The Film & Coating Connection

"Spreading the News"

Issue #13 ***February, 2009***

In This Issue Read About….

- ***Relocation of the Orange Tech Lab***
- ***The Effects of Crystallinity in Flexible Packaging***
- ***New Roll & Web Defect Industry Resource***
- ***Use of Auxiliary Equipment in Extrusion Coating to Improve Bond***
- ***Processing Tips – "Tricks of the Trade"***
- ***Useful Internet Resources, Industry Events…and more….***

Change is in the Wind for 2009 - Tech Lab Relocation

In September of this year, Chevron Phillips Chemical's facility in Orange, Texas took a direct hit from hurricane Ike. Although wind damage was minimal, flood waters overtook our technical center and damaged much of our testing and fabrication assets.

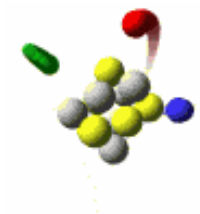
After a thorough assessment, the decision was made to relocate and consolidate the Orange Technical Laboratory (OTL) with Chevron Phillips Chemical's Plastics Technical Center (PTC) located in Bartlesville, Oklahoma (pictured above).

For those of you who have never visited the PTC, we think you are in for a real treat. The PTC is a first class technical facility that has a rich heritage in both research and product development.

Plans call for relocating our extrusion coating and cast film lines as well as several key pieces of testing instrumentation that support our flexible packaging business. The relocation is expected to be completed during the summer of 2009. Once the relocation is complete, our newly combined resources will significantly enhance our customer and product support capabilities.

We welcome your visit and look forward to serving you from our new home in Bartlesville, Oklahoma.

Basic Molecular Properties - Crystallinity



Crystallinity is one of the basic molecular properties of polyethylene, and is a measure of uniformity of chain packing in a polymer. In the solid state, polyethylene consists of both highly ordered crystalline regions and unordered amorphous regions. Because of this two-phase structure, polyethylene is referred to as a "semi-crystalline" polymer.

To understand crystallinity, it is helpful to understand how polyethylene behaves as it transitions from the melt state to the solid state. Polyethylene is made up of polymer chains of various lengths, each made up of repeating ethylene (-C2H4-) units. In the melt state, these chains exist as random coils and therefore are not tightly arranged. Upon cooling, these chains begin to fold upon themselves, which allows chains to occupy less space; this in turn allows the chains to arrange more densely, resulting in a greater amount of crystalline

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

The Film & Coating Connection
Chevron Phillips Chemical Company LP
Phone 1-800-437-2650
e-mail: theconnection@cpchem.com

Industry Events

SPE International Polyolefins Conference – The 2009 SPE Polyolefins Conference will be held February 22-25, 2009 at the Wyndham Greenspoint in Houston. Check out www.4spe.org for more information.

Polyethylene Films 2009 – Polyethylene Films 2009 will be held March 26-27 at The Shores Resort & Spa in Daytona Beach, Florida. This conference will provide an international forum for film producers, raw materials suppliers and equipment manufacturers and will provide a comprehensive overview of the latest material, technology and business trends. Check out www.amiplastics.com

2009 TAPPI PLACE Flexible Packaging Summit - The TAPPI PLACE Division will hold their Flexible Packaging Summit April 28 – 30, 2009 Westin Hotel, Brewery District in Columbus, Ohio. The conference will include a short course on packaging and barrier materials as well as symposium on nanomaterials. Check out www.tappiplace.org for the latest information.

NPE 2009 - NPE 2009 showcases the latest information on the plastics industry and plastic products to be held June 22-26, 2009 at McCormick Place in Chicago. Check out www.npe.org for more information.

SPE ANTEC 2009 – The 2009 SPE ANTEC conference will be held at the NPE Conference in Chicago June 22-26, 2009 at McCormick Place. Check out www.4spe.org for more information.

