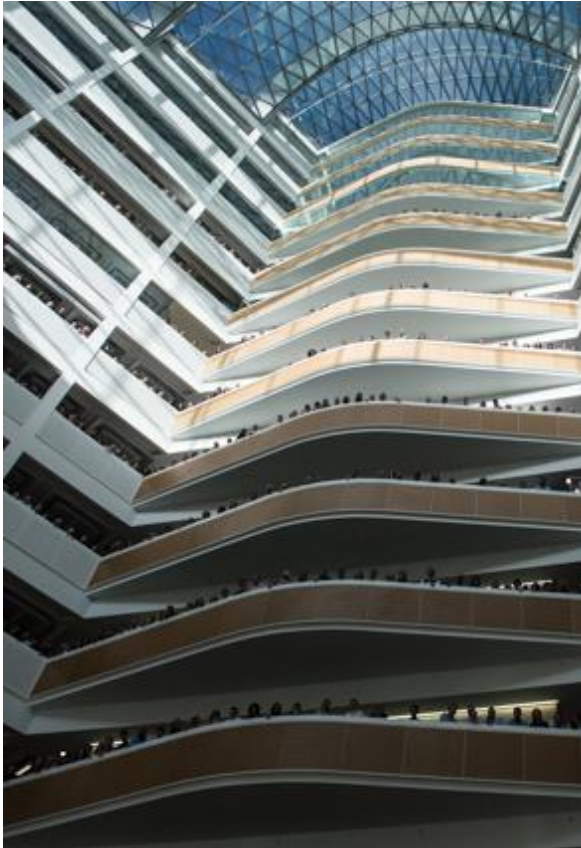
Pollution by industry and road traffic for example:

- Nitrogen Oxides (NO_x)
- Ammonia gas (NH₃)

Harmful indoor gases, for example out-gassing from furniture or cigarette consumption:

- VOCs (Benzene, Toluene)
- Formaldehyde, acetaldehyde

Even bacteria and fungal spores can be significantly reduced by photocatalysis.



KEIM ECOSIL-ME –

Left; 1 Angel Square,
Manchester – New Co-operative Group
Headquarters
Below; Administrative Centre, City of Edinburgh
Council



KEIM SOLDALIT-ME –

Above; Swedish Ambassadors Residence, London,
Right; Civic Quarter Car Park, Doncaster



KEIM MINERAL PAINTS

Even without photocatalytic additives, mineral paints are significantly different to conventional acrylic based paint materials. When applied to mineral substrates, mineral paints penetrate into the surface creating a microcrystalline structure which provides a very durable long life finish. This crystalline structure allows free passage of moisture vapour, virtually eliminating blistering and flaking of paint.

KEIM Mineral paints are manufactured using natural earth oxide pigments and potassium silicate. They do not contain any harmful ingredients such as VOCs, solvents or petrochemicals and have no detrimental affect on either the substrate, environment or air quality.

Acrylic and oil based paints, on the other hand, typically contain petrochemicals, VOCs (Volatile Organic Compounds) and solvents. These components have detrimental environmental effects in both manufacture and application. VOCs are released during the drying process of paints and for some time afterwards, the subsequent effect on air quality being the most significant environmental impact currently associated with the use of conventional paints.

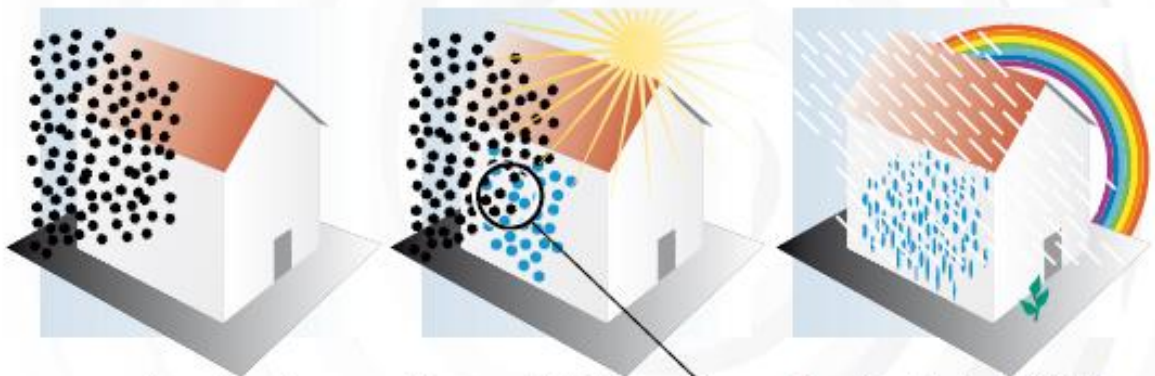
Other features and benefits of KEIM Mineral Paints include:

