

Agion®

ANTIMICROBIAL STEEL COATING



HVAC

Server Rooms

Food Service

Hospitals

Agion® antimicrobial compound for HVAC, server room, food service and hospital applications. Agion inhibits the growth of bacteria, molds, fungi and other microbes through the release of silver (Ag) ions and can be applied to carbon and stainless steel.

Agion® ANTIMICROBIAL STEEL COATING

A Successful Business is All About the Details



Agion, an antimicrobial additive, is combined with our coating to prevent the surface growth of mold, mildew and bacteria.

THERE ARE A FEW HUNDRED MILLION YOU MAY HAVE OVERLOOKED.

The world around us is teeming with microbes. Many are harmless, yet some can cause serious illnesses and diseases. Others such as mold and mildew can cause millions of dollars in damage to buildings and property.

Now, there is a way to fight back. Demand for antimicrobial products steadily increases, for personal use, in our homes, schools, and businesses. In fact, it's now a \$1 billion a year industry. Consumers can buy antimicrobial hand cleaners, toys, cutting boards and kitchen utensils, even mouthwash, and deodorant. Now there is a way for manufacturers of HVAC equipment to take part in this rapidly growing market opportunity.



Cleanliness is a priority of Woodward Academy in Atlanta, which specified antimicrobial-coated steel for its rectangular ductwork to inhibit the growth of microbes.

Agion® ANTIMICROBIAL STEEL COATING

Antimicrobial Protection for HVAC Equipment

Now you can offer your HVAC customers a premium product that provides an added measure of cleanliness, thanks to coatings with the Agion antimicrobial compound available exclusively from Cleveland-Cliffs Steel Coatings, Inc.

The Agion antimicrobial compound has been registered by the Environmental Protection Agency as an antimicrobial agent which can resist the growth of bacteria, molds and fungi, and can be applied to components throughout the entire HVAC system, including air handlers, ductwork and diffusers.

These coatings can be used on many other carbon and stainless steel products, including commercial refrigeration systems, appliances, and building components. For manufactured HVAC components, coatings are available through authorized shop coaters. Coils of antimicrobial-coated carbon and stainless steel may be purchased from a Cleveland-Cliffs Steel Coatings steel distributor.



Cleveland-Cliffs Research and Innovation Center features Agion Coated Ductwork



Carrier's top-of-the-line 39 m aero air handling units offer the added cleanliness provided by Cleveland-Cliffs Steel Coating's Agion antimicrobial-coated steel.

The steel is used as an integral material for their prepainted steel inner liner.

Agion® ANTIMICROBIAL STEEL COATING

Benefits and Solutions

HOW IT WORKS

The Agion antimicrobial coating inhibits the growth of bacteria, molds, fungi and other microbes through the release of silver (Ag) ions. The controlled release of silver ions provides continuous antimicrobial protection for the product for the life of the coating.

HVAC BENEFITS

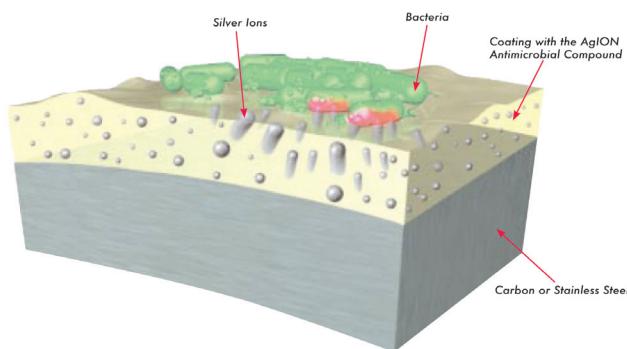
Agion antimicrobial coatings suppress the growth of microbes on HVAC components, keeping them cleaner. While the coatings are not meant to replace routine cleanings, they provide an effective tool in buildings where there is heightened concern about microbial growth, such as hospitals, nursing homes, daycare centers, and schools.

REFRIGERATION

Temperatures below 40 °F inhibit the growth of many microbes, but not all. Even at colder temperatures, Agion antimicrobial-coated steel works to inhibit the growth of bacteria, molds and fungi, whether in walk-in refrigeration units or refrigerated areas or storage facilities.