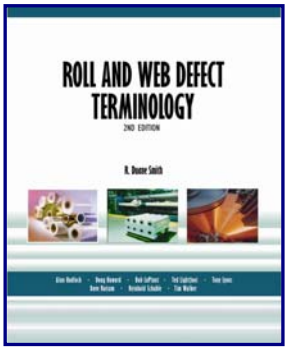
regions in the solid state when cooling is complete. If the chains contain side branches such as short chain branching (SCB), the chain folding process is disrupted, increasing the volume occupied by the chain, resulting in lower crystallinity in those regions.

Another way to illustrate this change during cooling is to recall that the density of polyethylene in the melt state is ~0.760 g/cc, whereas in the solid state we know that the density of most film and coating resins will be greater than 0.910 g/cc. This difference in density illustrates the random chain arrangement in the melt state and a more ordered chain arrangement in the solid state.

The faster the polymer is cooled, the less time available for chains to fold and arrange themselves into these crystalline regions. A good illustration of this is comparison of cast film and blown film density. Since cast film is cooled at a faster rate, the cast film has relatively fewer crystalline regions relative to blown film. This results in lower film density and better optics in the cast film. Because of this strong effect on density, crystallinity has significant impact on strength properties such as dart, puncture, modulus, and tensile, optical properties such as haze and gloss, and barrier properties such as OTR and WVTR.

Roll & Web Defect Terminology Handbook Available

"Roll and Web Defect Terminology" has been recognized by many in the web handling industry as the most comprehensive reference guide available for addressing roll and web defects. This latest edition features 224 defects commonly found in paper, film, nonwoven webs, and wound rolls, many of which did not exist when the first edition was written 15 years ago. This must-have troubleshooting resource was updated by a team of 22 leading industry experts and 16 contributing editors, including Chevron Phillips Chemical's Kelly Frey, Technical Service - Extrusion Coating.



"Roll and Web Defect Terminology" – 2nd Edition was edited by R. Duane Smith of Black Clawson Converting Machinery. "The group who worked with me on this collaboration is extremely knowledgeable and talented. The chapter champions and consulting editors have more than 500 years of combined web handling and winding experience. Their valuable expertise makes this a tremendous resource to aid in the battle to eliminate roll and web defects," explains Smith. "Not only is this a reference book, it is a tool for web producers, converters, printers and their customers to communicate using a common language to properly identify roll and web defects. This is the first and most important step in the defect problem solving process."

Within the book's more than 400 pages are 10 chapters and 287 images covering general roll defects, web profile defects, edge defects, roll and web wrinkling defects, papermaking web defects, calendaring web defects, aqueous coating web defects, film extrusion and lamination defects, web handling defects and slitting defects. Detailed information can be found for each individual defect including a description and illustration, commonly used terms, cross references, causes and remedies, and other sources of published information. In a nutshell, "Roll and Web Defect Terminology" – 2nd Edition is a systematic guide written in a common language to provide a clean and concise format for describing roll and web defects.

"Many industry experts have endorsed this book as invaluable in identifying and troubleshooting defects saying that it is a 'must have' publication," added Smith. "We are excited to see how it benefits the industry." Click here to find out more information in this invaluable and impressive resource.

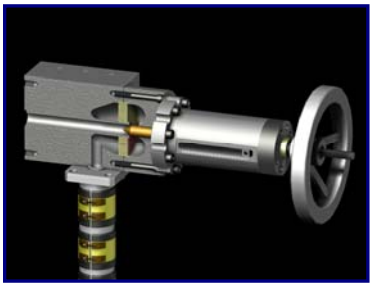
Processing Tips - Tricks of the Trade

"The Film & Coating Connection" is pleased to offer useful extrusion coating 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.

Screw Cleaning Procedure – Looking for a safe and effective method of cleaning a screw just prior to removing a screw from the extrusion system. Click here to view this "tried and true" procedure that eliminates most of the "elbow grease" typically associated with this task.

