

PAINTS AND COATINGS

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Honeywell

HONEYWELL GIVES YOU THE COMPETITIVE EDGE...

HONEYWELL PROVIDES FORMULATION FLEXIBILITY

Honeywell's chemically diverse lines of low molecular weight A-C® performance polymers allow formulators to tackle a variety of development challenges. Our major lines of additives include:

- **A-C® Polyethylenes**
 - Homopolymers
 - Oxidized (High and Low Density)
 - Copolymers (Ethylene-Vinyl Acetate, Ethylene-Acrylic Acid & Ethylene-Maleic Anhydride)
- **A-C® Polypropylenes**
 - Homopolymers
 - Maleated
- **ACumist® Micronized Polymers**
 - Polyethylene Homopolymers
 - Oxidized HDPEs
 - Polypropylenes
 - Modified Polyethylene Blends (PFOA free)
- **NduroMatt™ Multi-functional additives**
- **AClyn® Ionomers**

OUR EXPERTISE CAN HELP YOU INNOVATE

Honeywell has more than 50 years of experience in the field of polymer science. We were the first to produce Low Molecular Weight polyolefin materials. That was followed by years of innovation in product design, and experience in solving customer problems, making our line of A-C® products the world's most versatile family of low molecular weight polyolefin products.

Today, we remain one of the world's leading manufacturer's of low molecular weight polyolefins. We have the know how and technical expertise to consistently deliver products of the highest quality and help you with formulating challenges. Our customers also benefit from our vast industrial applications knowledge.

As a global player, with operations or offices in over 100 countries, we provide the advantage of our global supply and customer service capabilities.

WE HELP YOU GROW YOUR BUSINESS

Whether your coatings are water or solvent based, energy cured, 100% solids, or another form, AC®, ACumist®, AClyn® and NduroMatt™ additives can help your company meet your customers most demanding requirements.

Our additives can control slip (Coefficient of Friction), which aids in improving surface properties (Mar, Abrasion, Rub, Scuff, Scratch, Burnishing, Color Transfer, etc.), can modify solvent based rheology, control gloss, enhance moisture and chemical resistance, and modify the melt flow characteristics of thermoplastic resins.

Contact us to help you formulate your next coating and give us the opportunity to help you grow your business. Our additives improve coating performance, leading to longer service life, consistent high quality and more satisfied customers.

Whether our products help grow your revenues, cut formulation or processing costs, or create a competitive advantage for your company, the effect on your bottom line will be positive.



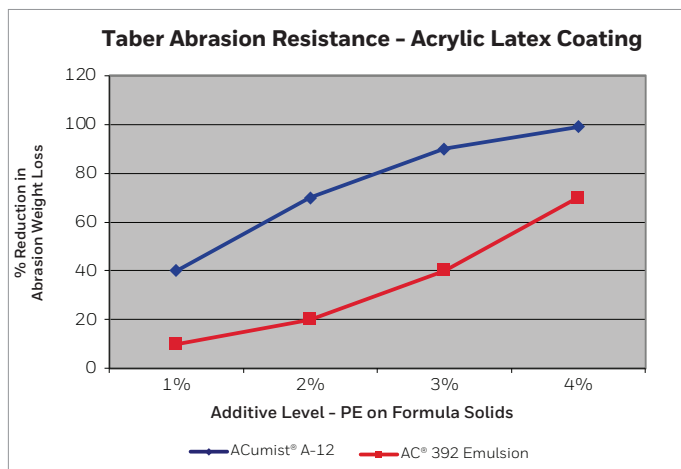
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SURFACE PROPERTIES

