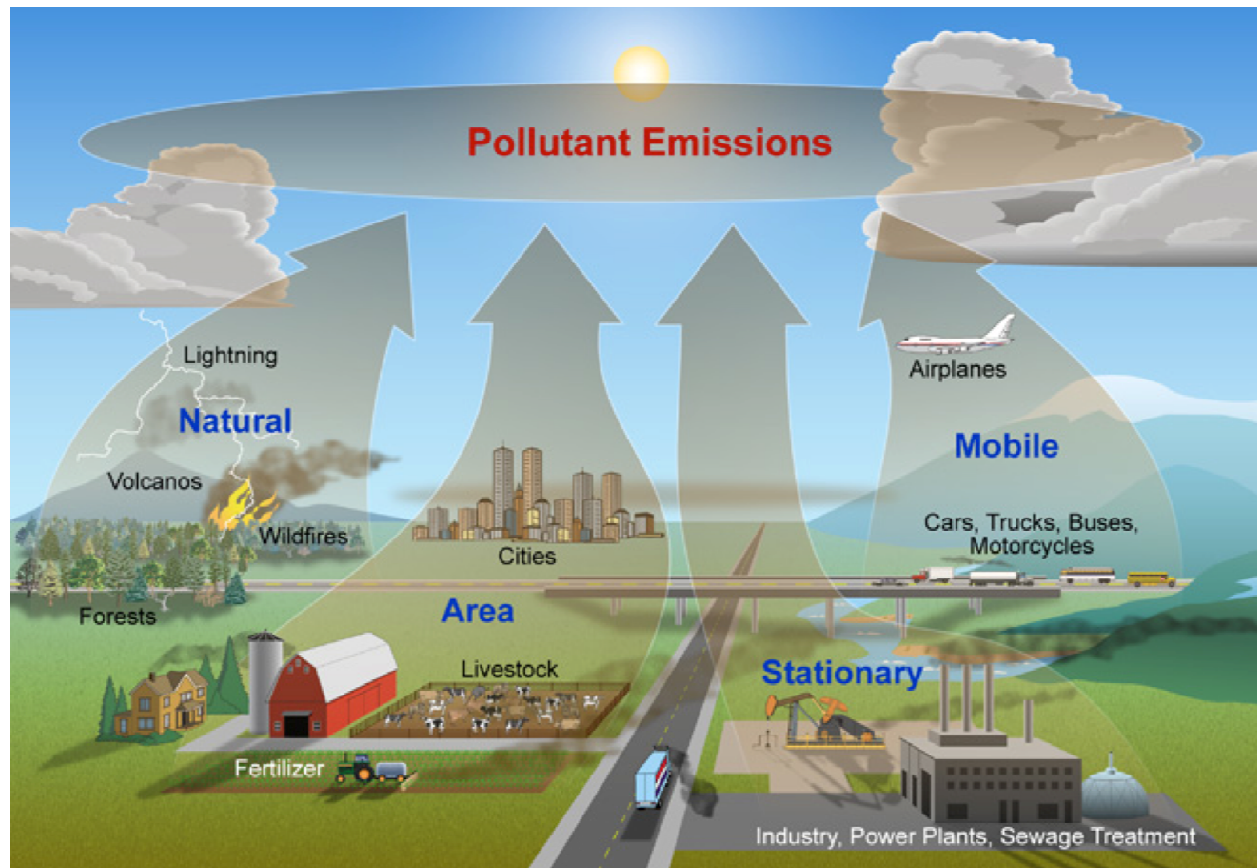




Remediating Pollution with Photocatalytic Pavements



Air Pollution: Natural Causes

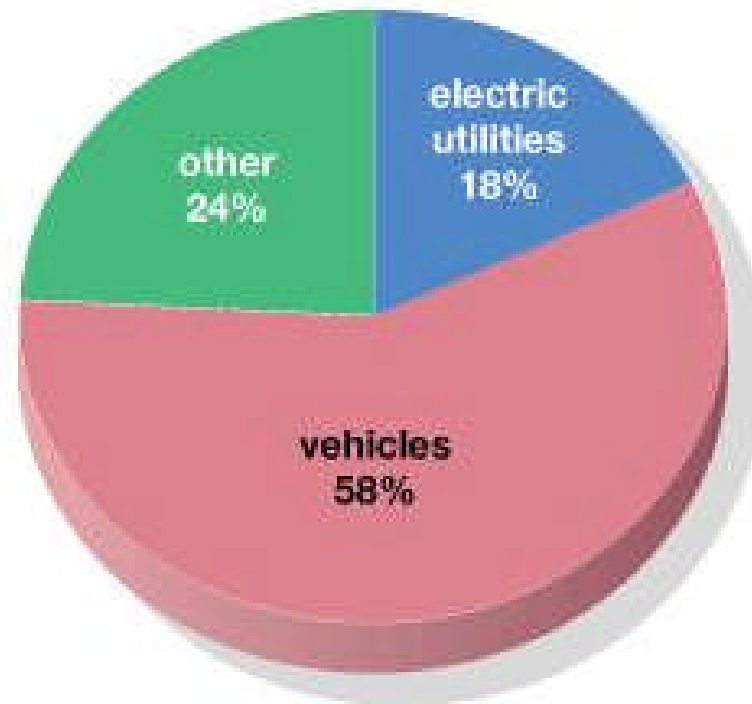




Real Science. Real Results.

Air Pollution: Man-Made Causes

NO_x 14.8 million metric tons



Source: EPA National Emissions Inventory (NEI)



The Back Story on Air Pollution

- Over 90% of transportation fuel is petroleum based.