- High light reflectance
- Easily cleanable
- UV stability, fade free colours
- Incombustibility
- No electrostatic charge
- Resistance to acids and alkalis
- Resistance to mould and fungal growth



HOW DOES KEIM SOLDALIT-ME WORK?

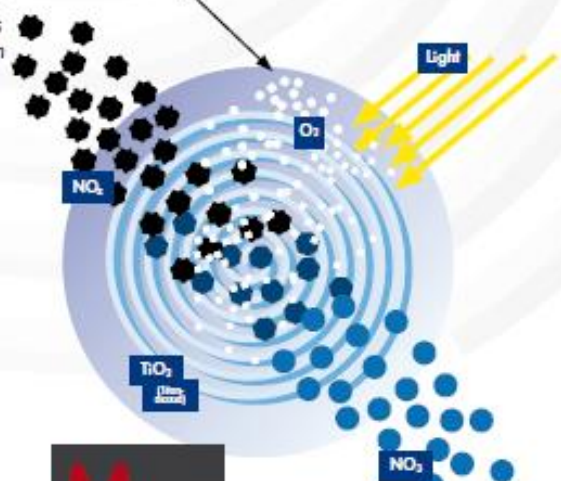
Degradation of pollutants by means of photocatalysis (schematic diagram)



Nitrogen oxides are deposited on the surface of the paint

When exposed to light the nitrogen oxides are turned into harmless nitrate (NO_3) by means of oxidation. Furthermore, ozone is converted into oxygen during the described reaction.

The easily soluble nitrate (NO_3) is then washed off the surface by rain.

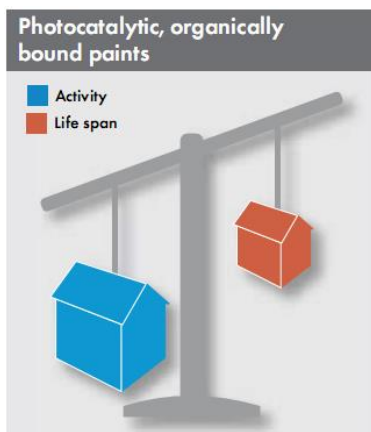


The catalyst titanium dioxide is not consumed. As long as the crystals are supplied with energy by electromagnetic waves (light), the process remains active.

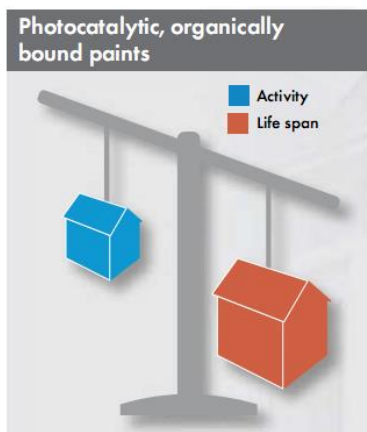
PHOTOCATALYTIC PAINTS & EFFICIENCY – THE CHALLENGE!

The efficiency of any photocatalytic building material, including paints, is determined by:

- The quality of the photocatalyst - KEIM Mineral Paints use only the highest quality Anatase Titanium Dioxide which has the best overall photocatalytic activity.
- The surface of the photocatalyst - The larger the contact surface between the pollutant and the photocatalytically active surface, the better the effect. The crystalline structure created by mineral paints is an excellent surface to ensure a high surface to air contact.
- The quantity of the photocatalyst - The photocatalytic reaction has the capability to decompose organic substances. This virtually has a 'self-destruction effect' in conventional organic based paints leading to chalking, premature weathering and a shorter life of the coating. Photocatalytic Mineral Paints offer long-life coatings effectively combined with high performance photocatalytic activity.