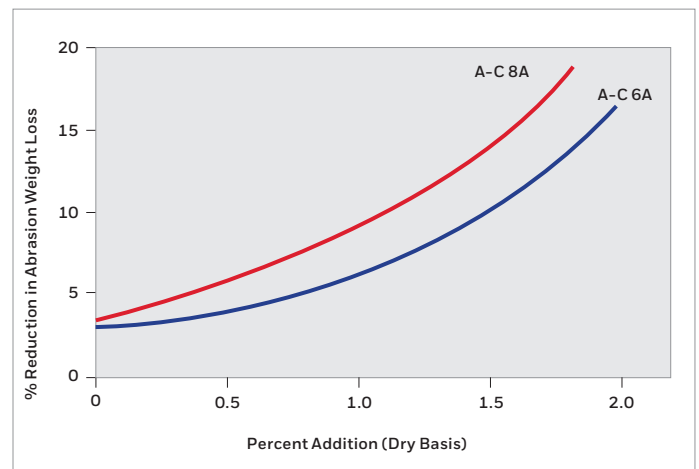
An improvement in surface properties, include such properties such as: Mar, Abrasion, Rub, Scuff, Scratch, Burnishing, Color Transfer, etc. and any other damage to a film surface caused by an object rubbing against, or sliding over it in close contact. The surface performance of the coating is primarily controlled by the toughness and cross linking of the coating film former (resin system).

Once that resin system has been selected for your application, adding a small amount of AC[®], ACumist[®] or NduroMatt™ performance polymers to your formulation, can be a cost effective method for increasing the surface property performance, without effecting other important coating properties. Improving surface properties leads to longer coating service life and reduced maintenance costs.

In many systems, micronized polymer particles will actually microscopically protrude above the film surface. An opposing abrading material will ride on these peaks, reducing it's actual contact with the coating film, and consequently reduced surface damage. These types of particulate materials will naturally reduce the gloss of the coating. Smaller polymer particles, such as out of an emulsion or dispersion, will also improve surface properties, mainly by lowering the COF (Coefficient of Friction) of the surface, but will not effect the gloss of the coating. Larger particles tend to be more effective in improving surface properties. **(See Graphic #1 below)** Harder polymers usually provide more performance for surface properties than softer ones. **(See Graphic #2 below).**



GRAPH 1: ACumist A-12[®], which is a micronized high density oxidized polyethylene, vs AC[®] 392, which is a high density oxidized polyethylene emulsion. The larger micronized particles provide greater protection against abrasion



GRAPH 2: AC[®] 8A vs AC[®] 6A incorporated into an air dried alkyd based paint. Both AC[®] products significantly improve abrasion resistance but the harder AC[®] 8A demonstrates a higher level abrasion resistance performance.

AC[®] performance polymers can be incorporated as water or solvent based dispersions, aqueous emulsions or micronized particles.

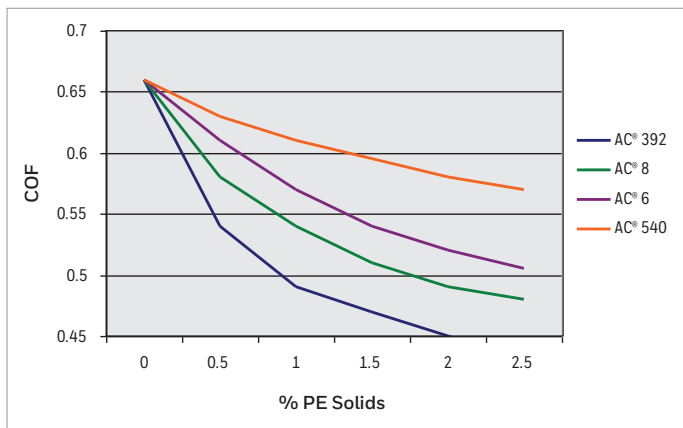
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SLIP AND ANTI-BLOCK

Slip, a measure of the coefficient of friction (COF), is an important property in many coatings applications. Slip is usually optimal within an upper and lower limit. For example, a coated bag that is too slippery may not stack properly. Yet, it must have sufficient slip to move easily along a production line.

