TECHNICAL UPDATE

CRAY VALLEY

BENEFITS

- Excellent processing aid
- Improved weathering resistance
- Good surface quality

TARGET MARKETS/ APPLICATIONS

- Rigid PVC fencing, window frames and siding

Cleartack® W-110 Resin as PVC Lubricating Processing Aid With Excellent Weathering Resistance

Introduction

Polyvinyl chloride (PVC) is an important durable material used in many applications including outdoor building applications. Due to the high rigidity and modulus of PVC, it is often used in construction applications such as windows and siding. One of the drawbacks of PVC is thermal sensitivity, which leads to a narrower process window than other polymers. Because of this thermal sensitivity, processing aids are commonly used to enable easier processing of the PVC. Historically, these processing aids were acrylic based. A new development from Cray Valley is the use of Cleartack® W resins as process aids in PVC. Cleartack W resins are low molecular weight polymers based on the polymerization of aromatic hydrocarbons. Using Cleartack W instead of a traditional acrylic processing aid improves fusion time and gives high tensile strength, with very good impact strength and surface quality. All of these properties are achieved while also giving excellent weathering resistance. Cleartack W is offered in pastilles and a new powdered form.

Cleartack W-110 has a lower polarity than PVC (moderate polarity); therefore, some incompatibility is expected. This incompatibility provides a slip layer to achieve flow but not too much that it would block fusion. This means that Cleartack W-110 provides some lubricating effect while acting as a processing aid.

TotalEnergies

Certified renewable feedstock available

Formulations and Testing

In Table 1, the formulation of rigid PVC used in this study is shown.

Table 1: Formulation for the rigid PVC tested

Material	PHR
Shintech Se 950 PVC Resin (0.92 IV / 66K)	100
Advastab TM-181 Tin Stabilizer	1.3
Ferro 15F Calcium Stearate	0.6
Ferro 165 Paraffin Wax	1.0
Lonza Lonzest GMS Ester Wax	0.3
Arkema Durastrength 200 Impact Modifier	6.0
Pigment	12.0
Cleartack W-110	1.0
Lubricating Acrylic Processing Aid	1.0

From a previous study, the use of Cleartack W-110 resin as a lubricating process aid reduces torque and shear heating. This is shown in Table 2 where Cleartack W-110 is compared to a standard acrylic processing aid.

Table 2: Fusion performance of Cleartack W-110 and an acrylic processing aid

	Cleartack W-110	Acrylic
Fusion Time (s)	60	62
Fusion Torque (mg)	1,590	1,740
Fusion Temperature (°C)	170	177

In addition, Cleartack W-110 resin gave increased tensile strength versus the standard lubricating acrylic as shown in Table 3. Cleartack W-110 also gave comparable modulus and impact resistance properties.

Table 3: Physical properties for Cleartack W-110 versus a lubricating acrylic processing aid

	Cleartack W-110	Acrylic
Izod Impact (ft-lbs/in)	2.71	2.45
Tensile Strength (psi)	6,683	6,556
Modulus (psi)	382,149	378,634

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In the current study, compounds were extruded into sheets, and then cut into strips for testing resistance to weathering. Gloss retention was monitored over 1500 hours. Cleartack W-110 resin gave better gloss retention than acrylic processing aid as shown in Table 4. Weathering was tested using a QUV with method G154 cycle 1/0. Gloss was tested in accordance with ASTM D523.

Table 3: 60° gloss measurements as molded and after 1500 hours of accelerated weathering

	Cleartack W-110	Acrylic
As molded	77.2	73.9
After weathering	23.1	13.1
Retention	30%	18%

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Summary

The low polarity of Cleartack W-110 allows it to be used as a lubricating processing aid that improves PVC processability by reducing torque and shear heating, compared to acrylic processing aids. Cleartack W-110 also improves tensile strength with comparable impact resistance and provides better weatherability.

About Cray Valley

Cray Valley is a global supplier of specialty chemical additives, hydrocarbon specialty chemicals, and liquid and powder tackifying resins used as ingredients in adhesives, rubbers, polymers, coatings, and other materials. Cray Valley has pioneered the development of these advanced technologies, introducing hundreds of products that enhance the performance of products in energy, printing, packaging, construction, tire manufacturing, electronics, and other demanding applications.

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