



## SELF-CLEANING GLASS?

***If it rained distilled water...then our residential and commercial windows would be virtually self-cleaning and require little, if any, maintenance. Similarly, if municipally-furnished tap water were deionized and free of rust and hard-water minerals, our kitchens, baths and glass shower doors would be infinitely easier to clean and maintain. Unfortunately, in most of the world's densely populated areas, that is not the case.***

**The Impact of Water on Glass:** Exterior glass continues to age prematurely from weathering and the ongoing exposure to chemically active water. This is due primarily to the abrasive action of wind-borne sand and particulate matter combined with rain that contains dissolved gases, carbonic acid, chlorides, sulfates, nitrates and ammonia. Even water from sprinkler systems contains enough residual chemicals and minerals to actively promote the adhesion and build-up of soil, lime scale, rust and calcium deposits on windows.

**The Nature of Everyday Soil:** Ambient surface soil is water-soluble, oil soluble or water insoluble. Water-soluble soil is readily softened and cleaned with plain water, soap water or mild detergent solutions. Oil soluble soil can be softened and cleaned with suitable solvents or it can be emulsified and removed with strong, surface-active agents solubilized in water.

Water insoluble soil is the result of salts, hard water minerals, lime scale, bacteria, and organic and inorganic contaminants from which water has evaporated and which has hardened and become attached to the surface. It is the water insoluble soil that presents the greatest cleaning challenge.

To remove water insoluble soil, homemakers and cleaning professionals are turning to stronger and stronger cleaning aids; including powerful acids and alkalis, penetrating solvents, heavy duty detergents and a broad range of abrasive cleansers.

**A Surface-Destroying Vicious Cycle:** The inevitable result of using such harsh cleaning aids is a surface destroying vicious cycle: ***The stronger the cleaning action, the more it opens the microscopic pores of the surface. The more open and vulnerable the pores, the deeper the new soil penetrates and the greater its adhesion and build-up...and the stronger the cleaning action required to remove the soil...with greater and greater destruction of the surface finish.*** Although microscopic at first, this cycle ultimately leads to glass that is visibly rough, exhibits the loss of clarity and becomes infinitely more prone to soiling.

### **The Historical Response by Glass Manufacturers**

Manufacturers of glass have responded to this downward wear cycle with better product formulation, advanced production processes and polishing techniques that have improved the density and durability of their surface finishes. Although technically significant, these improvements have failed to keep pace with the ongoing impact of the water and soil - and the increasingly more powerful cleaning agents - to which their surfaces are subjected.

Having virtually exhausted their ability to further improve the finish of their products from a formulation, production and polishing standpoint, glass manufacturers are now turning to so-called permanent "anti-soil" coatings. This effort is similar to the "hard coating" techniques employed for years by manufacturers of acrylics and polycarbonates. While "hard coats" on plastics have, in fact, improved the resistance of the surface against abrasion, such improvement was due to the significant difference between the softer, less dense plastics and the harder, denser glass-like siliceous coatings that were successfully bonded to transparent plastics.



The new breed of integrated, vapor deposit or heat-cured “anti-soil” coatings range from titanium dioxide and fluorocarbons to diverse siliceous materials. Unfortunately, these coatings only exhibit levels of surface hardness, density and chemical resistance that are barely higher than the glass surfaces to which they are applied. The integrated or on-line application of such “permanent” coatings invariably involves additional equipment, ventilation, employee health monitoring and some disruption of production.

**Disappointing Results:** In use test after use test, and notwithstanding the exaggerated claims being made for them, the typical factory-applied “anti-soil” coatings on glass exhibited only marginal initial improvement in chemical and physical resistance compared to the unmodified glass by the same manufacturer. And, in case after case, in normal use and after subjecting the so-called “active” or “repellent” finishes to any of the strong acids, alkalis or abrasive cleansers that are so abundant, absolutely no difference could be found between factory-treated and untreated specimens.