Dispersed polyethylene at the surface of a coating is responsible for increased slip. The most effective polyolefin polymer, for any given situation, may not be outwardly obvious, until demonstrated in lab studies.

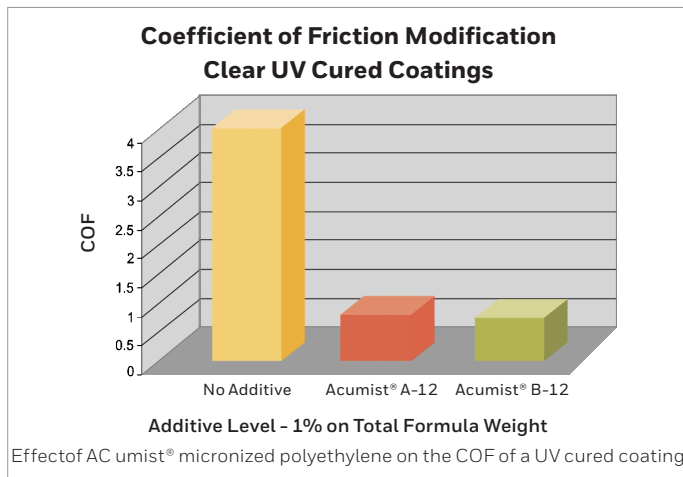
Different AC[®] polymer chemistries will provide varying levels of slip. **(See Graphic #3 Below)**



GRAPH 3: Comparison of various AC[®] grades, demonstrating their ability to control the Coefficient of Friction, at various dosage levels

ACumist[®] micronized polyethylene particles, added to many types of coatings at low levels (typically < 2%), are very effective at lowering the COF (Coefficient of Friction).

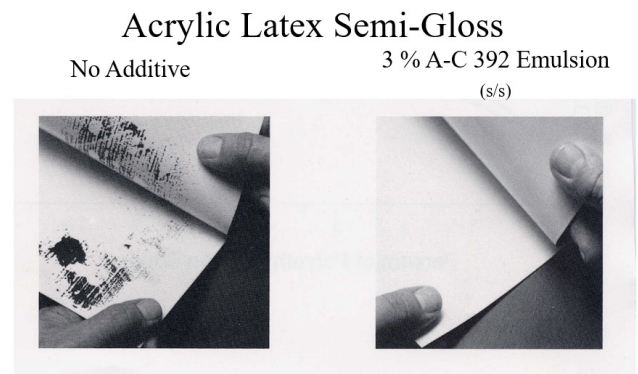
(See Graphic #4 Below)



GRAPH 4: Demonstration of ACumist[®] A-12 and B-12 micronized polyethylenes lowering the Coefficient of Friction at low dosage rates, in a UV cured coating

Controlled slip allows coated coil stock to move through forming equipment with less defects, allows high speed filling of beverage cans, and provides easy stacking and removal of bags or cans from shelves, allowing downstream customers to handle and display products more easily. Coatings modified for improved slip control by Honeywell additives, provide increased production efficiencies, reduced returns, and improved customer satisfaction by prolonged service life.

When two surfaces come into contact, especially under pressure or elevated temperatures, they may stick together. This is called Blocking. The anti-blocking properties, that Honeywell products entrain into coatings, provide release, reducing or eliminating damage to the surfaces in contact with each other. **(See photo in Figure 5 below):**