Laminate and Break – In a sticky situation trying to extrusion coat a material that tends to wrap the chill roll, especially during start-up when neck-in is high and edges are thicker? Try hanging a roll of thin paper or film on the auxiliary unwind and laminate to prevent the sticky material from coming in contact with the chill roll until you are lined-out and have come up to line speed. Once you are lined out then cut the secondary substrate and now the edges are thinner with less chance for chill roll wrap.

Effectively Increase Melt Temp – Need to increase the overall melt temperature during a production run? Remember that most of the heat generated in the extrusion system is frictional heat and not heat produced from heater bands. Increasing back pressure by adjusting the back pressure valve can effectively increase melt temperature for higher oxidation to improve bond and also improve melt quality. An increase of 100psi can increase the overall melt temp as much as 3F.



Easily Measure Cell Volumes of Anilox Rolls – Do not know the current cell volume of an anilox roll? Wondering if the cells on a primer anilox roll are dirty and clogged? Easily solve this issue by measuring the actual cell volume using a Capatch Strip. Capatch strips offer a quick, accurate, economical and disposable method of measuring cell volumes of anilox rolls. However, some training is required and proper technique is essential to obtain accurate results. Check out www.capatch.com., which also includes instructional videos on using Capatch strips.

Easily Measure Layer Distribution – Measuring layer distribution of a coextruded structure using a microscope? To make the measurement easier, try measuring a cross section using a sample where the line speed is significantly reduced without changing the output of the individual extruders. This will provide a sample with the same layer ratio, but the layers will be much thicker and easier to measure using a microscope.

Utilizing Auxiliary Equipment to Improve Adhesion

Over the past several years, various auxiliary items have been designed to increase adhesion of polyethylene to various substrates. Most notably, these include corona and flame treaters, ozone applicators, and priming systems. Combining these methods with various substrates and polymer products the line operator, foreman, or plant process engineer can successfully overcome challenging adhesion issues that would otherwise limit the types of structures that can be developed and manufactured.

There are several available auxiliary equipment options available to the extrusion converter to also improve bond properties. Corona treatment is widely accepted and specified in most new extrusion laminating or coating lines. An electrostatic charge is applied via electrodes and applicators to the substrate as it passes over a roller. The electrostatic charge does impart some desirable heat to the substrate, but it is widely accepted that the charge on the substrate's surface provides a polar bonding (boundary) layer to which the oxidized polymer can adhere. In general, as the wattage of the treater is increased the adhesion increases. The wattage should be optimized in the process, but extra caution should be taken to prevent excess treatment. Over-treatment can cause back side treatment in a film and pinholes in a coating; both of these are undesirable.

Flame treatment equipment is routinely installed in paper and paperboard coating operations. In addition to the formation of polar sites on the substrate, the flame also helps to burn off impurities and surface fibers of porous substrates. Flame treaters are an excellent tool for increasing adhesion. Just like corona treaters, flame treaters must be optimized but not allowed to over-treat. Several flame treaters on the market come with a plasma analyzer that calculates a flame "richness" level that can be controlled.

Ozone generators and applicators are being used in more and more operations. The theory behind ozone application is similar to corona and flame treatment. The ozone allows for chemical polar sites to be formed on the molten polymer as it is in the air gap and before it contacts the substrate. This charge allows for good chemical bonding to the substrate. Ozonation is a practical solution when high line speeds are being employed and the optimal time in the air gap cannot be achieved to oxidize the polymer. Ozonation can also be effective when processing materials that are thermally sensitive and must be processed at lower temperatures where it can be difficult to achieve oxidation.

Chemical primers have been used for several years in extrusion laminating and coating. The process calls for a liquid (solvent or water-based) to be applied via a roller system to the substrate, which is then dried. The surface results in a uniform layer of a material, usually a polymer, which provides a chemical surface for polymer adhesion. Common types of chemical primers include: polyethyleneimine, and ethylene acrylic acid and primer options are tailored to specific needs (e.g. adhesion to OPP, PET, or foil). Priming deck installations have changed greatly. Gone are large drum dryers and dangerous doctor blades. Instead, applicators are designed with enclosed doctor blades and tunnel dryers are specified.

