

The Film & Coating Connection

"Spreading the News"

Issue #15

December, 2010

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Sustainability and Other Challenges in Flexible Packaging

Flexible packaging obviously plays an extremely important role in today's society, but also faces multiple challenges and obstacles. One of the most extraordinary challenges that flexible packaging faces, is the pivotal role it will play in supporting population growth in the decades ahead. Population growth is expected to increase from approximately 6.8 billion people today, to more than 8.5-10 billion inhabitants by the year 2040. The obvious question is, "how are we going to effectively produce and distribute food to support this population growth?" One of the most promising solutions is through better food packaging.

REFLECTIONS ON BEING GREEN



It is estimated that today, as much as fifty percent of all food spoils before it is consumed. So the goal in the next few decades will be to significantly reduce the amount of food spoilage to help support population growth. This can be achieved by designing and developing food packaging that will effectively reduce food spoilage (e.g. high barrier packaging, re-closeable packaging, smart packaging, etc.). Due to the amount of time it takes to develop and bring packaging improvements to market, the flexible packaging industry is currently busy working on packaging solutions to address this specific issue. This task becomes more complex as consumers demand packaging that is more sustainable - packaging that uses the least amount of natural resources with minimal environmental impact.

Talk to an elementary school class and it is not uncommon to hear the comment or consensus that, "plastics are bad." But we all know that without plastics and flexible packaging there would be a detrimental effect on the sustainability of the food distribution network - food spoilage would greatly surpass fifty percent. Chevron Phillips Chemical's goal is to positively impact sustainability by developing new and improved flexible packaging aimed at providing superior quality of life today and for future generations. But we don't stop there! Chevron Phillips Chemical accomplishes this by minimizing the impact on the environment by consistently minimizing raw materials, reducing emission, and lowering energy consumption in our production facilities. Chevron Phillips Chemical also works closely with many of our suppliers and customers to help them achieve their sustainability goals. Many of these accomplishments can be found on Chevron Phillips Chemical's sustainability statement, www.cpchem.com.

News about the people, products, and processes in flexible packaging.

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Industry Events

SPE International Polyolefins Conference and FlexPackCon

– The 23rd International Polyolefins Conference will take place in Houston, Texas at the Hilton Hotel North on February 27- March 2, 2011. The theme of the event will be "Evolving Technology for the Global Economy." Visit www.spe-stx.org

Flexible Packaging Association Annual Meeting

– The annual meeting of the Flexible Packaging Association will be held March 9-11, 2011 at The Ritz-Carlton Golf Resort in Naples, Florida. The meeting will include general sessions that focus on industry-specific issues and networking opportunities as well as presentation of the 2011 Flexible Packaging Achievement Awards. Visit www.flexpack.org

Polyethylene Films 2011

– The 9th annual Polyethylene Films Conference will take place on April 14-15, 2011 at the Shores Resort and Spa in Daytona Beach, Florida. Visit www.amiplastics-na.com

SPE ANTEC 2011 – The 2011 ANTEC will take place on May 1-5, 2011 at the Hynes Convention Center and Boston Marriott Copley Center Hotel in Boston, Massachusetts. Visit www.4spe.org

Tappi PLACE Flexible Packaging Symposium

– Join your colleagues one day prior to the start of the ICE SHOW for the 2011 TAPPI PLACE Flexible Packaging Symposium, April 5, 2011 at the Orange County Convention Center in Orlando, Florida USA. Visit www.tappi.org

MarFlex® HHM TR-258 is a 0.2 MI, 0.923 density low density linear polyethylene (LDLPE) blown film resin produced on Chevron Phillips Chemical's loop reactor technology, and offers a unique combination of processing characteristics and physical properties. A good physical description of MarFlex® HHM TR-258 is that it has the frosty appearance of HDPE with a feel that is more like that of LDPE.

MarFlex® HHM TR-258 has a broad molecular weight distribution, processes easily, and can be used alone, in blends, or in coextrusions. It also can be processed on a wide range of die gaps (35-100 mils) in either seated bubble or high stalk blown film processes.