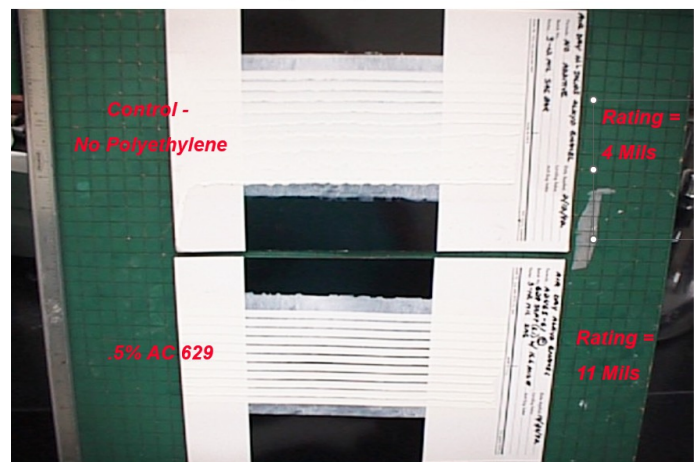
GRAPH 5: Anti-blocking improvement using an emulsion of A-C[®] 392. (Coatings were conditioned for 18 Hours, @ 16 lb/in², 73 ° F & 50% RH)

RHEOLOGY CONTROL

In formulating a coating system, rheology control is critical. During application, which is a high shear event, the coating must break down in viscosity for ease of application, then immediately begin to rebuild viscosity to prevent Sagging/Dripping (See Photo #6 below), and then finally build to a high viscosity in storage to prevent settling/separation, maintaining homogeneity. When added to solvent based formulations, AC® Oxidized Polyethylenes form associations with other paint components, providing very effective pigment suspension and sag control, resulting in improved application appearance.



Sag Resistance Air Dry Alkyd Enamel



GRAPH 6: Demonstration of AC® 629, an oxidized low density polyethylene, improving the sag resistance of an air-dried, solvent based alkyd coating. The addition of AC® 629, 656 or 645, at as little as .5% loading, greatly increases the sag resistance and anti-settling properties of solvent based coating automotive basecoats.

