APR Benchmark Polyethylene(PE) Films and Flexible Packaging
Innovation Test Protocol

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Concise title – “APR Benchmark Polyethylene(PE) Films and Flexible Packaging Test Protocol”

Introduction – Scope, Significance and Use
This method presents the steps used in processing and testing for a laboratory to evaluate the compatibility of PE-based films and flexible packaging design features with certain film reclamation systems sourcing post-consumer film from store drop-off collection points or, in some cases, curbside collection. The method also provides a report form for data and guidance from APR on evaluation of the results.

This test can be used to evaluate the impact of PE film design features and technologies, including multi-layer constructions, coatings, additives, printing, labels, or new PE resin co-polymer or multi-material compositions.

This test includes assessment of the effect of the material composition in both ASTM test parts and thicker gauge blown films up to 4.0 mil to model the expected end use applications of composite lumber and thick films such as construction sheeting or industrial liners. The APR recognizes the importance of a diversity of end-use applications for recycled PE films.

In APR Processing Practices and Test Protocols, the term “article” is used to mean the film or flexible package submitted for testing (except in the special case where a resin pellet is tested and is referred to simply as “resin pellet”). The article incorporates the design feature or material which requires test data for an APR recyclability classification.

The Benchmark test is not appropriate for package constructions that will not meet APR recommendations per the protocol SORT-B-03, Evaluation of Sorting Potential for Plastic Articles using Metal, Metallized, or Metallic Printed Components. If the sortation protocol does allow a Detrimental ruling on the article in question, it will qualify for the Benchmark protocol with the understanding that the metal sorting potential test does not allow any article to qualify as Preferred. This Benchmark test is not appropriate for materials that employ time dependent behavior where appearance or physical properties are expected to change over time. If it is questionable whether the test article meets these criteria, the appropriate APR sorting potential protocol or degradability test should be conducted prior to conducting the evaluation.
Notes on Food Residue
The purpose of this test protocol is to evaluate the design of a flexible packaging material. While the ultimate use of the package and its contents may be dependent on design, it is not the role or intention of APR test protocols to evaluate the fitness of a package for original use or to comment on appropriate contents. However, a quality supply stream is important to the overall health and advancement of the PE film recycling industry. To this end, brands that choose to package food, cosmetics, cleaning products, or any sticky or wet substance in a flexible package should be aware of “clean and dry” requirements for store drop-off recycling as well as prohibitions on food waste and residual liquids in bale specifications used by buyers and sellers.

Disclaimer: This document has been prepared by the Association of Plastic Recyclers as a service to the plastic industry to promote the most efficient use of the nation’s plastic recycling infrastructure and to enhance the quality and quantity of recycled postconsumer plastic. The information in this document is offered without warranty of any kind, either expressed or implied, including WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, which are expressly disclaimed. APR and its members accept no responsibility for any harm or damages arising from the use of or reliance upon this information by any party. Participation in the Recognition Program is purely voluntary and does not guarantee compliance with any U.S. law or regulation or that a package or plastic article incorporating the innovation is recyclable or will be recycled.

Safety Statement: APR Test and Practice documents do NOT CLAIM TO ADDRESS ALL OF THE SAFETY ISSUES, IF ANY, ASSOCIATED WITH THEIR USE. These Tests and Practices may require the use of electrically powered equipment, heated equipment and molten polymers, rotating motors and drive assemblies, hydraulic powered equipment, high pressure air, and laboratory chemicals. IT IS THE RESPONSIBILITY OF THE USER TO ESTABLISH AND FOLLOW APPROPRIATE SAFETY AND HEALTH PROCEDURES WHEN UNDERTAKING THESE TESTS AND PRACTICES THAT COMPLY WITH APPLICABLE FEDERAL, STATE AND LOCAL REGULATORY REQUIREMENTS. APR and its members accept no responsibility for any harm or damages arising from the use of or reliance of these Tests and Practice documents by any party.
Method Summary

This Benchmark test protocol provides three pathways for testing resins and articles (see flow diagrams found on pages 9 through 13) that employ multi-layer constructions, coatings, additives (including compatibilizers with the innovative material), printing, labels, or new PE resin co-polymer or multi-material compositions. Controls are comprised of similar articles made solely with a control PE resin without the innovation. Typically, material will be size reduced prior to extruding into pellets for blending, but these steps may be bypassed in certain cases if the film is not suitable for granulation. See method steps for further clarification.

