FILM SLITTING

The slitting of a roll of film from a large master roll to a size that can be further converted and then placed on packaging machinery is a key converting process. This process can depend on many factors from equipment parameters to the film polymer type of the film itself and the thickness of film being slit.

There are three slitting methods used today by secondary converters for slitting roll stock into smaller rolls. These methods are crush cutting, razor knife and shear slitting. Each of these methods has been used to slit biaxially oriented polylactide (BOPLA) film, however there are specific benefits to using one slitting method over another method. Razor knife and shear slitting methods have been utilized for slitting BOPLA with the greatest success.

Crush cut slitting involves the use of a non-chiseled cutting wheel that crushes the film through pneumatic force against a hardened steel roller until the film separates. With low ductility films such as BOPLA, this method tends to leave a moderate quality edge, which can result in edge defects and ultimately tears across the web during slitting. This slitting method is generally not recommended for PLA.

In general, razor knife cutting tends to produce a poor quality edge, however it is usually a last resort for secondary converters when other slitting methods have failed. Using a support roller for the film placed directly under the razor knife can improve the edge quality to some degree and is recommended for BOPLA.. The edge of the film can be raised due to the gradual dulling of the razor. This raised edge is caused when the razor gets warm and starts to melt a small part portion of the film as it passes over the razor. A raised edge can cause winding issues on the slitting machine and other packaging machines. Razor knifes made from carbon steel, stainless steel, titanium carbide coated, ceramic and solid tungsten carbide can be selected for slitting based on the film being slit and the desired wear life for the blade.

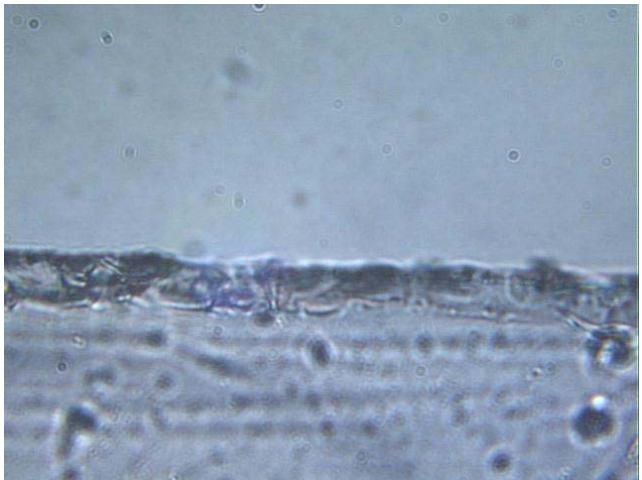
Rotary shear slitting has been found to be the ideal method for slitting BOPLA film. This method involves a chiseled cutting wheel that rotates past a fixed or rotating shear wheel. The cut is made similar to that of a scissors using rotating wheels in place of straight blades. This method can create a high amount of dust, however it does produce the highest quality edge. A set of shear slitting parameters found to work well for BOPLA film are listed in Table 1.

Table 1	
Air Line Pressure	4 – 4.5 bars
Side Load Pressure	3 bars
Cant Angle	0.5 degrees
Cutting Wheel	Compound bevel 25°and 15°
Shear Wheel	3 -5 °back grind

Figures 1 and 2 below show the difference in a cut edge between razor slitting with a stainless steel blade and rotary shear slitting using the parameters above. A saw tooth pattern along the edge of the razor cut film can be seen where as the edge for the rotary shear slit film is smooth.

Figure 1. Razor slitting BOPLA film

Figure 2. Rotary Shear Slitting BOPLA film



Safety and Handling Considerations
Material Safety Data (MSD) sheets for PLA polymers are available from NatureWorks LLC. MSD sheets are provided to help customers satisfy their own handling, safety, and disposal needs, and those that may be required by locally applicable health and safety regulations, such as OSHA (U.S.A.), MAK (Germany), or WHMIS (Canada). MSD sheets are updated regularly; therefore, please request and review the most current MSD sheets before handling or using any product.

The following comments apply only to PLA polymers; additives and processing aids used in fabrication and other materials used in finishing steps have their own safe-use profile and must be investigated separately.

Hazards and Handling Precautions
PLA polymers have a very low degree of toxicity and, under normal conditions of use, should pose no unusual problems from incidental ingestion, or eye and skin contact. However, caution is advised when handling, storing, using, or disposing of these resins, and good housekeeping and controlling of dusts are necessary for safe handling of product. Workers should be protected from the possibility of contact with molten resin during fabrication. Handling and fabrication of resins can result in the generation of vapors and dusts that may cause irritation to eyes and the upper respiratory tract. In dusty atmospheres, use an approved dust respirator. Pellets or beads may present a slipping hazard. Good general ventilation of the polymer processing area is recommended. At temperatures exceeding the polymer melt temperature (typically 170ºC), polymer can release fumes, which may contain fragments of the polymer, creating a potential to irritate eyes and mucous membranes. Good general ventilation should be sufficient for most conditions. Local exhaust ventilation is recommended for melt operations. Use safety glasses if there is a potential for exposure to particles which could cause mechanical injury to the eye. If vapor exposure causes eye discomfort, use a full-face respirator. No other precautions other than clean, body-covering clothing should be needed for handling PLA polymers. Use gloves with insulation for thermal protection when exposure to the melt is localized.

Combustibility
PLA polymers will burn. Clear to white smoke is produced when product burns. Toxic fumes are released under conditions of incomplete combustion. Do not permit dust to accumulate. Dust layers can be ignited by spontaneous combustion or other ignition sources. When suspended in air, dust can pose an explosion hazard. Firefighters should wear positive-pressure, self-contained breathing apparatuses and full protective equipment. Water or water fog is the preferred extinguishing medium. Foam, alcohol-resistant foam, carbon dioxide or dry chemicals may also be used. Soak thoroughly with water to cool and prevent re-ignition.

Disposal
DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. For unused or uncontaminated material, the preferred options include recycling into the process or sending to an industrial composting facility, if available; otherwise, send to an incinerator or other thermal destruction device. For used or contaminated material, the disposal options remain the same, although additional evaluation is required. (For example, in the U.S.A., see 40 CFR, Part 261, "Identification and Listing of Hazardous Waste.") All disposal methods must be in compliance with Federal, State/Provincial, and local laws and regulations.

Environmental Concerns
Generally speaking, lost pellets are not a problem in the environment except under unusual circumstances when they enter the marine environment. They are benign in terms of their physical environmental impact, but if ingested by waterfowl or aquatic life, they may mechanically cause adverse effects. Spills should be minimized, and they should be cleaned up when they happen. Plastics should not be discarded into the ocean or any other body of water.

Product Stewardship
NatureWorks LLC has a fundamental duty to all those that make and use our products, and for the environment in which we live. This duty is the basis for our Product Stewardship philosophy, by which we assess the health and environmental information on our products and their intended use, then take appropriate steps to protect the environment and the health of our employees and the public.

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