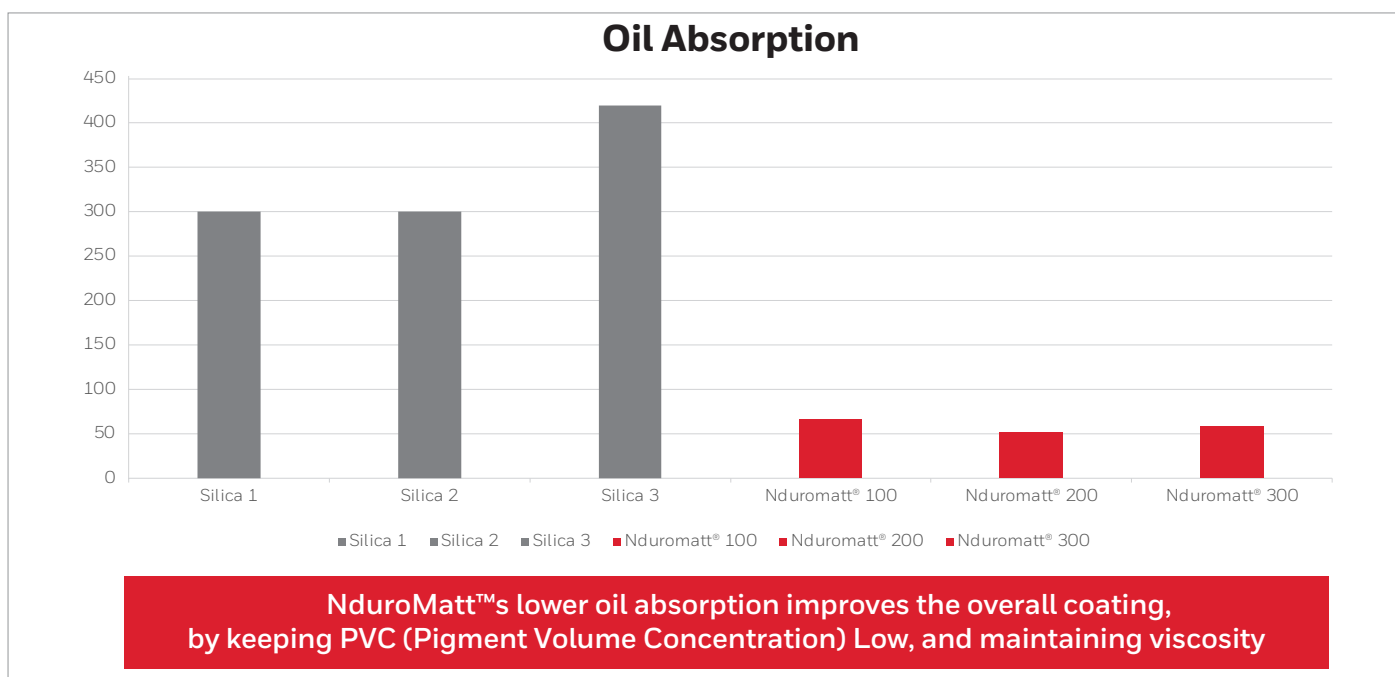


Honeywell AC® Ethylene-Acrylic Acid & Ethylene-Vinyl Acetate Copolymers provide rheology and mettalic flake orientation in solvent based automotive basecoats.

GLOSS CONTROL (MATTING)

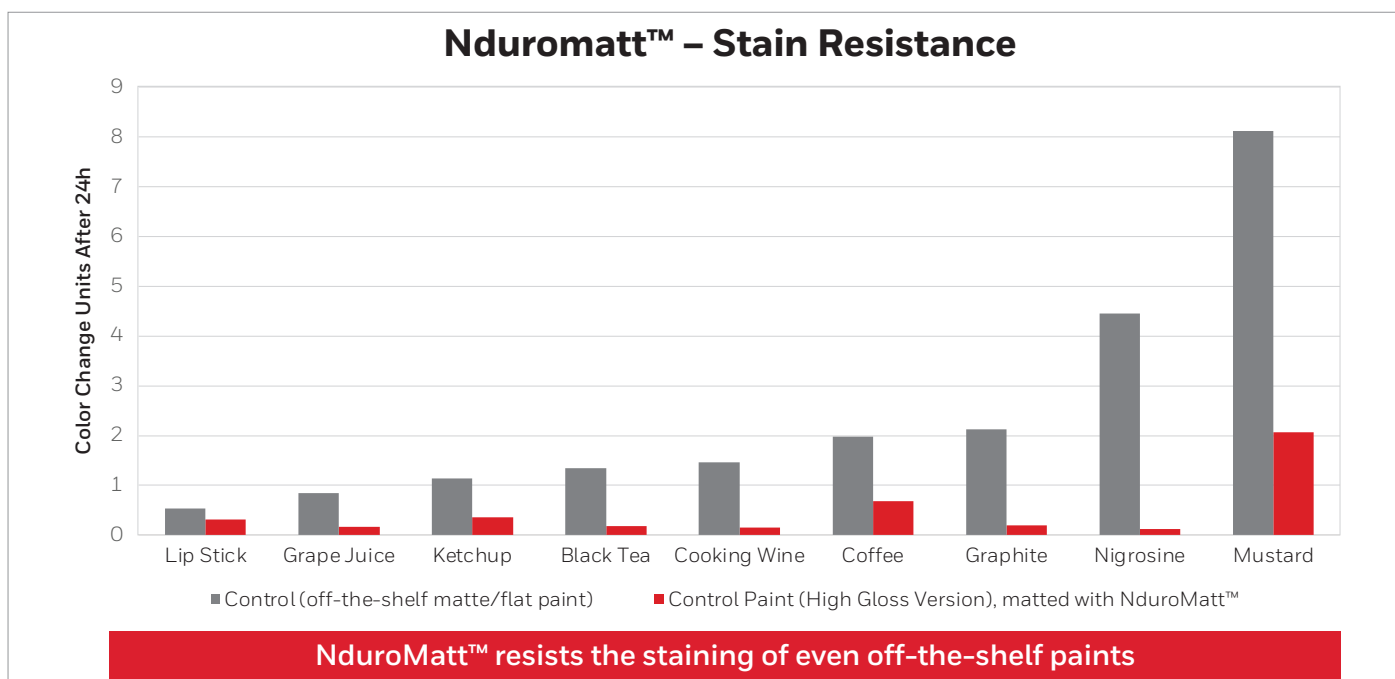
Matte coatings are more prevalent than ever before, yet the requirements for durability and longevity remain the same. Conventional matting agents make coating surfaces more susceptible to damage. The NduroMatt™ matting agent materials are multi-functional, efficient matting agents, that offer a wide range of performance attributes for all types of coatings. Those attributes include: improvements in surface properties (mar, abrasion, scratch, scuff, scrub, color transfer,