All method steps are to be conducted per the PE Film Standard Laboratory Processing Practices, FPE-P-00.

Path 1A, 2A and 3 are utilized for complete PE control and test articles in the form of flexible or film materials. Path 1B and 2B are utilized when the control material cannot be secured in the form of flexible film and instead is in the form of resin pellets. If a resin pellet is selected as a control, the specific grade should be as close as possible in properties (density, MFI, molecular structure, etc) as the major PE component of the test film. Pellets are to be extruded to establish a heat history before testing. Film controls are encouraged to avoid any confounding factors when comparing a resin control to a blown film test article.

Path 1A and 1B
A flow diagram for Path 1A and 1B illustrates processing through these steps:

- Granulation (optional)
- Mechanical densification
- Sample blends created from the densified materials.
  - Sample A: 100% control material
  - Sample B: 50/50 blend of control material and test material
  - Sample C: 75/25 blend of control material and test material
- Blends dried, extruded and pelletized
- Pellet samples A and B subjected to testing and evaluation.
- Pellet samples A and B injected molded into ASTM test bars for testing and evaluation
- Pellet samples A and C blown into 3.0-4.0 mil monolayer film samples for further testing and evaluation.

Path 2A and 2B
A flow diagram for Path 2A and 2B illustrates processing through these steps:

- Oven densification
- Granulation
- Sample blends created from the densified materials.
  - Sample A: 100% control material
  - Sample B: 50/50 blend of control material and test material
  - Sample C: 75/25 blend of control material and test material
- Blends dried, extruded and pelletized
- Pellet samples A and B subjected to testing and evaluation.
- Pellet samples A and B injected molded into ASTM test bars for testing and evaluation
- Pellet samples A and C blown into 3.0-4.0 mil monolayer film samples for further testing and evaluation.
Path 3
A flow diagram for Path 3 illustrates processing through these steps:

- Without previous densification and/or size reduction the material may be fed directly into the extruder with pressure maintained for the control and test materials.
- Sample blends created from the whole articles.
  - Sample A: 100% control material
  - Sample B: 50/50 blend of control material and test material
  - Sample C: 75/25 blend of control material and test material
- Blends dried, extruded and pelletized
- Pellet samples A and B subjected to testing and evaluation.
- Pellet samples A and B injected molded into ASTM test bars for testing and evaluation
- Pellet samples A and C blown into 3.0-4.0 mil monolayer film samples for further testing and evaluation.

Reference Documents

The following documents are referenced in this Protocol:

APR PE Film Standard Laboratory Processing Practices, FPE-P-00 (incorporating FP-P-01 through FPE-P-07).

ASTM Pellet Test Methods:
  - ASTM D3418 Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry
  - ASTM D1238 Melt Flow Rates of Thermoplastics by Extrusion Plastometer
  - ASTM D792 Density and Specific Gravity (Relative Density) of Plastics by Displacement
  - ASTM D1505 Density of Plastics by the Density-Gradient Technique
  - ASTM D5630 Ash Content in Plastics
  - ASTM D6980 Determination of Moisture in Plastics by Loss in Weight
  - ASTM D1895 Apparent Density, Bulk Factor, and Pourability of Plastic Materials
  - ASTM D6290 Color Determination of Plastic Pellets

ASTM Molded Parts Test Methods:
  - ASTM D638 Tensile Strength
  - ASTM D638 Elongation at Yield
  - ASTM D256 Notched Izod
  - ASTM D1238 Melt flow

ASTM Film Test Methods:
  - ASTM D6988 Thickness of Plastic Film Test Specimens
  - ASTM D1922 Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method
  - ASTM D882 Tensile Properties of Thin Plastic Sheeting
  - ASTM D1709 Impact Resistance of Plastic Film by the Free-Falling Dart Method
Method Steps for Testing

The following steps are taken to prepare samples for evaluation; these steps are illustrated in the flow diagrams. Details of each step are presented in the PE Film Practices, FPE-P-01 through FPE-P-05, and FPE-P-07 (included in document FPE-P-00). The amount of material will depend upon the equipment and scale used in each laboratory.