MarFlex® HHM TR-258 possesses excellent melt strength and is therefore especially suited for use in blends with LLDPE to improve bubble stability and processing rates. The high melt strength allows for the production of heavy gauge films such as those found in C&A markets. Films produced with MarFlex® HHM TR-258 also have a unique matte finish, so slip and antiblocking additives are not required unless there is a need to reduce the COF to less than 0.3.

An interesting feature of MarFlex® HHM TR-258 is that it has shrink characteristics similar to fractional melt index LDPE and is worth considering for use in shrink film applications. The following table compares properties of both MarFlex® HHM TR-258 and a fractional melt LDPE at 2 mils.

Property	Units	MarFlex® HHM TR-258	Fractional MI LDPE
Resin MI	(g/10 min.)	0.2	0.5
Resin Density	(g/cc)	0.923	0.923
Slip	(ppm)	0	0
Antiblock	(ppm)	0	6000
Film Gauge	(mil)	2	2
Die Gap	(mil)	35	35
BUR	N/A	2.5	2.5
Shrink, MD/TD	(%)	80 / 19	80 / 28
Haze	(%)	48	11
Gloss, 60°	N/A	26	89
COF	(kinetic/static)	0.35 / 0.32	0.49 / 0.48
Elmendorf Tear, MD/TD	(g/mil)	50 / 542	141 / 127
Dart Impact	(g)	168	172
Tensile @ Yield, MD/TD	(psi)	2,651 / 2,015	No Yield / 1,598
Tensile @ Break, MD/TD	(psi)	6,166 / 5,641	3,395 / 3,142
Elong. @ Break, MD/TD	(%)	563 / 760	235 / 540
1% Secant Mod., MD/TD	(psi)	38,104 / 63,284	26,014 / 30,982
WVTR	(g/100in ² /day)	0.4354	0.6435
OTR	(cc/100in ² /day)	182	218

Although the optical properties are not on par with that of LDPE, this concern can be addressed by placing MarFlex® HHM TR-258 in the core layers of coex structure. This allows the shrink characteristics of MarFlex® HHM TR-258 to be utilized while high clarity skin layers, such as MarFlex® D350 mMDPE can impart low haze and high gloss to the structure.

Please contact your Chevron Phillips Chemical sales or technical service representative, or visit www.cpchem.com, if you would like to learn more about MarFlex® HHM TR-258.

"The Film & Coating Connection" is pleased to offer useful extrusion processing tips. However, due to the complexity of production and manufacturing, these tips should be used only as rough guidelines and suggestions. Implementation of any of these processing tips could affect the finished properties of the final product and should never be implemented without proper safety considerations. Further, they are not a substitute for your own expertise.

Melt Index and Density Blend Calculator – More often than not, two or more materials are being blended together to achieve the desired properties of a structure. When blending materials together it can be very useful to know the finished melt index and density of this blend. Knowing the melt index of the blend can be a predictor of how the material is going to process and can help predict back pressures, motor loads, drawability, neck-in, bubble stability and can also help determine if interfacial instability might be encountered if coextruding.

Finished density will help predict the properties of the structure, such as stiffness, temperature resistance, and barrier properties, to name a few. To download an easy to use calculator that can be used to calculate the melt index and density of a blend, [click here](#). Note, that this calculator is used for two or more materials, however melt index (190C and 2.1kg) must be used and not other properties such as HLMI, MFR or intrinsic viscosity. The calculator is most accurate when all materials are polyethylene.

Extruder RPM Calculator – Instead of manually calculating extruder rpm to achieve a desired coating weight, [click here](#) to download a spreadsheet that will automatically calculate it for you. To use this extruder RPM calculator, simply input target line speed, die width, extruder pumping efficiency, target coating weight for each extruder and the extruder rpm set points will be calculated. Inputting the resin density in the spreadsheet will also calculate the thickness of the extrudate along with target coating weight.