burnishing and haptic/hand), minimal viscosity build, due to much lower oil absorption (**See Figure #7 Below**), and improved stain resistance (**See Figure #8 below**). NduroMatt™ products can completely replace your existing matting system (**See Figure #9 Below**), or be used in conjunction to improve surface properties (**See Figure #10 Below**).



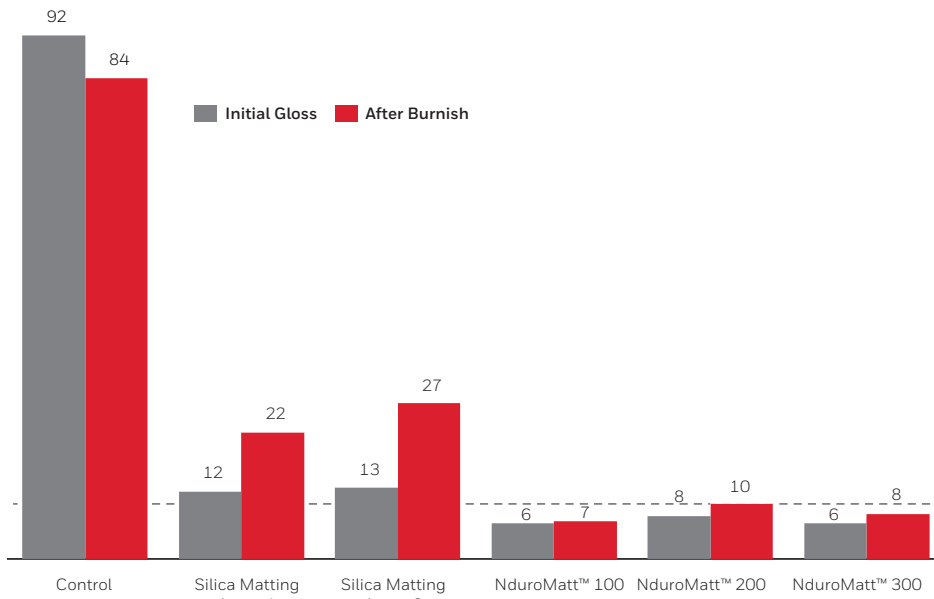
GRAPH 7: The comparative oil absorption values of three major types of silica vs NduroMatt™

NOTE: Label Silica #1 as Unsurface treated silica; Silica #2 as Organically surface treated silica; and Silica #3 as Fumed Silica.