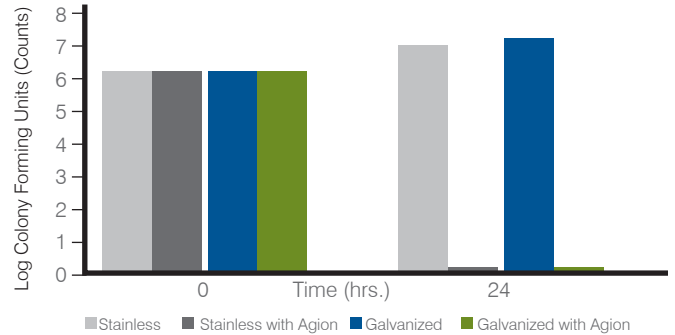
HOW IT WORKS

Agion antimicrobial compound is an inorganic material whose active ingredient is ionic silver. Encapsulated silver ions are released to the surface of the treated steel where they suppress the growth of destructive microbes.



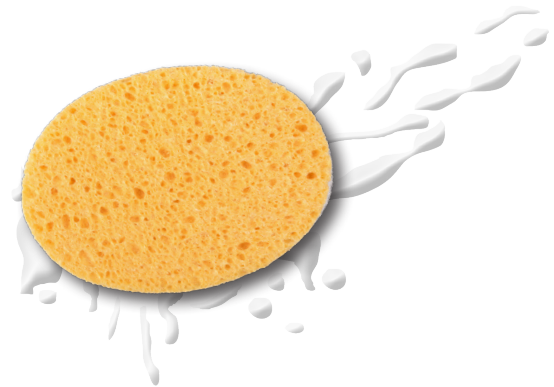
After 24 hours, an Agion antimicrobial-coated steel surface shows much less bacteria contamination than an uncoated surface.

ANTIMICROBIAL EFFECTIVENESS



CARE AND CLEANING

Agion antimicrobial-coated steels can be formed, bent or drawn using conventional fabricating procedures. When cleaning, the surface of the antimicrobial-coated steel product should be cleaned with mild detergent and then air-dried. Harsh abrasive cleaners, strong solvents, and acid-based cleaners can cause coating damage.

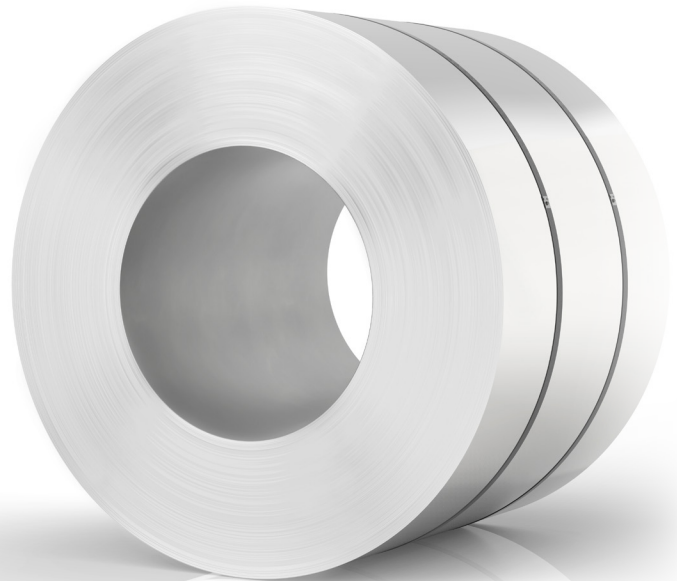


STANDS THE TEST OF TIME

The antimicrobial action of the Agion compound maintains its effectiveness over a wide range of temperatures and pH values. Agion antimicrobial-coated steel has completed salt spray testing (ASTM B117), condensing and humidity testing (ASTM D2247), and water immersion testing (ASTM D870). Cleveland-Cliffs Steel Coatings will help you develop a test to evaluate the durability of Agion antimicrobial-coated steel in your specific application.