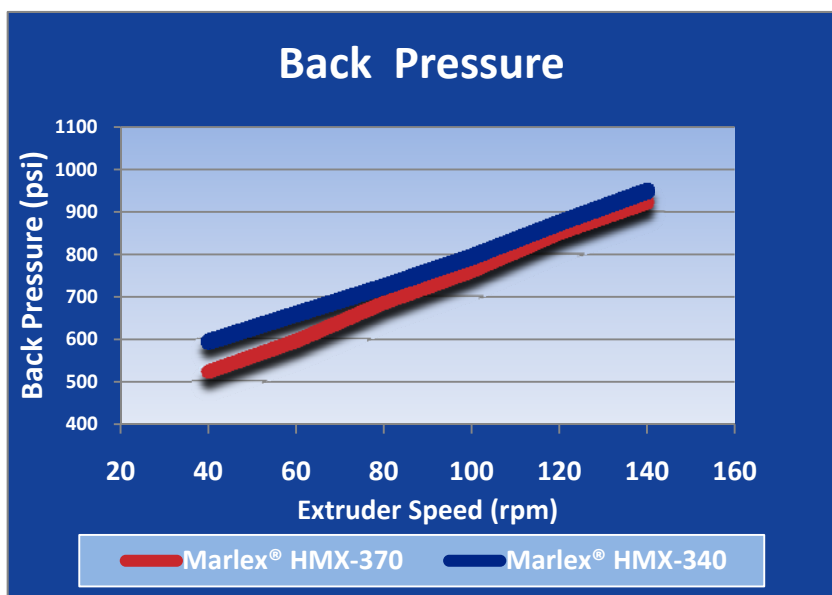
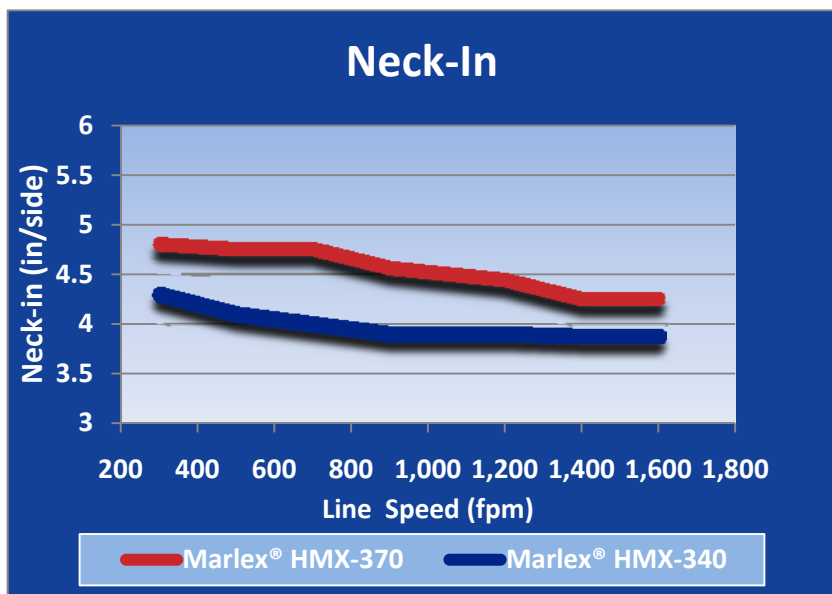
Masterbatch Blend Calculator – Adding a masterbatch or concentrate to a blend and trying to determine how much to add to achieve a target concentration? For example, if adding a 5% slip masterbatch to a blend and trying to achieve a total concentration of 1000ppm. Then this blend calculator will easily show that 2% of the slip masterbatch is needed. [Click here](#) to download the blend calculator.

Extrusion Coating Troubleshooting Guide – [Click here](#) to download the Chevron Phillips Chemical extrusion coating troubleshooting guide. This comprehensive guide covers everything from adhesion and die lip build-up issues, to gauge bands and pinholes. Simply look up the defect and several causes and solutions are suggested to reduce or eliminate the issue at hand.

