COATINGS PROTECT PRESERVE PROVIDE

Paints and coatings have long been recognized to provide both protection and aesthetic appeal. But paints and coatings aren't just inactive surface coverings; they are indispensable products that extend the useful life of everyday objects by compass of otective of the

Just a thin coating or layer of paint no more than a few thousandths of an inch — can provide protection from degradation like corrosion, abrasion, high or low temperatures, chemicals and ultraviolet rays, moisture, and microbes, amongst a host of aggressive or destructive conditions.

> While often overlooked, coatings do a tremendous job of preserving the things that are a part of our daily lives. Coatings not only preserve our cars and homes, they also preserve the bridges we drive across and the tunnels through which we travel.

Coatings help protect our environment too, in ways you wouldn't imagine, they save energy by keeping buildings cooler, play an integral part in the use of wind energy, contribute to reductions in CO_2 emissions, and keep machinery out of landfills.

These environmental advances are possible because coatings perform well under varied conditions, making sustainability not only possible but efficient. High performance coatings lead to a longer useful service life before re-application, this maximizes environmental benefits while minimizing ecological burdens.

PROTECTION & SAFETY

Coatings on cans containing edible products are an indispensable component of food safety: they protect food from both bacteria in the environment and corrosion from compromised metal. Coatings on the inside lining of a can act as a barrier to prevent the food from attacking the metal, especially when food is acidic; and the coating on the outside of the can protects the can from damage due to exposure to the environment. *Source: Courtesy of Valspar Corporation*

Additives in paints make workers safer in industrial environments: a coating system fortified with aerogel particles and applied at just a few millimeter thick to a pipe heated to 200° C is enough to protect any worker who touches it from a serious burn. *Source: "Stretching Paint Performance," Chemical and Engineering News, American Chemical Society, June 6, 2011*

COMMUNICATIONS

Special coatings used for communications instillations, satellite dishes, and radar housing domes (radomes), are designed to resist corrosion, abrasion, chemicals and impact, and to be self-cleaning in most environments. They function to prevent water film from building up and hindering signals. Interestingly, these coatings are applied in a range of climates, from deserts to the Arctic. *Source: Courtesy of Boyd Coatings Research Co.*

Transparent, conductive coatings used on electronics, including cellphones and tablets, create a film integral to making usable the touch-screens so entrenched in our lives, enabling excellent sensor-conductivity function and optical performance. *Source: Courtesy of Cambrios Technologies*

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Optical fiber coatings make telephone and internet technology possible by protecting the glass fibers that transmit telecommunications signals. Such technology allows an estimated 3.9 million people to telecommute, reducing gasoline consumption by 840 million gallons and CO₂ emissions by almost 14 million tons. *Source: Schmid, S.R., DSM DesoTech Fiber Optic Materials, and The Energy and Greenhouse Gas Emissions Impact of Telecommuting and e-Commerce, conducted by TIAX*

ARCHITECTURAL COATINGS

Many architectural paints — both interior and exterior — are now paint and primer in one product, which allows for a paint-job with fewer coats, translating to greater efficiency and environmental advantages. These combinations are designed to provide a high quality application that is more durable and lasts longer, thereby reducing the frequency for repainting or multiple applications. *Source: Courtesy of Devoe Paint and Behr Paints*

Emulsion technology used in architectural paints allows for low-VOC, near odorless paints with highscrub resistance, and come in a variety of finishes, from flat to semi-gloss sheens. *Source: Courtesy of Celanese Emulsion Polymers*

Certain architectural paints use renewable, biobased or recycled ingredients, such as recycled plastic and soybean oil, shifting away from organic solvents. Bio-based products are composed of agricultural, forestry, or marine materials. Such innovation has been recognized with the Presidential Green Chemistry Challenge Award. Source: Courtesy of The Sherwin-Williams Company

Architectural coatings play a critical role in providing air barriers that are essential for energy efficient building enclosures. Air barriers stop the flow of air through the building, protecting the structure and increasing the efficiency of heating and cooling systems in the building. Air barriers provided by architectural coatings contribute to the energy efficiency performance requirements found in all green building standards. *Source: The Technology of Air Barriers, A Durability + Design Collection, Technology Publishing Company, 2012*

