

# Antimicrobial Additive in TPU Surface Protection Film

## Value Proposition

SWM has incorporated an antimicrobial additive package in its commercial line of dual layer, thermoplastic polyurethane (TPU) surface protection films. This new Argotec™ product has been tested per JIS Z 2801 and the results of the JIS testing were a 99.98% average reduction (log 3) in bacterial growth on the film. The JIS Z 2801 is an internationally recognized industrial standard test protocol for measuring antibacterial activity on plastics and hard surfaces.

TPU surface protection films have been used broadly over the last decade for automotive exterior paint protection, electronic display screen protection, electronic device protection and a variety of surface protection applications where conformability around a 3-dimensional surface, optical clarity and abrasion resistance are important.

In many of these applications, the film is exposed to undesirable micro-organisms. A TPU film with an antimicrobial additive is desirable in these applications, especially if the additive has minimum impact on the film's optical/aesthetic characteristics and other properties.

## Background

SWM has supplied high gloss aliphatic, or non-yellowing, Argotec TPU film in automotive paint protection applications for over 15 years. Typically, Argotec film is coated with an optically clear, permanent/removable acrylic pressure sensitive adhesive (PSA) by Argotec customers. The TPU film contains no processing aids that may affect adhesive anchorage or printability, maximizing coating yield. The film/PSA construction is then die cut and applied to vulnerable (gravel, dirt, insect) automobile exterior surfaces. Film conformability around curved exterior vehicle surfaces, along with exceptional abrasion resistance, chemical resistance and UV stability/durability, are key properties of Argotec aliphatic TPU film.

**The TPU film/PSA protects the underlying paint for the life of the car, maintaining its appearance after exposure to:**

- General surface abrasion
- UV
- Moisture
- Cleaning solutions

At any time, the film/PSA can be removed, revealing the paint (or other) surface in its original condition. SWM's first introduction to paint protection was Argotec 49510, a 6-mil, single-layer, aliphatic TPU film cast on a high gloss PET carrier. In 2011, Argotec introduced a two-layer version 49510-60DV, adding a harder 60D surface (hard coat) for improved performance (stain and impact resistance) in the end use.

For some time, TPU paint protection films with appropriate PSA and release liner technology from adhesive coater and converters have been adopted to protect personal electronics and computer displays, including laptops, tablets and smart phones. Other than the gravelometer test, many of the performance requirements of automotive paint protection described above also apply to electronic devices.

Also for some time, end-users have requested TPU film with an antimicrobial additive package for a wide variety of applications and end-use locations. A TPU film with an antimicrobial additive package that inhibits the growth of mildew and bacteria on the film is desirable in electronic applications, particularly where such devices are shared by multiple users. Argotec has developed a novel, optically clear and cost effective approach to incorporate this package in traditional 49510-60DV TPU surface protection film.

## Opportunities and Challenges Incorporating an Antimicrobial Additive Package:

The opportunity to incorporate an antimicrobial additive package in traditional Argotec TPU film is defined by ever increasing end-user requests. The challenge is to incorporate an additive in the traditional surface protection film construction without sacrificing the key properties of the product enjoyed by endusers to date.

The key characteristics of traditional Argotec 49510-60DV are:

### Base Layer:

- 93A surface tension, no processing aids for maximum adhesive anchorage
- Conformable

### Surface Layer (hard coat):

- Gloss level
- Qualitative visual appearance – minimum orange peel and contamination
- Enhanced stain, abrasion and impact resistance

### Both Layers Combined:

- Low gel size and frequency
- Optimal haze/light transmission
- Low yellowness index
- Ideal tensile, elongation and stiffness of the composite for handling and installation

With these characteristics as a benchmark, the next step is to include an antimicrobial package in the traditional 49510-60DV TPU film to create 49510-60DV-AM. Typical antimicrobial additives are solids or liquids. Solids in particular present a challenge in that a solid may affect the haze, color or visual appearance of the film. Liquids pose a challenge for these same reasons; additionally, the processes to distribute the liquid additive evenly throughout the solid film layer are complex and expensive.

Through proprietary techniques, Argotec has developed a process to incorporate antimicrobial additives that inhibits the growth of mildew and bacteria on the film with minimal effect on the optical and physical properties of the film. The resulting films were tested per JIS Z 2801, a widely accepted test method for antimicrobial activity on hard surfaces and plastics.

Additionally, 49510-60DV-AM does not adversely affect downstream PSA coating, converting and installation processes. Argotec makes no direct or implied claims that this product protects users from disease-causing bacteria or provides other health benefits. Antimicrobial testing data provided for information only. No finished product incorporating this product may make any public health claims without first obtaining an EPA registration for the finished product. Regarding to the effectivity of antimicrobials, the EPA has precise language and guidelines that coaters, converters and end-users should reference in the promotion of their products. The reference document is EPA PR Notice 2000-1.

## Conclusion

As new applications develop for surface protection films, performance requirements for TPU film will continue to expand. Argotec 49510-60DV-AM successfully meets the needs of end users who have requested TPU surface protection film with an antimicrobial package, particularly for shared electronic devices.

## About SWM

SWM is a leading global performance materials company. We use natural fibers, resins, and polymers to provide essential solutions that enhance product performance and help our customers win in a variety of industries and applications. For further information, please visit our web site at [www.swmintl.com](http://www.swmintl.com).