New Marlex® Polypropylene Extrusion Coating Grade

Polypropylene possesses properties that make it ideal for certain markets in extrusion coating. Higher temperature resistance, greater stiffness, improved moisture barrier and better grease resistance (compared to LDPE) make polypropylene the resin of choice for some applications. However, because PP does not have the superior melt strength of LDPE, and relies on a different mechanism to obtain good adhesion to most substrates, it has long been viewed as a “challenging” resin to process in extrusion coating.

Recently however, Phillips Sumika Polypropylene Company has addressed this issue and launched a new extrusion coating grade of PP, Marlex® HMX-340, with improved processing. Marlex® HMX-340 is a 0.909 density, 34 MFR PP and has replaced Marlex® HMX-370 which was a 37 MFR. The slightly higher viscosity of Marlex® HMX-340 provides a significant neck-in advantage, compared to HMX-370, but does not substantially increase extruder back pressure or motor loads during processing.



For more information on Phillips Sumika polypropylene resins, check out www.cpchem.com or contact Jennifer Hicks, Phillips Sumika technical service specialist, hicksjl@cpchem.com.

Versatility of MarFlex® 4517

Chevron Phillips Chemical produces many grades of extrusion



coating resins with a melt index range of 3.5 -16 MI. It is critical to match the viscosity or melt index to the amount of draw-down needed for a particular application. For example, in applications where coating weights of 7 #/ream (0.5mil) or greater are required, then MarFlex® 1017, at a 7MI, is typically the resin of choice. This is the highest viscosity LDPE extrusion grade produced by Chevron Phillips Chemical. At these higher coating weights neck-in is minimized and draw-down is not a concern. At the other end of the spectrum, applications with very low coating weights, for example 2-3#/ream (0.2mils), require a low viscosity resin with excellent draw-down, such as MarFlex® 1019, with a 16MI. The trade-off though, with low viscosity, high draw-down resins, is a greater amount of neck-in.

The challenge is that some processors may serve many different markets and have applications with various coating weights and thicknesses. In some cases, it may not be practical to inventory more than one LDPE grade. This is where MarFlex® 4517 can be part of the solution. MarFlex® 4517 is often thought of as a general purpose extrusion coating grade, primarily due to the fact that at a relatively low melt index (5.1MI), it has outstanding draw performance.

MarFlex® 4517 has specifically been designed to offer an excellent balance of good drawdown properties with minimal neck-in. MarFlex® 4517 can be drawn down to the 2-3#/ream range with less than 2" of neck-in per side. MarFlex® 4517 also has a higher melting point compared to Chevron Phillips Chemical's 10XX series resins (109C vs.104C), which also gives MarFlex® 4517 slightly higher temperature resistance required for hot cup applications.

To determine if MarFlex® 4517, high performance, general purpose grade is suitable for your particular application, please contact your Chevron Phillips Chemical technical service representative or visit www.cpchem.com.

Internet Resources

Regulatory Information – Looking for product regulatory information for Chevron Phillips Chemical products, then check out Product Regulatory Overviews (PRO's) at www.cpchem.com

SPE Plastics Encyclopedia – General plastics information arranged by general directory, hot topics, or by contributor. Check out www.4spe.org

Featured Guest Article - Coefficient of Friction Properties Effect on Winding – Duane Smith



The goal of every film manufacturer is to consistently wind quality rolls to insure that their printing and converting customers can produce defect free products. Roll density or hardness is the key factor for consistently producing quality rolls of film materials. The amount of in-wound tension or residual stress wound into the roll is obtained by using one or more of the T.N.T. (Tension/Nip/Torque) winding principles. The film's layer to layer coefficient of friction properties have a major effect on the ability to apply the T.N.T. principles to produce the desired roll hardness without roll defects.