- 50% of fuel combustion emissions are Nitrogen Oxides (NO_x).
- NO_x is the primary cause of visual air pollution and acid rain.

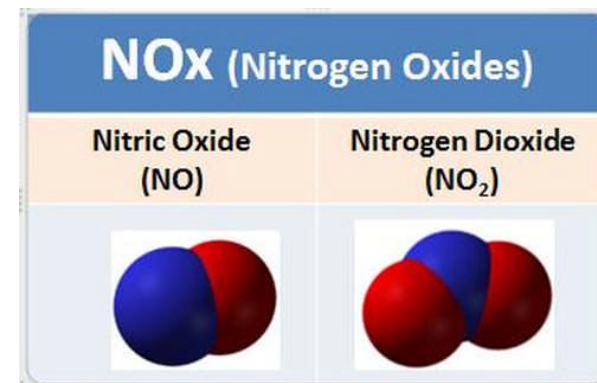
Source: EPA



Understanding Nitrogen Oxides

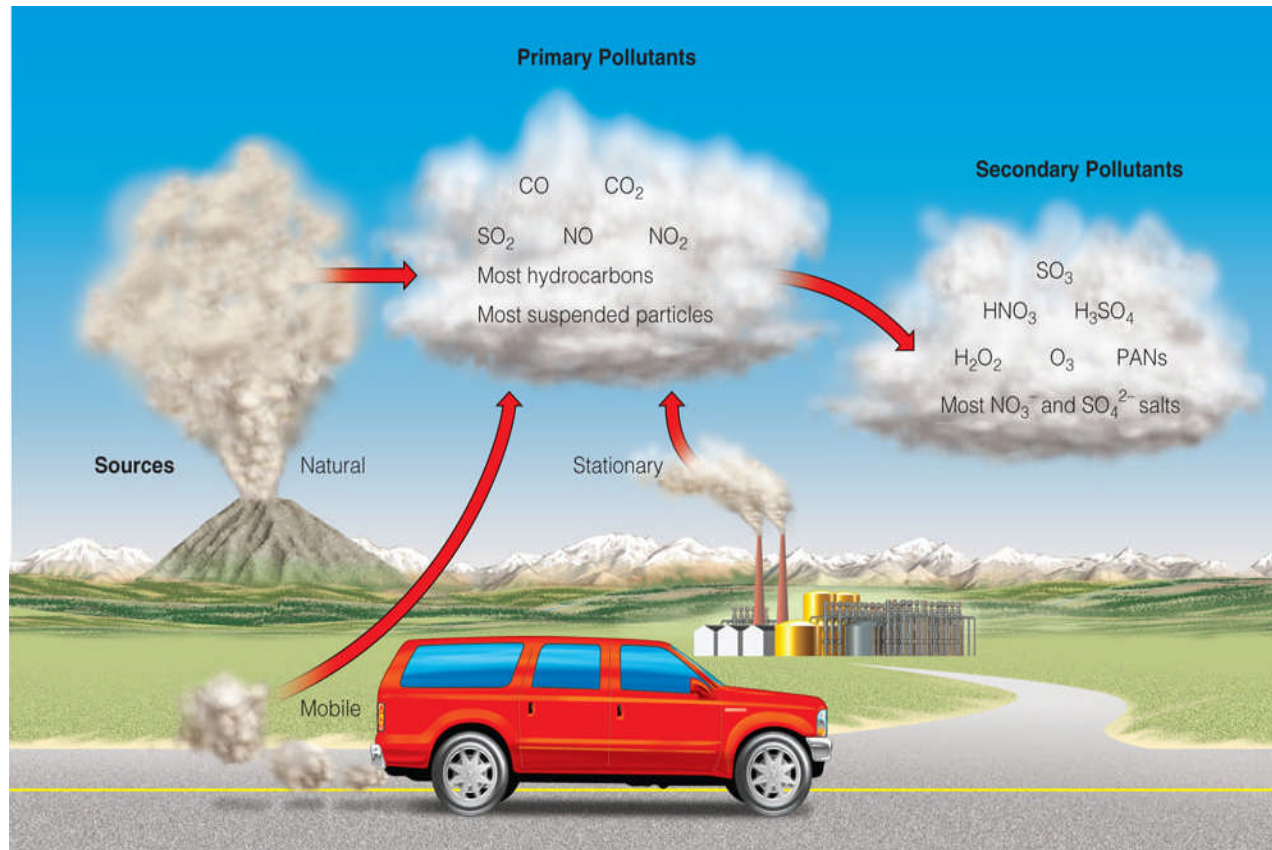
NO_x includes Nitric Oxides (NO) and Nitrogen Dioxides (NO₂) – with NO₂ being particularly dangerous due to its:

- Adverse effects on human respiratory systems
- Role as a precursor to tropospheric ozone and particulate matter





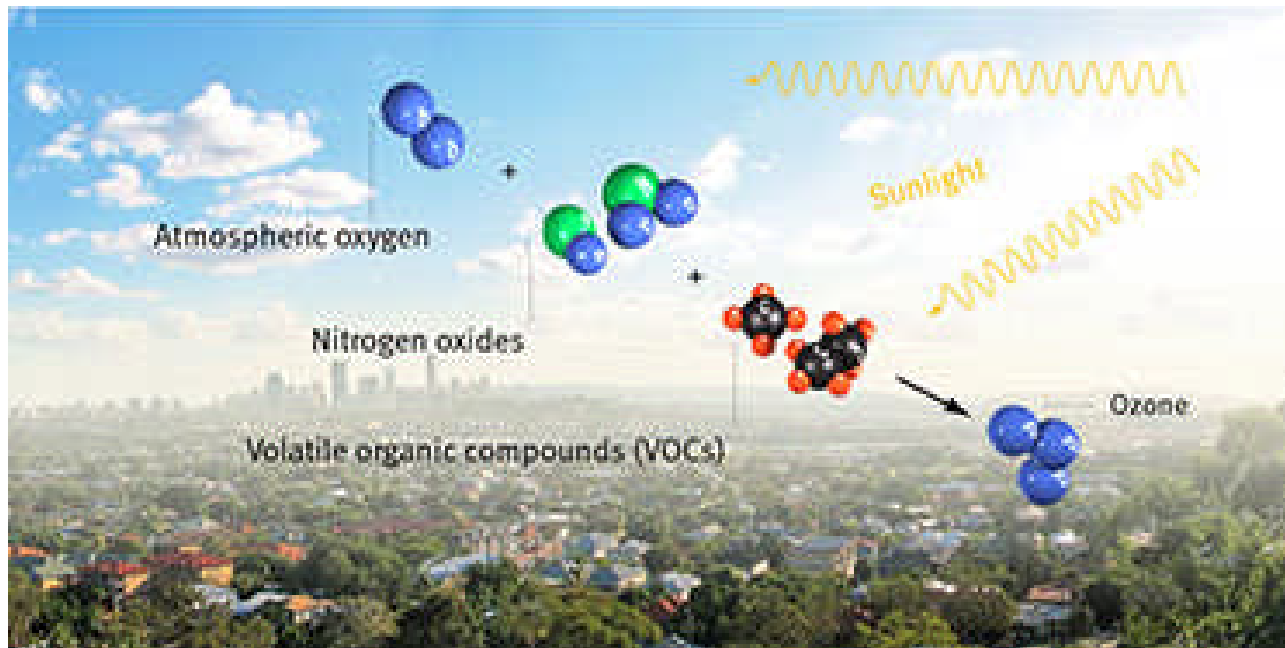
From the Vehicles We Drive... to the Air We Breathe