GRAPH 8: Comparative stain resistance testing with and without NduroMatt™

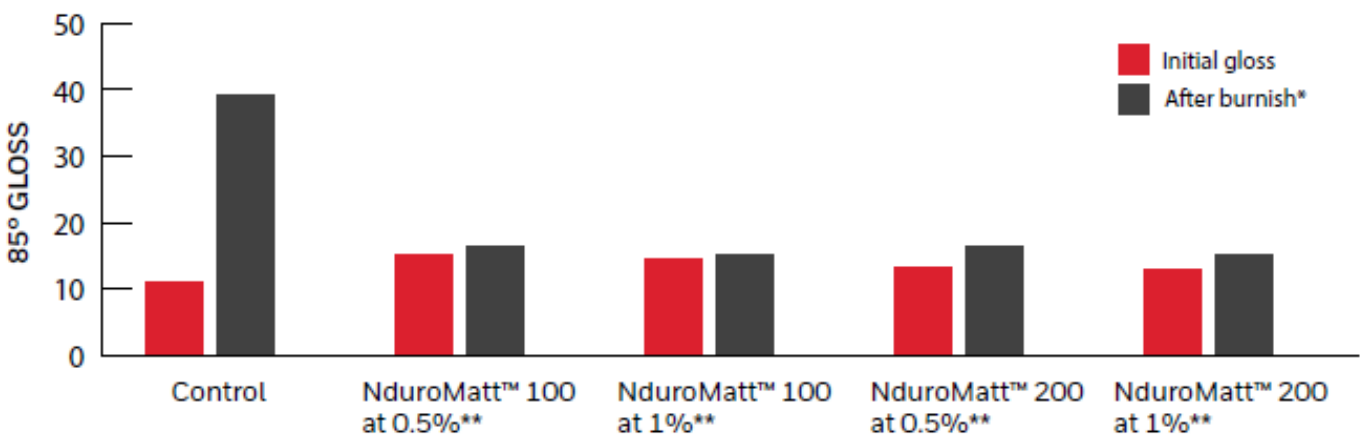
Burnish Resistance- Full replacement of matting agent



1. Gloss readings are at 85° Gloss Angle
 2. BYK Gardner Abrasion Tester: 300 cycles and an additional 500 grams of weight

GRAPH 9: Burnish results for water-based clear acrylics with NduroMatt™ post added at 5% w/w

Burnish Resistance- Partial replacement of matting agent



*400 cycles with 4 pounds (1.81kgs) weight
 **Post added w/w loading

GRAPH 10: Low gloss matte/flat architectural paint, produced by a major US Supplier, with small amounts of NduroMatt™ (.5 & 1.0%) to greatly improve burnish resistance

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OTHER ADVANTAGES OF USING HONEYWELL'S PERFORMANCE POLYMERS



MELT FLOW

As low molecular weight thermoplastic materials, A-C performance additives can be used to alter the melt flow properties of higher molecular weight film formers. This characteristic is useful in Powder Coatings by lowering melt viscosity, enhancing buffability in floor polishes, by a combination of pressure and frictional heating, and improving substrate wetting.



OTHER COATING'S INDUSTRY TYPES IMPACTED

Automotive BaseCoats, Fruit Coatings, Traffic Paints, Over Print Varnishes, Bottle Coatings, Can and Coil Coatings, etc.

MOISTURE AND CHEMICAL RESISTANCE

Because of their hydrophobic nature, A-C polyethylenes provide increased moisture resistance. This is an important feature in applications such as anti-transpirant fruit coatings, anti-corrosion coatings (ex: AClyn® Ionomers), and polishes. Many of the AC® polymers are relatively inert and can resist acids, bases and many types of solvents, especially at ambient temperatures.

DRIVING YOUR BUSINESS FORWARD

Honeywell's performance additives offer many important advantages, that can be utilized effectively in a wide range of applications. The Honeywell materials provide multi-functional performance enhancements, such as slip control, surface property improvements, rheology control, gloss reduction, adhesion boosting, etc. all from a single additive in many cases. Our additives allow you to produce more efficiently, and deliver higher performing products, very cost effectively for your customers.

Learn how to put the power of AC®, ACumist®, NduroMatt™ and AClyn® performance additives to work for you. Visit [Specialty Additives \(honeywell.com\)](https://www.honeywell.com) or call our **Global Technical Service Number: (800) 451-9961**, for more detailed information, and/or to order samples.

We are dedicated to helping you grow your profitability by developing products that keep your customers satisfied and grow their demand.

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**THE
FUTURE
IS
WHAT
WE
MAKE IT**