Path 1A and Path 1B Method Steps

1. Obtain control and test film to use in the evaluation for Path 1A
2. Obtain control resin and test film to use in the evaluation for Path 1B
3. For each of the test and control articles for Path 1A, separately:
   a. Granulate the articles. This step is optional if granulation is not practical for the specific film article and if the mechanical densifier used can accept whole articles.
   b. Mechanically densify articles
4. Extrude control resin if required per Path 1B, to represent the initial film production heat history.
5. Prepare the following required blends:
   a. 100% densified control or pelletized control - Sample A
   b. 50/50 blend of densified control or pelletized control with the innovation article – Sample B
6. Extrude blends and melt filter per FP-P-00 Film Processing Practices to create pellet samples A and B.
   a. Pellet samples A and B are to be evaluated for DSC, FTIR, melt flow, density, ash content, moisture content, bulk density and color.
7. Injection mold A and B sample pellets into ASTM test parts per FP-P-00 Film Processing Practices for required part testing.
   a. Parts A and B are to be evaluated for tensile strength, elongation at yield, notched Izod, melt flow rate
8. Prepare film testing blend C using a 75/25 blend of densified control material and pellet sample B, for an effective innovation concentration of 25%. Produce thick gauge test film samples per FP-P-00 Film Processing Practices for required film testing.
   a. Film samples are to be evaluated for tear strength (MD&TD), tensile strength (MD&TD), elongation at yield (MD&TD), and dart impact.

Path 2A and Path 2B Method Steps

1. Obtain control and test film to use in the evaluation for Path 2A
2. Obtain control resin and test film to use in the evaluation for Path 2B
3. For each of the test and control articles for Path 2A, separately:
   a. Oven densify the articles
   b. Granulate the densified materials
4. Extrude control resin if required per Path 2B, to represent the initial film production heat history.
5. Prepare the following required blends:
   a. 100% densified control or pelletized control - Sample A
   b. 50/50 blend of densified control or pelletized control with the innovation article – Sample B
6. Extrude blends and melt filter per FP-P-00 Film Processing Practices to create samples: A pellets, B pellets.
   a. Pellet samples A and B are to be evaluated for DSC, FTIR, melt flow, density, ash content, moisture content, bulk density and color.
7. Injection mold A, B sample pellets into ASTM test parts per FP-P-00 for required parts testing.
   a. Parts A and B are to be evaluated for tensile strength, elongation at yield, notched Izod, melt flow rate
8. Prepare film testing blend C using a 75/25 blend of densified control material and pellet sample B, for an effective innovation concentration of 25%. Produce thick gauge test film samples per FP-P-00 Film Processing Practices for required film testing.
   a. Film samples are to be evaluated for tear strength (MD&TD), tensile strength (MD&TD), elongation at yield (MD&TD), and dart impact.

Path 3 Method Steps

1. Required blends are 100% control film; and a 50/50 blend of control material and test film.
2. Prepare the following required blends:
   a. 100% control film - Sample A
   b. 50/50 control film and innovation film-- Sample B
3. Direct feed into extruder without densification or granulation. Extrude blends and melt filter per FP-P-00 Film Processing Practices to create the samples: A pellets, B pellets.
   a. Sample A, B extruded pellets to be evaluated for DSC, melt flow, density, ash content, moisture content, bulk density and color.
4. Injection mold A, B sample pellets into ASTM test parts per FP-P-00 for required parts testing.
   a. Parts A and B are to be evaluated for tensile strength, elongation at yield, notched Izod, melt flow rate
5. Prepare film testing blend C using a 75/25 blend of densified control material and pellet sample B, for an effective innovation concentration of 25%. Produce thick gauge test film samples per FP-P-00 Film Processing Practices for required film testing.
   a. Film samples are to be evaluated for tear strength (MD&TD), tensile strength (MD&TD), elongation at yield (MD&TD), and dart impact.
Flake and Pellet Measurements, Report and Guidance Values

Path 1B or 2B Control 1st Melt History Extruded Pellet

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
<th>APR Guidance Preferred values</th>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen Pack Pressure Build</td>
<td>Practice FPE-P-06</td>
<td>Record and Report</td>
<td></td>
</tr>
</tbody>
</table>