Certain interior paints contain antimicrobial additives, which help to extend the useful life of the coating by controlling deterioration caused by mildew, and thereby odor. Such additives, including silver, are embedded in the paint to inhibit the growth of mildew on the surface of the paint film, making the paints particularly well suited to hospitals and schools. *Source: Courtesy of Benjamin Moore & Co.*

Specially formulated low-emitting interior coatings protect the health and comfort of sensitive populations, including children in schools and patients in hospitals. *Source: Courtesy of Dunn-Edwards Corporation*

COOL ROOFS

Cool roofs — rooftops with certain reflective coatings — help to counter the "urban heat island" effect by reflecting the sun's hot rays and absorbing 80% less heat than traditional dark-colored roofs, cooling rooftops and helping to lower indoor temperatures by up to 30% on hot days. *Source: NYC °CoolRoofs*

Cool roof coatings not only lower buildings' energy consumption and costs, but also overall temperature and stress on the power grid. This effort could help reduce New York City's greenhouse gas emissions 30% by 2030. *Source: NYC °CoolRoofs*

According to the National Resources Defense Council, 'smart roofs' employing cool coatings technology substantially reduce energy costs and curb carbon pollution. Source: Natural Resources Defense Council, Looking Up: How Green Roofs and Cool Roofs Can Reduce Energy Use, Address Climate Change, and Protect Water Resources in Southern California, June 2012

The U.S. Department of Energy (DOE) actively touts cool-roof coatings as a cost-effective and relatively non-intrusive means of improving the energy efficiency of existing buildings, which currently account for more than 20 billion sq. ft. of commercial roofing space available for retrofit in the United States. *Source: U.S. Department of Energy, Cool Roof Fact Sheet*

DOE estimates that replacing or resurfacing conventional roofing materials with improved reflective elastomeric roof coatings can reduce a commercial building's annual air conditioning energy use by up to 25%. Source: U.S. Department of Energy, Cool Roof Fact Sheet

Roofs with cool roof coatings can be as much as 100° F cooler than roofs covered with traditional, dark-colored roofing materials, demonstrating energy savings of as much as 10-70%, according to EPA. Source: U.S. Environmental Protection Agency, Reducing Urban Heat Islands: Compendium of Strategies, Cool Roofs

AEROSPACE COATINGS

Protective coatings play a vital role in aerospace technology: a conductive thermal control coating was applied to Space Exploration Technologies (SpaceX) Dragon capsule for its first flight to the International Space Station. *Source: Courtesy of Alion Science and Technology*

New technology in aerospace coatings can minimize drag in the air and eliminate debris build-up, both of which reduce airplane fuel consumption, and thereby, carbon footprint. Such savings have both an economic and environmental impact that cannot be understated: a 1% improvement in fuel efficiency in the aviation industry can lower fuel costs by \$700 million a year, according to the International Air Transport Association (IATA). On average, airlines incur about \$100 a minute per flight in total operating costs, IATA says. Therefore, even saving just one minute of flight time could reduce total industry operating costs by more than \$1 billion a year and significantly reduce environmental emissions. *Source: TripleO Performance Solution and International Air Transport Association*

AUTOMOTIVE

Powder Coatings as an auto-body coating alternative ushered in a new era for automotive manufacturers who are keen to reduce both their carbon footprint and their costs without compromising on technical quality or performance. Such powder coating systems reduce the number of process steps and enable significant reduction in energy consumption. *Source: Courtesy of AkzolNobel Coatings*

Many additives are made from bio-based molecules, especially those in automotive and industrial paints, and give those waterborne paints a better carbon footprint: they enable faster drying times and provide a smoother finish. When automakers paint cars, they typically pass them through an oven twice to speed the drying process. Such additives make it possible to eliminate one of the baking steps, thus reducing the overall energy consumed. Another benefit: the faster drying time can also increase the number of cars that can be painted during a work shift. Source: "Stretching Paint Performance," Chemical and Engineering News, American Chemical Society, June 6, 2011

Automotive coatings, like most others, are used mainly to provide protection and decoration. The main concerns for automotive coatings 20 years ago were corrosion and fade/gloss from sunlight, acid rain, and other degradations. Most coatings had a useful life of about five years. Today, with advancements in chemistry, formulation, and processing, automotive coatings have useful lives of more than 10 years. Source: Courtesy of BASF Corporation, North American Automotive Coatings