How Ozone Forms

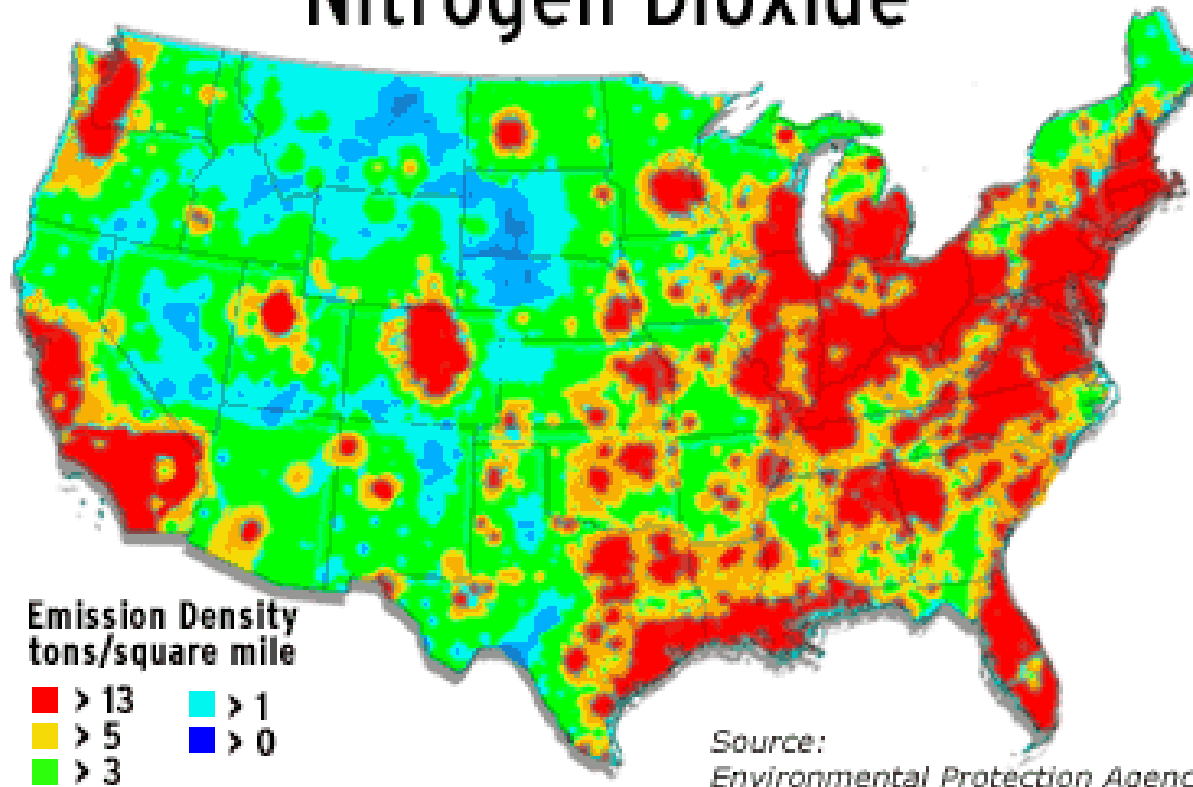
As NO_x Mixes with Air and Sun,
Dreaded Ground Level Ozone and
Other Damaging Pollutants are Formed.





Real Science. Real Results.