Extruded Pellet Evaluation All Paths

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
<th>APR Guidance Preferred Values for All Samples</th>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen Pack Pressure Build</td>
<td>Practice FPE-P-06</td>
<td>End pressure no greater than 25% over starting pressure value</td>
<td></td>
</tr>
<tr>
<td>Melt Flow Rate</td>
<td>ASTM – D1238</td>
<td>&lt; 0.75 g/10minutes delta to the control</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>ASTM – D792 or ASTM 1505</td>
<td>&lt;0.996 g/cc for control and test</td>
<td></td>
</tr>
<tr>
<td>Ash</td>
<td>ASTM – D5630</td>
<td>Record and Report</td>
<td></td>
</tr>
<tr>
<td>Volatiles/Moisture</td>
<td>ASTM – D6980</td>
<td>&lt; 0.5%</td>
<td></td>
</tr>
<tr>
<td>Bulk Density</td>
<td>ASTM – D1895</td>
<td>&gt;480 kg/m³</td>
<td></td>
</tr>
<tr>
<td>FTIR</td>
<td>ASTM-D7399</td>
<td>Identify PP homopolymer, record and report</td>
<td></td>
</tr>
<tr>
<td>DSC</td>
<td>ASTM – D3418</td>
<td>Primary Peak not to exceed 150°C</td>
<td></td>
</tr>
<tr>
<td>Pellet Irregularity</td>
<td>Porosity, roughness, grainy, gloss etc.</td>
<td>Record, Report, and Photograph</td>
<td></td>
</tr>
<tr>
<td>Extrusion Process Irregularity</td>
<td>Unusual sticking, fumes, odor or build-up at the feed throat or die exit of the extruder</td>
<td>Record, Report, and Photograph</td>
<td></td>
</tr>
<tr>
<td>Pellet Color</td>
<td>ASTM – D6290</td>
<td>Can reveal contamination before later evaluation</td>
<td></td>
</tr>
</tbody>
</table>
### ASTM Parts Measurements, Report and Guidance Values

**Path 1 and 2 – ASTM Part Evaluation**

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
<th>APR Guidance Preferred values</th>
<th>Additional Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melt Flow Rate</td>
<td>ASTM – D1238</td>
<td>&lt; 0.75 g/10 minutes delta to the control</td>
<td></td>
</tr>
<tr>
<td>Tensile Strength at Yield</td>
<td>ASTM – D638</td>
<td>No more than a 25% Δ decrease from control to test samples.</td>
<td>Record and Report any increase</td>
</tr>
<tr>
<td>Elongation at Break</td>
<td>ASTM – D638</td>
<td>No more than a 50% Δ decrease from control to test sample.</td>
<td>Record and Report any increase</td>
</tr>
<tr>
<td>Notched Izod</td>
<td>ASTM – D256</td>
<td>Control and test samples should have the same break type or show greater ductility for test sample.</td>
<td>Record and report values for the control and test.</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>ASTM – D790</td>
<td>No more than a 25% Δ decrease from control to test samples.</td>
<td>Record and Report any increase</td>
</tr>
</tbody>
</table>

### Film Measurements, Report and Guidance Values

**Evaluation of Blown Film Samples All Paths**

<table>
<thead>
<tr>
<th>Property</th>
<th>Method</th>
<th>APR Guidance Preferred values for Samples A and B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>ASTM – D6988</td>
<td>3.0-4.0 target range (allowable delta from target +/- 20% within range) mils per FPE-P-06</td>
</tr>
<tr>
<td>Tear Strength (MD/TD)</td>
<td>ASTM – D1922</td>
<td>No more than a 25% Δ drop to the control. Record and report % increase.</td>
</tr>
<tr>
<td>Tensile Strength (MD/TD)</td>
<td>ASTM – D882</td>
<td>No more than a 25% Δ drop to the control. Record and report % increase.</td>
</tr>
<tr>
<td>Elongation @ Yield (MD/TD)</td>
<td>ASTM – D882</td>
<td>No more than a 25% Δ drop to the control. Record and report % increase.</td>
</tr>
<tr>
<td>Dart Impact</td>
<td>ASTM – D1709</td>
<td>No more than a 25% Δ drop to the control. Record and report % increase.</td>
</tr>
</tbody>
</table>
Path 1A: Flow Diagram for Control and Test PE Films (Grind then Densify)