INFRASTRUCTURE

New protective pipe coatings for water transmission are improving the pipeline infrastructure in developed nations and can be an important part of establishing water transmission infrastructure in emerging countries. The coatings work as both an internal lining and a corrosionresistant external coating, for both potable and nonpotable water transmission pipelines, acting as a barrier for both mechanical resilience and resistance against both chemical and climactic impact. *Source: Courtesy of BASF Corporation*

Unprotected steel structures in harsh environments can lose as much as 1 mm in thickness in as little as five years. This loss contributes to structural weakness, and the steel must be replaced. A thin protective coating applied to the steel can slow or delay the corrosion process and significantly extend the life of the steel by 15 or more years, even in offshore environments. *Source: Courtesy of AkzoNobel Coatings Inc.*

Coatings applied to the San Mateo Bridge in Hayward, California extended the service life of the bridge by an additional 25-45 years. *Source: Case study courtesy of Bayer MaterialScience LLC*

Coatings developed particularly for the electric railroad industry help keep us safe: they reduce the potential for derailments; prevent shifting or movement from the force of passing trains; and permanently protect rail structures from corrosion and abrasion by strengthening existing metal structures. *Source: BASF Polyurethanes*

MARINE

Special marine coatings called antifouling coatings help reduce the growth of marine organisms on immersed areas of ships, which reduces the ship's energy and fuel consumption. Antifouling coatings carry tremendous eco-efficiency benefits: when applied to tankers, bulk cargo and other vessel types, they can reduce greenhouse gas and other emissions by an average of 9% — no small feat, since shipping counts for an estimated 2-4% of global greenhouse gas emissions. Source: Energy and GHG Emissions Savings Analysis of Fluoropolymer Foul Release Hull Coating, Energy & Environmental Research Associates, December 10, 2010, for

Antifouling coatings play an important role in protecting marine environments from the spread of invasive species: increased world trade and subsequent transport of goods across the oceans and along coastlines has resulted in the introduction of nonnative organisms that are harmful to sensitive marine environments because organisms attach to the hulls of ships. Antifouling coatings, many of which employ safe biocides, work to protect valuable ecosystems from this devastating biofouling and invasive species threat. Source: International Maritime Organization's Biofouling Correspondence Group, "Summary of Biofouling

SOLAR & WIND ENERGY

Anti-reflective glass coatings developed for solar panels are integral to the important, fast-growing solar energy market, which is widely viewed as an alternative and renewable energy source. The coating is applied to the cover glass of solar modules and strongly reduces the reflection of sunlight. As a result, more sunlight passes through the glass, increasing the energy output of these modules by up to 4%. *Source: Courtesy of Royal DSM*

Paints and coatings specifically designed for wind energy uses, including rotor blades for wind turbines, provide fast drying, good UV and weathering resistance, and protection against rain erosion. This is critical as the use of wind energy is booming worldwide. The global spread of wind energy — including the trend toward offshore farms and plants — has meant a wider variety of exposures that demand higher-performing, more flexible coating systems. *Source: Courtesy of BASF Corporation*

DEFENSE

A military-specified coating creates a hardening effect that offers blast mitigation in buildings, including embassies and defense installations, and is designed to provide a fast, cost-effective alternative to traditional structural steel or concrete systems. This coating was specifically designed to meet criteria requirements of the U.S. Department of Defense Anti-Terrorism Force Protection. Source: Courtesy of PPG Government Solutions, PPG Industries Inc.

The U.S. coatings industry has been recognized as a key player in the fight against corrosion of our military ships, planes and tanks. Corrosion of steel, aluminum, and other structural metals erodes the safety and financial stability of industries and countries alike. Fighting corrosion in ships, tanks, planes and equipment costs the Pentagon \$22.9 billion a year. Corrosion costs advanced industrialized nations about 3.5% of GDP to replace damaged material and components, plus a similar amount due to lost production, environmental impact, disrupted transportation, injuries, and fatalities. Source: BusinessWeek.com, June 1, 2011, The High Cost of Waging War on Rust

Saltwater is the ever-present, costly enemy of Navy ships — a major cause of corrosion. New anti-corrosion marine coatings with military performance specification battle the costs and offer longer service life (2-3 times the longevity). They require less maintenance and can be cleaned versus repainted, which is more environmentally prudent because it requires fewer coats. Source: Courtesy of The Sherwin-Williams Company



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