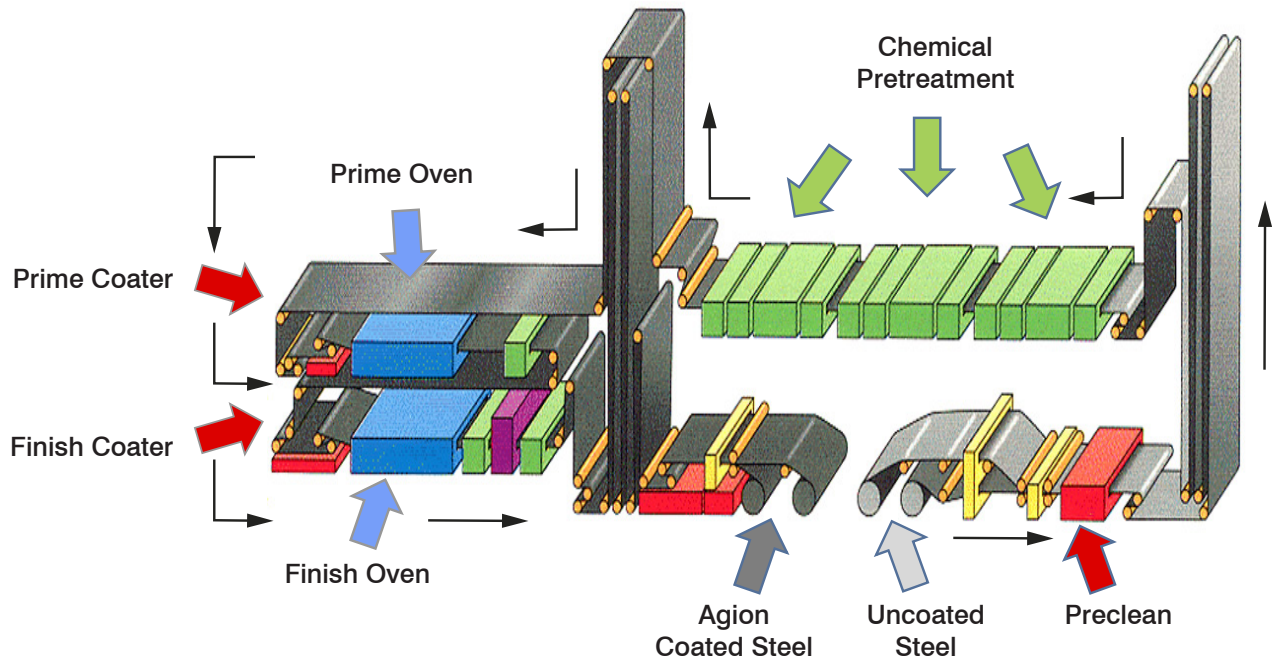
Coil Coated vs. Shop Coated HVAC Material

Properties	Coated	Shop Coated
Efficacy	Maximized due to uniformity of coating thickness	Variable due to coating application process
Coating Adhesion	Maximized due to cleaning/pretreatment prior to coating application	Depends on surface prep conditions
Coating Durability	Maximized due to use of pretreatment	Depends on coating adherence, uniformity
Coating Hardness	Harder – 2H Pencil	Softer –Typically B-HB pencil
Chemical Resistance	Maximized due to use of epoxy coating	Depends on coating uniformity/adhesion. Coating is acrylic based
Weldability	Spot weldable due to control of coating thickness	Variable depending on coating thickness
Formability	Can be bent, drawn, stretched, lock seamed	Limited by adhesion and hardness of coating
Appearance	Uniform	Can be variable due to coating