U.S. NO₂ Emission Density Nitrogen Dioxide



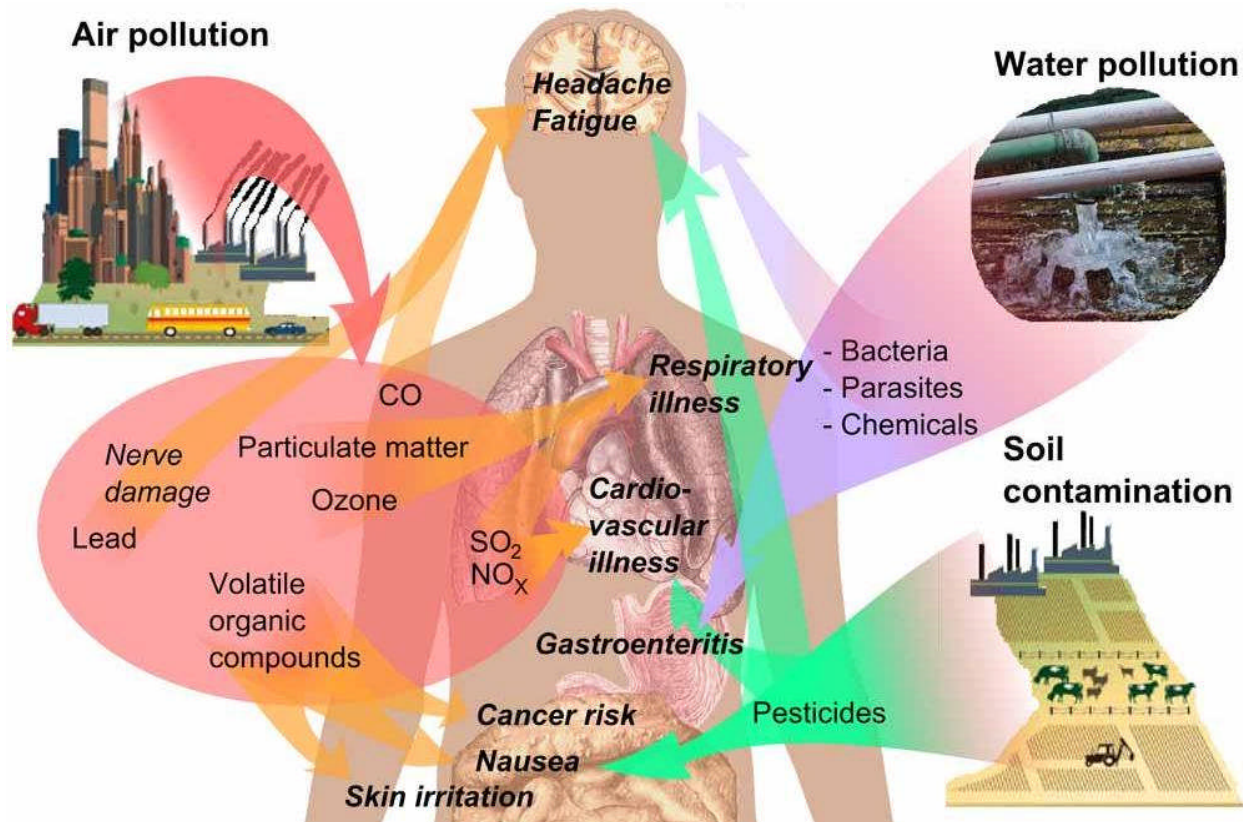


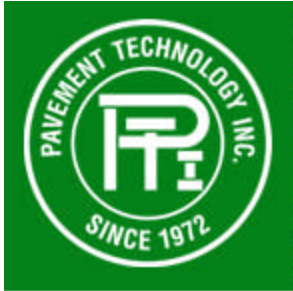
What Does this Mean to All of Us... and to Our Grandchildren?

- In 2014, the World Health Organization estimated 7 million premature deaths worldwide due to air pollution.
- An MIT study estimated 200,000 premature deaths in the U.S. each year due to air pollution.
- The International Energy Agency estimates China's smog is reducing life expectancy by 25 months.



Today's Reality is Grim... The Health Costs of Pollution





The Monetary Costs of Pollution

- The World Bank estimates air pollution is costing the world economy more than \$5 trillion annually in welfare costs.
- The International Energy Agency estimates additional costs in life-saving innovations as:
 - \$2.3 trillion for advanced pollution controls in vehicles
 - \$2.5 trillion for advances in the energy sector



The Safety Costs of Pollution

THE TIMES
TUESDAY NOVEMBER 29 2016

JOIN NOW

LOG IN

Air pollution is blamed for increases in road accidents

Oliver Moody, Science Correspondent

October 3 2016, 12:01am, The Times



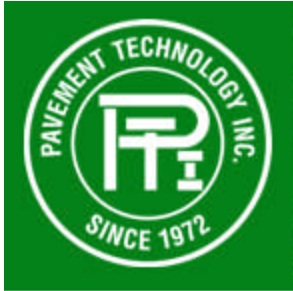
A PhD student at the London School of Economics found that the number of accidents on British roads fluctuated in line with levels of nitrogen dioxide
PETER MACDIARMID/GETTY IMAGES

Heavy pollution makes people drive more dangerously, according to the first study to link dirty air with road accidents.



The Problem is Clear...

and a field-proven approach
to pollution remediation
has been found!