Either ... good activity (sufficient pigments) but, very reduced life span.

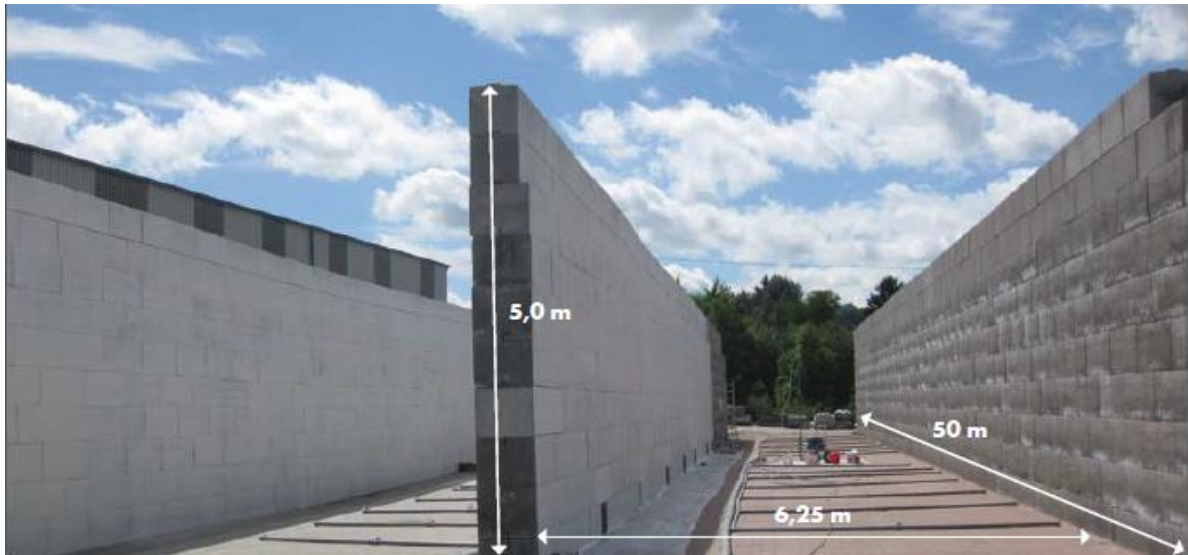


or ... good life span but, no optimal activity (insufficient pigments)



