The Science Behind NanoTechnology

How They Work

There are 3 factors in how our coatings work -- chemistry can sound complicated - no need for a PhD here, we break down the concepts.

Our Coatings Covalently Bond with The Surface.

Many coatings can only form mechanical bonds with surfaces, and thus generally require significant surface prep grinding. **Mechanical bonding** means that the molecules that make up a coating are not chemically reacting with the surface. Instead, coatings relying on mechanical bonds fill in the micro-spaces created in a surface after surface prep grinding. Once the coating fills the micro-spaces created from grinding, it cures and become hard. The result is a coating and surface that are fitted together almost like the teeth of two gears matching up. This type of bonding means the coating does not become part of the surface, but rather gets locked into the surface.

A **covalent bond** is a chemical bond. This means that the molecules that make up our coating are chemically reacting (bonding) with the surface molecules they meet. A covalent bond is the strongest chemical bond. When a covalent bond occurs, something entirely new is created. To demonstrate this idea, let's look at hydrogen and oxygen. Hydrogen alone is a gas at room temperature, and is used for such things as filling balloons, and once upon a time, airships. Oxygen alone is a gas a room temperature and is used for welding and steel production. However, covalently bond the two gases together, and we get H2O, or water. Our coatings covalently bond with the surface they treat, creating an entirely new, super protective surface. The coating cannot delaminate because the coating and the surface have become one.

Our Particles Are Very, Very Small - NANO Small

When it comes to coating a surface, it is best to use the smallest particles possible. This is because smaller particles can wet a surface better. **Wetting** refers to how much contact there is between a coating and a surface. This is a big part of the reason why grinding a surface is recommended before coating a surface. Grinding increases surface area, meaning there is literally more surface to be contacted than before the grinding. Most coatings need as much surface as they can get their molecular hands on. This is because they are not chemically bonding with the surface. Instead, they are essentially getting "trapped" in the micro-spaces created by grinding and then curing.

How small are our particles? Take the width of a **single strand of human DNA**. Multiply by 10. You get the width of the particles our coatings are made of. Our coatings have extreme wetting ability because they contact the actual molecules of the surface. This is far beyond the reach of most traditional coatings. We take it one step further and covalently bond with these surface molecules.

Our Coatings Use the Air to Cure

Our coatings are single step coatings, meaning they are ready to use out of the can without any mixing. This is very rare for a coating which covalently bonds with a surface. Covalent bonds require large amounts of energy to occur. For most coatings to develop a chemical bond, energy required to form this bond must be first be generated, generally from heat, and a lot of it - sometimes well over 350 degrees Fahrenheit! For many surfaces and applications, this is just not practical. Our coatings obtain this energy by reacting with the water already present in the air - a chemical process known as **hydrolysis**. Hydrolysis gives our coatings the energy they need to form the powerful covalent bond with the surface without needing to introduce high amounts of heat.

Why They Work

We have our coating incredibly well bonded to the surface. Why is this important?

Our coatings are very effective because of what they are comprised of. They are made up of two groups of components: inorganics and organics. Think of inorganics as components which comprise the Earth: stones, minerals, and metals. In our case, we use silicon dioxide, or Quartz. Inorganics do not break down from the environment, are generally quite hard, and tend to not decay over time as organics do. Organics are everything from plants to plastics to paints. Organics tend to be flexible, softer, and chemically resistant.

It is well known that it is very difficult to bond organics with inorganics. Like trying to mix oil and water, they will never become one. Our innovative chemical processes merge the two together using, yet again, covalent bonds. The result is a coating that is very hard, corrosion resistant, UV resistant, and immune to aging -- these qualities are derived the inorganic side. Our organic components

contribute extreme flexibility and chemical resistance. The surface and coating become one, transferring all the properties of the coatings to the surface. A much more durable surface is created.

In today's marketplace, is not enough to just be effective. There are many effective chemistries in the world that are unfortunately also extremely toxic and unsafe. For too much of human history, people simply looking for a solution to their problems have been subjected to toxins causing anything from blindness to cancer.

Keeping the people who must use these coatings safe has been a major priority of ours since we began. Our coatings follow and beat the toughest environmental guidelines in the United States - the South Coastal Air Quality Management District. All our coatings are under 100 grams per liter VOC.

Sentry Coatings:

- Are Durable
- Are Corrosion Resistant
- Are UV Resistant
- Are Chemically Resistant
- Are Abrasion Resistant
- Are Temperature Resistant
- Are Extremely Hard
- Have Excellent Adhesion to Substrate
- Are Easy and Convenient to Apply
- Are Environmentally Safe (Low to Zero VOC's)
- Have High Cross-Link Density Internally
- Have High Cross-Link Density with The Substrate