The Science Behind Photocatalytic Reactions

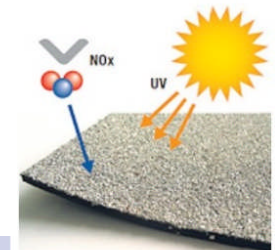
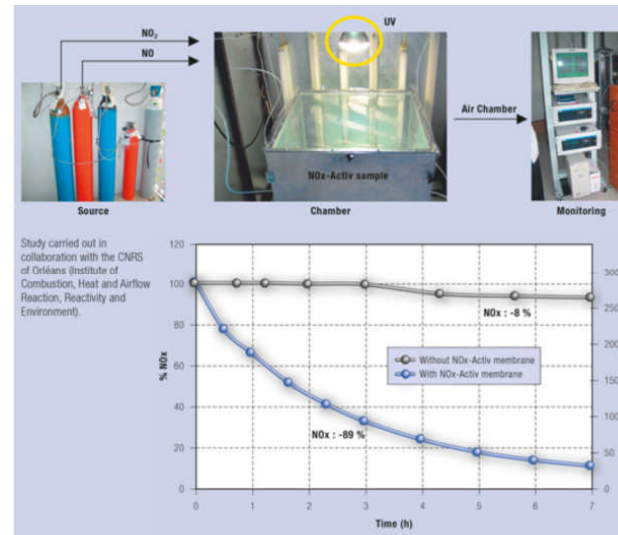
The use of Titanium Dioxide (TiO_2) as a photocatalyst was discovered in 1972.

- When exposed to UV light, TiO_2 creates hydroxyl radicals and superoxides.
- These intermediates then oxidize to reduce NO_x , which oxidizes into water-soluble nitrates that are washed away by rainfall.

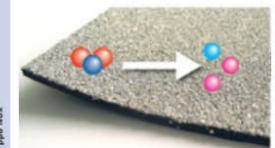


Proven in Application: Roofs

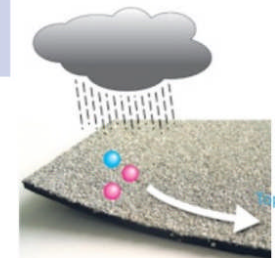
A CNRS study of Noxite® roofing demonstrates an 89% reduction in NOx!



Arrival of the pollutant (NOx)
Excitation of the TiO₂



Transformation of the pollutant



Nitrates diluted and washed away in rainwater

Source: Centre National de la Recherche Scientifique – French National Scientific Research Centre



Roofing Case Study

- Sustainable
- Proven in Performance

World Reference in Waterproofing Technology

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ROOFING CASE STUDIES

- Holcombe Brook Primary School, Bury, Lancashire
- St Martin's Special School - Gibraltar
- Jubilee House, Vancouver, Canada
- Alachua County 911, Florida, USA**
- Moorlands Junior School, Sale
- Morden Mount Primary School, Greenwich
- William Harvey Hospital

Alachua County 911, Florida, USA

Project Overview

Project: Alachua County 911 Centre
Location: Gainesville, Florida, USA
Area: 2,500 m²
Completion Date: May 2013
Contractor: Ferber & Osteen Roofing & Sheet Metal
Specifier: Paul Stresing Associates Inc
Client: Alachua County Sheriff's Office
System: Siplast Paradiene System with Noxite Eco-activ capsheet

[Download this case study](#)

Problem

The Alachua County Combined Communications Center houses 911 service technology for the city of Gainesville and the surrounding area, representing over 227,000 residents plus the population of the University of Florida.

When it was time to replace the building's old roof, the County's primary concern was reliability. But in addition, they approached the project from an environmentally conscious perspective, and wanted a system that would be sustainable and green.

Solution

To meet the high performance needs of this critical facility, the two-ply Icopal Siplast SBS- modified bitumen Paradiene 20/30 Eco-Activ® System was chosen.

Noxite® from Icopal is part of its Eco-Active range of building protection systems, and is manufactured with a granular titanium dioxide finish which works actively with the surrounding environment to transform harmful nitrogen oxides into harmless nitrates.

Find Local Sales
 To discuss your project in more detail please contact your local area manager.