Utilizing these types of auxiliary equipment is an effective and economical method of achieving bond in flexible packaging. It is also critical that these pieces of auxiliary equipment be properly maintained to ensure they are working correctly and efficiently. Often bond issues can be attributed to a neglected piece of auxiliary equipment and implementation of improper corrective actions (e.g. increasing melt temperature to compensate for dirty treater bars). Taking advantage of these types of auxiliary equipment and proper preventative maintenance will prevent unnecessary adhesion issues.

Use of Laboratory Microscopy

Microscopy is an extremely useful laboratory tool that can be utilized for everything from quality control and troubleshooting to inspection and characterization, in flexible packaging. Microscopy can be as simple as using a

Technical Service Group Changes

Darrell Landry will begin a new assignment in Chevron Phillips' extrusion coating technical service group. Darrell joins Kelly Frey as primary technical service contacts supporting extrusion coating and lamination markets. Darrell has a strong technical background that includes experience in film, extrusion coating, and oxygen scavenging applications.

Internet Resources

Chevron Phillips Chemical Company News – To find out more information on what is happening at Chevron Phillips Chemical Company, check out www.cpchem.com

MSDSXchange – Quick and efficient method of finding a MSDS for a chemical. MSDSXchange has over 1 million MSDS's listed on the free website www.MSDSXchange.com

Plastics News – Keep up with all of the ever changing news in the plastics industry and even check out the "Plastics Blog" at www.plasticsnews.com

Society of Petroleum Engineers – Keep up with the ever changing petroleum industry news, trends, statistics, and technology. Check out www.spe.org

LinkedIn - Keep up with current and past colleagues and establish new contacts with this professional networking website. Visit www.linkedin.com for more details.

Google Books - Search for books that contain information on specific technical subjects at Google books. Although some books offer online limited content , this site is still an excellent way to preview books before adding them to your technical library. Check out books.google.com for more information.

Wikipedia – This user generated online encyclopedia often contains excellent information on technical subjects such as polymers and plastics processing. Check out www.wikipedia.com for more information.

NIOSH Topics – Learn about a number of occupational safety topics at the National Institute of Occupational Health (NIOSH) website. Check out http://www.cdc.gov/niosh/topics/ for more information .

compound microscope to analyze defects in a film or extrusion coated structure or as complex as using a scanning electron microscope (SEM) to study the morphology of a particular polymer. Costs of microscopy equipment varies greatly with a simple compound microscope costing between $200-$2000 and a SEM potentially being worth in excess of $100,000.

Setting up a microscopy lab with a simple compound microscope and a few essential tools can prove to be extremely useful in a QC lab that produces flexible packaging. Some of the essential items needed to set up a small microscopy lab are:

- Simple Compound Microscope – Objectives ranging from 2.5X to 50X, coupled with a typical 10X eyepiece lens allows for 25 to 500X magnification. Transmission light for non-pigmented co-ex structures and illumination light or a non-attached light source for pigmented materials (optical fiber lamps, etc).
- Image Capturing Device - An inexpensive camera system can be attached to most microscopes to allow images and data to be captured and shared. Other options include adding a compatible video card to the computer and an onscreen measuring device (e.g. Boeckler Instruments) along with a screen capturing software (e.g.Snag-It).
- Measurement Device – A scale in one of the eyepieces can be used for measuring layer thickness and is very inexpensive. "Cross-hair" screen images can also be built into video software and can be used with measuring instruments for very accurate gauge/thickness measurement.
- Editing Software – Depending on your need and requirements, several photo editing programs are available. Photoshop Elements has a full range of capabilities for enhancing and annotating cross-sections. This is especially useful when conducting seminars or sending marketing photos to potential customers.
- X-Sectional Sample Holder- Sample holder and proper cutting technique is critical to properly analyze structures. This can be achieved with a metal holder and razor blades as shown in the photo.