In general, films which have a layer to layer coefficient of friction (COF) value of 0.2 to 0.7 will wind well. However, consistently winding defect free rolls of high slip or low slip (low COF or high COF) films usually presents major winding challenges. High slip films have low layer to layer COF (generally $COF < 0.2$). These films will often have inner web slippage or cinching problems when they are winding and/or in subsequent unwinding operations or will have roll handling problems in between these operations. This inner web slippage can result in defects such as web scratching, dishing, telescoping and/or starting roll defects. Low COF films need to be wound as tight as possible at the core, usually with high torque, and then taper the winding torque to a minimum amount at 3 to 4 times the core O.D. and build the desired roll hardness using the Nip winding principle. Air is never our friend when winding high slip films! These films always need to be wound with uniform nip loading to prevent air from entering the roll during the winding process.

Low slip films have high layer to layer COF (generally $COF > 0.7$). These films will often have blocking and/or wrinkling problems. When surface winding these high COF films, out of round rolls can be expected at low winding speeds and roll bouncing can also be a problem when winding at higher speeds. As explained by well know consultant and columnist Tim Walker of TJWA Inc., "this is due to the fact that the outer layers of a winding roll requires a small amount of sliding action as the layers first enters the winding roll. This sliding action produces in-wound tension as the air following the web is ejected from the nip or out the sides. If the full width slides, this is not a problem. But, if one lane or spot sticks and the rest slide, then a local shear stress will develop near the sticking point. This local shear may form a small buckle or soft wrinkle in the top layer. In some products, a small bump or ripple can be wound over and ignored, but in other products (especially optically clear films), the next layer will not smoothly wind over a bump or ripple, but will instead conform over the bump, producing a slightly larger bump or ripple. As additional layers are added, like a rolling snow ball, the defect will often get bigger with each turn." These defects are commonly called slip knots or slip wrinkles. High COF films are best gap wound with a minimum gap between the following roll and the winding roll. Spreading needs to be provided as close to the winding point as possible. A Flex-Spreader covering on the following roll has proven to be successful on a number of high COF winding applications.

For additional Tech Tips from Davis-Standard Converting Systems or the TAPPI Reference book *Roll and Web Defect Terminology*, please contact Duane Smith at smithd@bc-egan.com.

DISCLAIMER

Before using the product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the product is suited and the information is applicable to the user's specific application. Chevron Phillips Chemical Company LP does not make, and expressly disclaims, all warranties, including warranties of the merchantability or fitness for a particular purpose, regardless of whether oral or written, expressed or implied, or allegedly arising from any usage of any trade or from any course of dealing in connection with the use of the information contained herein or the product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state, or local laws, which may be encountered in the use thereof. Such questions should be investigated by the user.

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Industry Glossary

Cradle to Grave – Monitoring a product through its entire life cycle, from birth or creation to death or decomposition, also known as womb to tomb. Important when determining the total impact on the environment from a product or package.

Abuse Resistance – The ability of a polymer or finished article to resist abrasion, tear, puncture, or permanent deformation when strained, or a measure of the overall toughness of a product. Chevron Phillips MarFlex® LLDPE and mPACT® mLLDPE resins often provide increases in abuse resistance.

Destruct Bond – Term used to describe the amount of bond strength in extrusion coating, where typically the maximum bond strength between the extrudate and substrate is achieved. The bond is typically so high that when the bond strength is tested the entire samples is deformed and destroyed.

Important Contact Information

Chevron Phillips Chemical's Sales and Technical Service Contact Information:

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ext. 0539 Darrell Landry – Coating Tech Service
ext. 0459 Doug Mills – Film Tech Service
ext. 0511 James Solis – Film Tech Service
ext. 0489 Larry Szmuto – Film Tech Service
ext. 9845 Karla Anderson – Administrative Assistant

Polypropylene Film & Coating Technical Service
(918) 661-0443 Jennifer Hicks

K-Resin® SBC Technical Service
(740) 350-7761 Cliff Pettet

Sales and Customer Service
(800) 231-1212

Need datasheets, MSDS, or more information on Chevron Phillips Chemical's products, services, and capabilities? Visit us on the Web at www.cpchem.com.

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