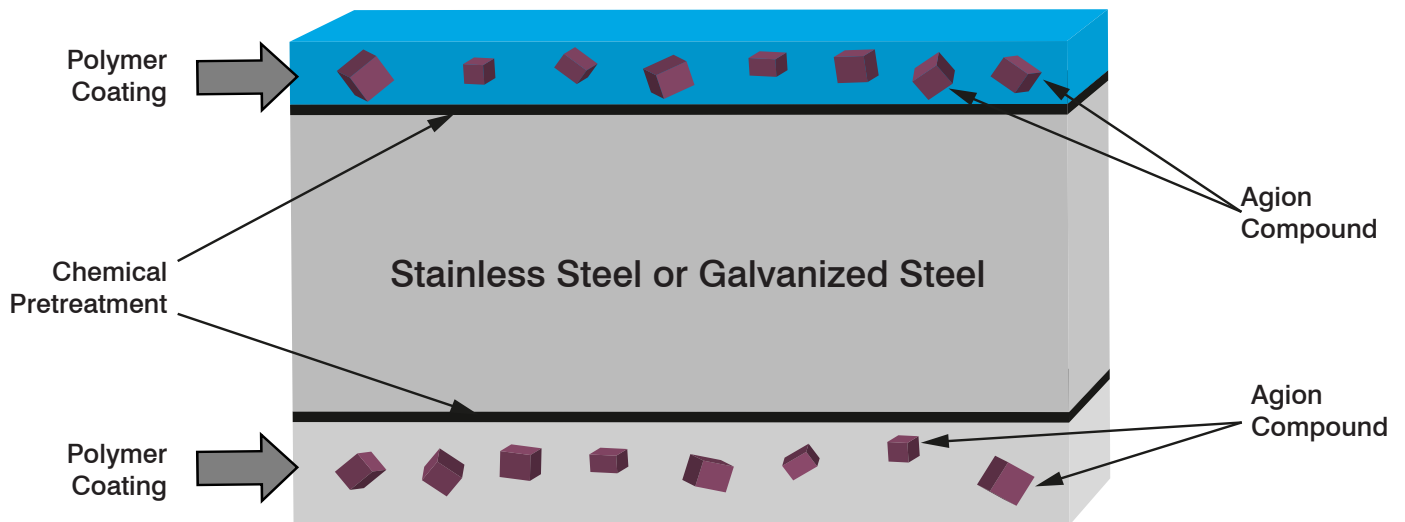


Agion® ANTIMICROBIAL STEEL COATING

The Process



- The patented Cleveland-Cliffs Coatings process utilizes a coil coating process line
- Galvanized steel is cleaned, pretreated and Agion coated
- Coatings are cured at temperatures above 400 °F



Cleveland-Cliffs Coatings developed the technology to incorporate the Agion compound into a coating and apply it to stainless and carbon steel.

Agion® ANTIMICROBIAL STEEL COATING

Coil Coated Ductwork vs. Shop Spray Coating

Properties	Coated	Shop Coated
Efficacy	Maximized due to uniformity of coating thickness	Variable due to coating application process
Coating Adhesion	Maximized due to cleaning/pretreatment prior to coating application	Depends on surface prep conditions
Coating Durability	Maximized due to use of pretreatment	Depends on coating adherence, uniformity
Coating Hardness	Harder – 2H Pencil	Softer –Typically B-HB pencil
Chemical Resistance	Maximized due to use of epoxy coating	Depends on coating uniformity/adhesion. Coating is acrylic based
Weldability	Spot weldable due to control of coating thickness	Variable depending on coating thickness
Formability	Can be bent, drawn, stretched, lock seamed	Limited by adhesion and hardness of coating
Appearance	Uniform	Can be variable due to coating
Testing	Every coil checked for silver release	Unknown

PROCESS FOR PAINTING GALVANIZED STEEL

- Clean: Alkaline based or solvent
- Pretreat: Phosphate, Chromate
- Paint application
- Cure

ISSUES WITH POST PAINTING GALVANIZED STEEL

- Cleaning/pretreatment
- Poor adhesion/flaking
- Uniform Coverage
- In house cost



Agion® ANTIMICROBIAL STEEL COATING

Advantages of Coil Coated Ductwork

COIL COATED



1.0 mil Prepainted Louvers after 16 months Daytona Beach exposure (fan running).

SHOP COATED



1.0 mil Prepainted Louvers after 16 months Daytona Beach exposure (fan running).



Agion® ANTIMICROBIAL STEEL COATING

Other Potential Applications for Agion®

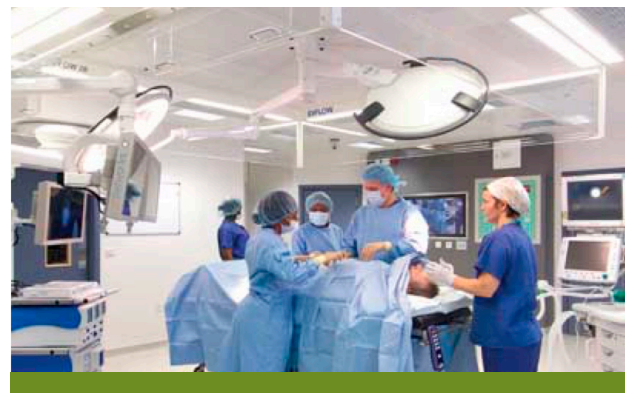
ANTIMICROBIAL-COATED STEEL

Not only is Agion Antimicrobial-Coated Steel the right choice to protect from harmful bacteria, mold and mildew, but other potential applications to consider include: residential and commercial kitchens, hospitals and physicians offices.

Please visit our website or contact us for more information.



Residential and Commercial Kitchen



Hospitals and Physician Offices

About Cleveland-Cliffs Inc.

Cleveland-Cliffs is the largest flat-rolled steel producer in North America. Founded in 1847 as a mine operator, Cliffs also is the largest manufacturer of iron ore pellets in North America. The Company is vertically integrated from mined raw materials and direct reduced iron to primary steelmaking and downstream finishing, stamping, tooling, and tubing. The Company serves a diverse range of markets due to its comprehensive offering of flat-rolled steel products and is the largest steel supplier to the automotive industry in North America. Headquartered in Cleveland, Ohio, Cleveland-Cliffs employs approximately 25,000 people across its mining, steel and downstream manufacturing operations in the United States and Canada.

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