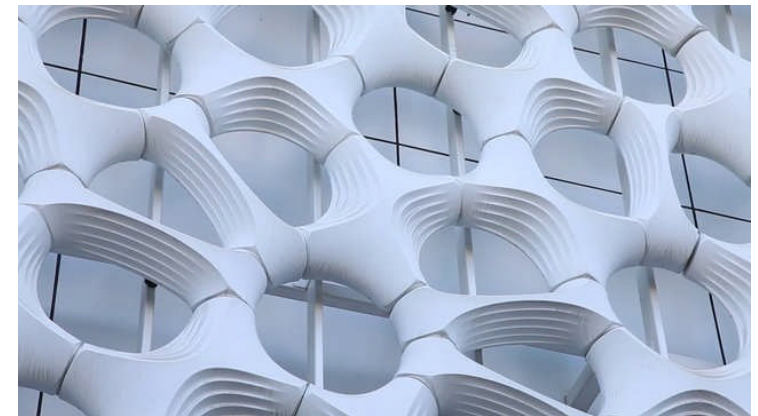
Technical Support
 Telephone: 0161 865 4444
 Email: technical.uk@icopal.com

Sales Enquiries
 Telephone: 0843 224 7400
 Fax: 0843 224 7401
 Email: sales.uk@icopal.com



Proven in Application: Buildings

Torre de Especialidades Hospital,
Mexico City, Mexico

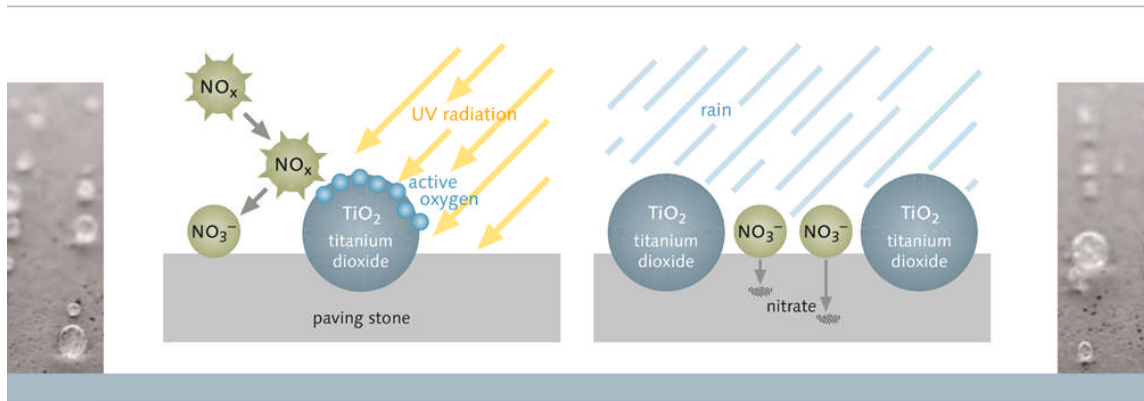




Proven in Application: Buildings

Palazzo Italia, 2015 World's Fair,
Milan, Italy: 9,000 sq.m Tiocem®
Photocatalytic Concrete with TiO_2

Reaction process of NO_x reduction by TioCem®



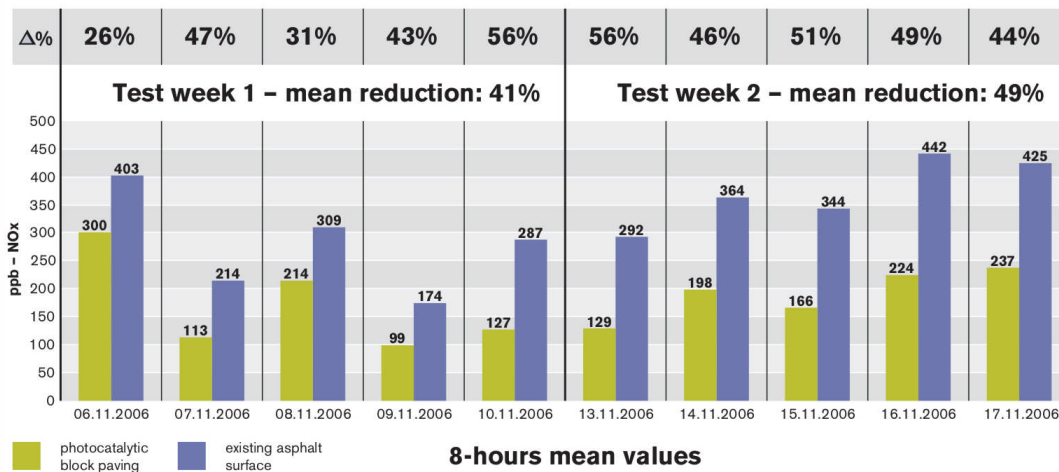


Proven in Application: New Concrete Roads

Borgo Palazzo Street,
Bergamo, Italy: New Roadways,
Tiocem® Photocalytic Concrete
with TiO_2