**The War of Words and Misleading Product Claims:** Recently, a leading glass manufacturer announced “the world’s first self-cleaning glass.” The manufacturer claims “a dual action coating, using hydrophilic and photocatalytic properties to eliminate water and organic and inorganic deposits from the surface of the glass.” They also claim that “the effects are continuous and will last the lifetime of the product.”

Yet their product literature warns against contaminating the coated surface with cutting oils or fingerprints, washing the surface with hard water, the use of razor blades, steel wool and abrasive cleansers, or the contact with harsh alkali solutions from concrete or masonry runoff. It suggests the use of de-ionized water and/or a range of specialty solvents for cleaning the glass.

While the problems with glass preservation remain significant, the answers are clear...

**Unelko Corporation & Unelko NV:** For over thirty years, Unelko has been a leading manufacturer of water repellents, surface treatments and protective coatings. Their primary focus has been on the **preservation, enhancement and “preventive cleaning”** of surfaces – ranging from glass, porcelain and ceramics to marble, granite and laminates and concrete, masonry and limestone – whose users could never sufficiently control the environments to which their products were exposed or the manner in which they were maintained.

Thus, Unelko’s focus has always been on **practical nanofilm technology**; on post-manufacture and end-user applied ultra-thin-film surface treatments that would not visually change the surface, but that would preserve its appearance and texture, enhance performance and make objects less prone to the adhesion and build-up of all foreign matter.

From the ongoing study of the nature and chemistry of water, water residue and everyday soil, **Unelko has demonstrated that the adhesion and build-up of water insoluble soil can only be prevented by making surfaces water and soil repellent.**

E.I. duPont & Co. is a perfect case in point. Some years ago, they invented a remarkable material, polytetrafluoroethylene (PTFE), that they marketed under their now famous TEFLON® trademark. When fused to various metal substrates, Teflon® made the surface “non-stick” and amazingly easy to clean. Perhaps the most notable success of Teflon® is on pots, pans and cooking utensils, where it eliminated the constant scraping and scrubbing. Teflon® did not change the way people cooked or the taste of the food, it just made it infinitely easier to clean pots, pans and utensils.



**MAJOR BREAKTHROUGHS IN SURFACE COATING TECHNOLOGY:** Through extensive, ongoing research & development, Unelko Corporation now has newly-patented surface care technologies that are **non-flammable, non-combustible, VOC-free, non-corrosive, non-toxic and non-irritating to eyes or skin.** These products clean and simultaneously shield surfaces with invisible nano-scale water, soil & stain repellent barrier coatings that reduce the penetration, adhesion and buildup of re-soiling for dramatically easier next-time cleaning!

While similar in performance and durability to the “non-stick” finishes on pots, pans and utensils, the Unelko cleaning and coating products are distinctive in a number of very important characteristics:

- They can be applied to new or used surfaces with simple wiping & polishing techniques.
- They are absolutely invisible, not gray, brown or black as are most PTFE coatings.
- They enhance, but will not change, the natural luster or color of the surface.
- They are infinitely renewed, without build-up, as the surface is cleaned after normal use.

**“Permanence” Versus “Renewability”:** Until the invention of glass, porcelains and ceramics that will permanently resist the ravages of water, soil and the aggressive cleaners needed to clean an unprotected surface, it is misleading to suggest that integrated finishes will solve the problem...unless, of course, manufacturers develop programs to have windows, sinks, tubs, tile and showers returned to their factories for periodic refinishing. Since such practice is totally unrealistic, it remains that **RENEWABLE** water and soil repellent coatings are the only viable technique for the preservation and enhancement of hard surfaces.

**Looking To the Future:** Unelko manufactures specialty cleaning, preservation and easy maintenance products. It has more advanced surface care technology on the way for its worldwide markets. Unelko is willing to private label and share its surface care expertise, technology and products with those manufacturers, distributors and retail chains committed to the preservation, enhancement and preventive cleaning of everyday surfaces.

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