START

Obtain Film Control FPE-P-01

Obtain Film with Design Feature FPE-P-02

Granulation (Optional) FPE-P-03

Granulation (Optional) FPE-P-03

Mechanical Densify FPE-P-04

Mechanical Densify FPE-P-04

Create Blends

Required Sample A
100% Control Material

Required Sample B
50% Control Material
50% Innovation Material

Create Blends

Sample FA
100% Control Material

Sample FC
75% Control Material
25% Innovation Material

Produce Blown Film from each Blend for Film Testing FPE-P-06

Injection Mold each Blend for Part Testing FPE-P-06

Extrude each Blend for Pellet Testing (FPE-P-05)

Required Evaluations
- Thickness
- Tear Strength (TD/MD)
- Tensile Strength (TD/MD)
- Elongation at Yield (TD/MD)
- Dart Impact
- Film Surface Impression
- Impurity Visual Inspection

Required Evaluations
- Thickness
- Tear Strength (TD/MD)
- Tensile Strength (TD/MD)
- Elongation at Yield (TD/MD)
- Dart Impact
- Film Surface Impression
- Impurity Visual Inspection

Required Evaluations
- Thickness
- Tear Strength (TD/MD)
- Tensile Strength (TD/MD)
- Elongation at Yield (TD/MD)
- Dart Impact
- Film Surface Impression
- Impurity Visual Inspection

Required Evaluations
- Screen pack pressure build
- DSC
- Melt Flow Rate
- Density
- Ash
- Moisture
- Bulk Density
- Required Observations:
  - Surface Irregularity
  - Extrusion Process Irregularity
  - Pellet discoloration

END
Path 1B: Flow Diagram for Control as Resin and Test as Film (Grind then Densify)

START

Obtain Film Control FPE-P-01

Obtain Film with Design Feature FPE-P-02

Granulation (Optional) FPE-P-03

Mechanical Densify FPE-P-04

Extrude FPE P-05

Create Blends

Required Sample A 100% Control Material

Required Sample B 50% Control Material 50% Innovation Material

Create Blends

Sample FA 100% Control Material

Sample FC 75% Control Material 25% Innovation Material

Required Evaluations A&B
Thickness
Tear Strength (TD/MD)
Tensile Strength (TD/MD)
Elongation at Yield (TD/MD)
Dart Impact
Film Surface Impression
Impurity Visual Inspection

Produce Blown Film from each Blend for Film Testing FPE-P-06

Injection Mold each Blend for Part Testing FPE-P-06

Required Evaluations A,B
Tensile Strength
Elongation at Yield
Notched Izod
Melt Flow

END

Obtain Film Control FPE-P-01

Obtain Film with Design Feature FPE-P-02

Create Film Blends

Sample FA 100% Control Material

Sample FC 75% Control Material 25% Innovation Material

Extrude each Blend for Pellet Testing (FPE-P-05)

Required Evaluations
Screen pack pressure build
DSC
Melt Flow Rate
Density
Ash
Moisture
Bulk Density

Required Observations
Surface Irregularity
Extrusion Process
Irregularity
Pellet discoloration

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Path 2A: Flow Diagram for Control and Test PE Films (Densify then Grind)

START

<table>
<thead>
<tr>
<th>Obtain Film Control FPE-P-01</th>
<th>Oven Densify FPE-P-04</th>
<th>Granulation FPE-P-03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain Film with Design Feature FPE-P-02</td>
<td>Oven Densify FPE-P-04</td>
<td>Granulation FPE-P-03</td>
</tr>
</tbody>
</table>

Create Blends

- Required Sample A
  - 100% Control Material
- Required Sample B
  - 50% Control Material
  - 50% Innovation Material

Create Film Blends

Sample FA
- 100% Control Material

Sample FC
- 75% Control Material
- 25% Innovation Material

Produce Blown Film from each Blend for Film Testing FPE-P-06

Injection Mold each Blend for Part Testing FPE-P-06

- Required Evaluations A,B
  - Tensile Strength
  - Elongation at Yield
  - Notched Izod
  - Melt Flow