Example of NO_x reduction – November 2006



Two Weeks of
Testing:
 NO_x reductions
of 41-49%



Proven in Application: Existing Asphalt Roads

Charlotte County, FL

A.R.A.-1 Ti® polymerized asphalt rejuvenator with pollution remediation

- Maltene-Replenishing
- Air-Purifying
- Deep Penetration
- Increased Longevity

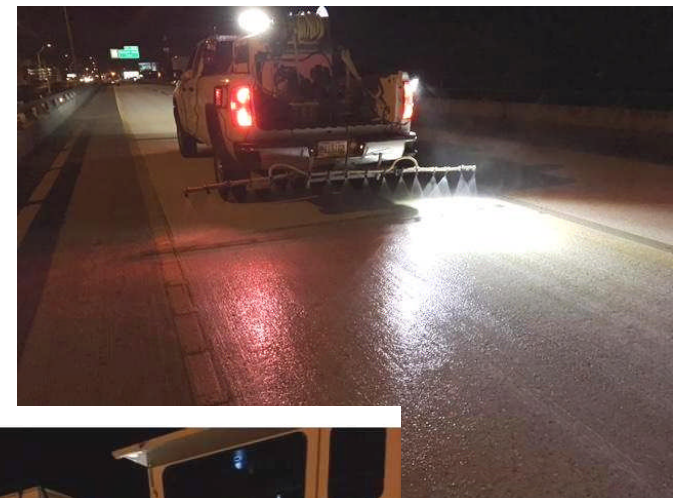




Proven in Application: Existing Concrete Roads

Austin, TX, TxDOT – I-35
PCC Softer Aggregate Pavement
Litho 1000 Ti® concrete sealer
and hardening agent with pollution remediation
and Skidabrader surface texturing

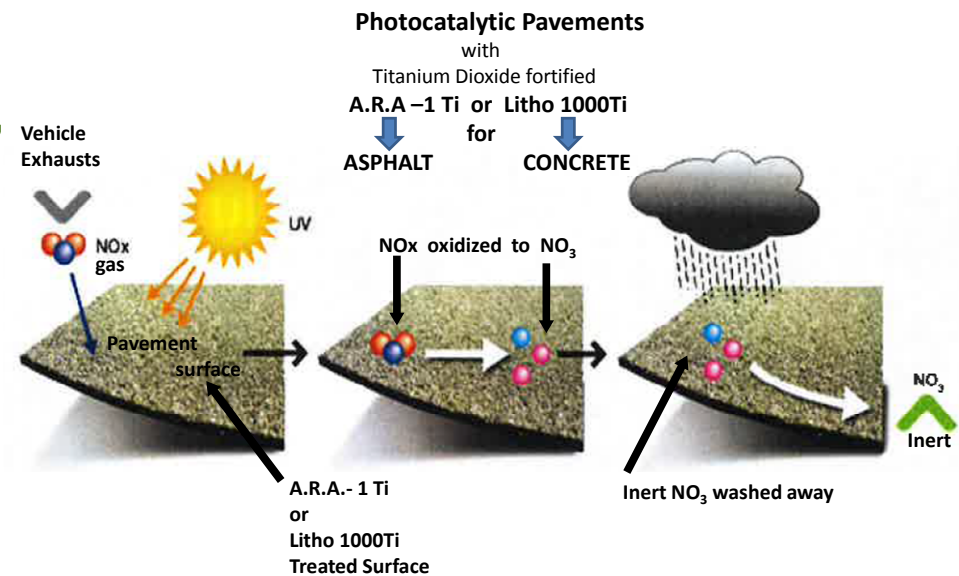
- Maltene-Replenishing
- Air-Purifying
- Deep Penetration
- Increased Longevity
- Enhanced Texturing





Proven in Application: *All Roads*

- Marginally more expensive than regular “top of the curve” preservation strategies
- Significantly contributory to remediating air pollution
- Equally effective on new and existing concrete and asphalt roadways





Imagine the Possibilities

Pollution-Remediating...

- Roofs
- Buildings
- Roadways





The Need is Clear, The Time is Now

The future is theirs...the responsibility, ***ours.***





Questions?

Chris Evers
727-638-1699