Good life span, optimal activity

KEIM SOLDALIT-ME - UNDER PRACTICAL CONDITIONS



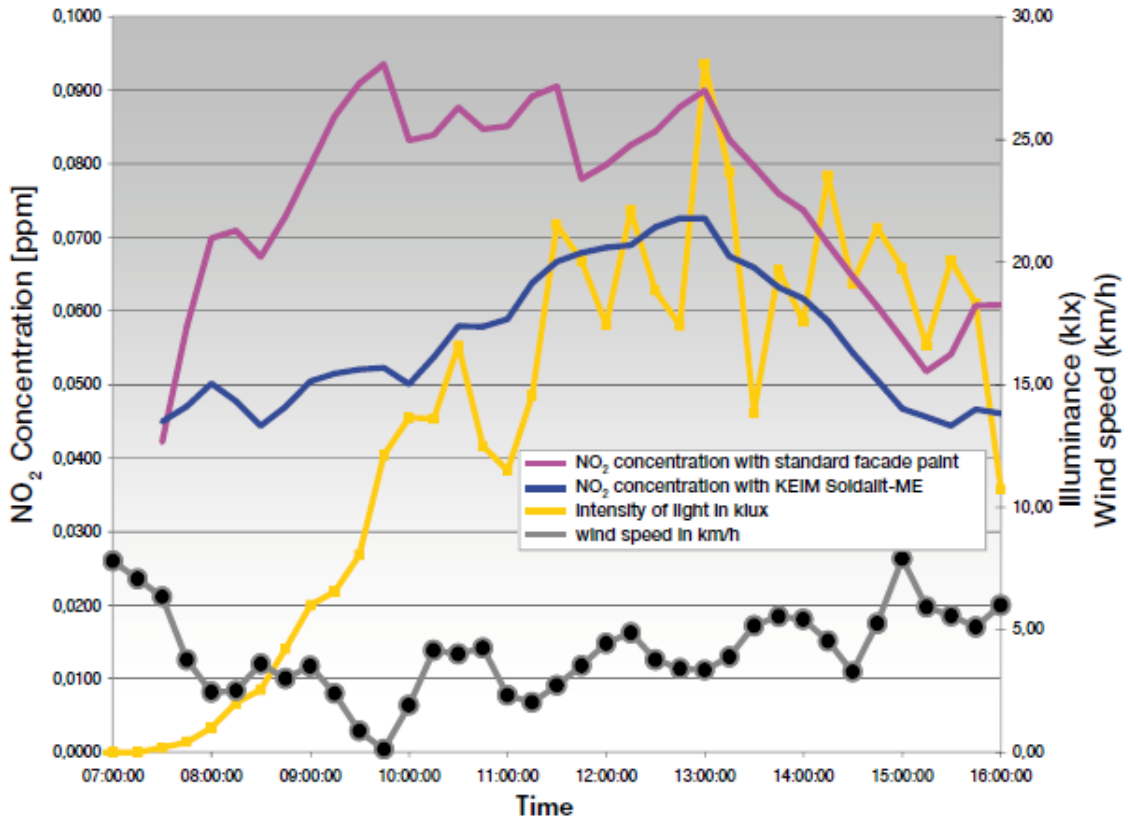
KEIM Soldalit-ME has been tested outdoors in direct comparison with another standard masonry paint. During the test the canyons were continuously exposed to nitrogen oxides and the pollutant gas concentration in both canyons was measured at a height of 3m over the duration of the test.

The degradation rates in practice are strongly influenced by wind strength and wind direction as well as by solar radiation.

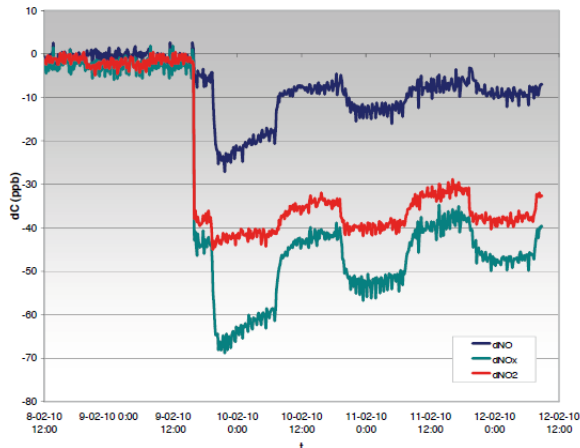
In the defined period, the street canyon test showed that KEIM Soldalit-ME leads to practical NO_2 reduction rates between 10 - 50 %.



OUTDOOR NO₂ TEST – KEIM SOLDALIT-ME



Laboratory test regarding NO₂ reduction with Soldalit-ME
 Concentration difference between the inlet and the outlet of the reactor



Proof instead of promises!

PREMIUM
 is our Standard.



EFFECTIVENESS OF KEIM SOLDALIT-ME

KEIM Soldalit-ME has been proven in outdoor tests to reduce Nitrogen Dioxides (NO₂) concentrations by up to 50%.

In Amsterdam, on the A10 Autobahn (Motorway) KEIM Soldalit-ME was used onto the noise reduction barriers and demonstrated an average reduction of 4.4g NO₂ per square metre on a smooth surface per year. For a textured surface this effect significantly increases as the surface texture creates a greater contact area.

- Average family car/small van emits approximately 5600g NO₂ per year.
- Approximately 32 million cars in the UK, equating to 179m kg of NO₂ being emitted into the environment every year.
- Just 1272 square metres of surface painted with KEIM Soldalit-ME could offset the NO₂ emissions of each vehicle every year.

When tackling Nitrogen Oxide pollution in the UK, any technique which significantly reduces this type of pollution should be considered to ensure improvement to the natural environment and public health.

Whilst photocatalytic mineral paints cannot, on their own, cure the problem, they are a significant step in the right direction, both in terms of air quality and protection of the environment, as well as changing our reliance on conventional, potentially damaging paint materials.





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