Sample FA

- Required Evaluations
  - Thickness
  - Tear Strength (TD/MD)
  - Tensile Strength (TD/MD)
  - Elongation at Yield (TD/MD)
  - Dart Impact
  - Film Surface Impression
  - Impurity Visual Inspection

Sample FC

- Required Evaluations
  - Screen pack pressure build
  - DSC
  - Melt Flow Rate
  - Density
  - Ash
  - Moisture
  - Bulk Density

Required Observations:
- Surface Irregularity
- Extrusion Process Irregularity
- Pellet discoloration

END
Path 2B: Flow Diagram for Control as Resin and Test as Film (Densify then Grind)

START 

Obtain Film Control FPE-P-01

Obtain Film with Design Feature FPE-P-02

Oven Densify FPE-P-04

Extrude FPE-P-05

Granulation FPE-P-03

Create Blends

Required Sample A
100% Control Material

Required Sample B
50% Control Material
50% Innovation Material

Create Blends

Sample FA
100% Control Material

Sample FC
75% Control Material
25% Innovation Material

Produce Blown Film from each Blend for Film Testing FPE-P-06

Injection Mold each Blend for Part Testing FPE-P-06

Sample A
100% Control Material

Sample B
50% Control Material
50% Innovation Material

Required Evaluations A&B
Thickness
Tear Strength (TD/MD)
Tensile Strength (TD/MD)
Elongation at Yield (TD/MD)
Dart Impact
Film Surface Impression
Impurity Visual Inspection

Required Evaluations A&B
Tensile Strength
Elongation at Yield
Notched Izod
Melt Flow

Required evaluations
Screen pack pressure build
DSC
Melt Flow Rate
Density
Ash
Moisture
Bulk Density
Required Observations:
Surface Irregularity
Extrusion Process Irregularity
Pellet discoloration

END
Path 3: Flow Diagram for Control and Test PE Films Direct Feed (No Grind or Densify)

START

Obtain Film Control FPE-P-01

Obtain Film with Design Feature FPE-P-02

Create Blends

Required Sample A  
100% Control Material

Required Sample B  
50% Control Material  
50% Innovation Material

Create Film Blends

Sample FA  
100% Control Material

Sample FB  
75% Control Material  
25% Innovation Material

Extrude each Blend for Pellet Testing (FPE-P-05)

Injection Mold each Blend for Part Testing FPE-P-06

Produce Blown Film from each Blend for Film Testing FPE-P-06

Obtain Film Control FPE-P-01

Obtain Film with Design Feature FPE-P-02

END

Required Evaluations A, B
Thickness
Tear Strength (TD/MD)
Tensile Strength (TD/MD)
Elongation at Yield (TD/MD)
Dart Impact
Film Surface Impression
Impurity Visual Inspection

Required Evaluations A&B
Thickness
Tear Strength (TD/MD)
Tensile Strength (TD/MD)
Elongation at Yield (TD/MD)
Dart Impact
Film Surface Impression
Impurity Visual Inspection

Required Evaluations A&B
Thickness
Tear Strength (TD/MD)
Tensile Strength (TD/MD)
Elongation at Yield (TD/MD)
Dart Impact
Film Surface Impression
Impurity Visual Inspection

Required evaluations
Screen pack pressure build
DSC
Melt Flow Rate
Density
Ash
Moisture
Bulk Density

Required Observations:
Surface Irregularity
Extrusion Process Irregularity
Pellet discoloration

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<table>
<thead>
<tr>
<th>Version</th>
<th>Publication Date</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>April 20, 2018</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>May 17, 2018</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>October 24, 2018</td>
<td>Added © and Compatibilizer language in Scope on P. 2</td>
</tr>
<tr>
<td>4</td>
<td>August, 2020</td>
<td>Eliminated references to virgin resin controls, eliminated washing and drying, eliminated float/sink requirement, modified blend naming to clarify difference in test material concentration for parts testing and film testing; added thick blown film to test, aligned test thresholds with Critical Guidance Protocol, adjusted formatting to be consistent with Critical Guidance Protocol, revised Flow Diagrams to be consistent with Critical Guidance Protocol.</td>
</tr>
</tbody>
</table>