A moderate quality compound microscope combined with some of these tools and a little bit of practice and technique can reveal and explain some of the mysteries in producing high quality flexible packaging structures. For example, microscopy testing of a finished structure can help to identify issues with layer distribution in a coex structure or help to identify defects in a structure or the composition of a contaminant in a finished product.

If you are interested in learning more about setting up a microscopy lab in your facility please contact your Chevron Phillips Chemical Technical Service Representative.

Industry Glossary

Polyolefins – A term used to describe a polymer or plastics that is produced from a simple olefin or alkene. The two most common polyolefins are polyethylene and polypropylene.

Homopolymer – A polymer that is produced using a single type of monomer or repeating unit. A 0.960 density HDPE is a homopolymer as it is produced using only one type of monomer, namely ethylene.

Copolymer – A polymer that is produced using two types of mononmers or repeating units. A 0.950 density HDPE is a copolymer, as ethylene monomer is used along with a copolymer, for example butene, to lessen the crystallinity and reduce the overall density. Other common copolymers are EVA, EMA, EEA, and EAA's.

Important Contact Information

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

Polyethylene Film & Coating Technical Service
(800) 437-2650

ext. 6137 Jim Addcox – Tech Service Supervisor
ext. 6315 Kelly Frey – Coating Tech Service
ext. 6391 Darrell Landry – Coating Tech Service
ext. 6136 Doug Mills – Film Tech Service
ext. 6193 James Solis – Film Tech Service
ext. 6126 Connie Sonnier – F&C Admin. Assistant
ext. 6322 Larry Szmutko – Film Tech Service

Polypropylene Film & Coating Technical Service
(918) 661-0519 Bill Bridendolph

K-Resin® SBC and Polystyrene Film Technical Service
(740) 350-7761Cliff Pettey

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.

Feedback

To unsubscribe or to let us know what you think about this newsletter please e-mail theconnection@cpchem.com

CHEVRON PHILLIPS CHEMICAL COMPANY
AMERICA'S POLYETHYLENE
TECHNOLOGY DEPARTMENT
ORANGE, TEXAS

Click Here to Return to Newsletter

Procedure for Cleaning Polyethylene from Extruder

1. Remove die, adaptor, feed block and screen packs. (Essentially everything from the end of the barrel, exposing the end of the screw) (The mixture will not go through a screen pack.)

2. Extruder should be heated to 300ºF and ensure cooling water is on particularly to throat section. Purge extruder to clear extrusion system enough to ensure that most of the polyethylene is removed from the system.

3. Make a dry mixture of polyethylene (MarFlex® 4517) and die cleaning soap* to the ratio of 1 bar with ½ of a 5 gallon bucket of LDPE (higher concentrations of soap can be used and will provide more aggressive cleaning.) Chop the bar soap into small bits (small enough to pass through feed throat) and dry blend it with the polyethylene resin.

4. Start extruder to slow speed and hand feed the LDPE/soap mixture into the hopper, keeping mixture in the feed throat (do not fill hopper with the mixture.) The amount to be added will be determined by the capacity of the extruder; normally enough to fill the screw section of the extruder twice. Stop feeding the LDPE/soap mixture. Then run screw until all of the LDPE/soap mixture quits coming out of the end of the screw/barrel.

5. Follow the LDPE/soap mixture with 100% PVC** (**caution: ensure system does not exceed 300F**) and process approximately 10-15lbs of PVC. PVC will remove the LDPE/soap mixture. Let the machine run until all PVC has been cleared of machine.

6. Inspect the hopper and throat sections and remove any trace of the PVC or soap mixture, by blowing with air or wiping clean.

7. Pull screw from extruder; wipe down screw and residual material. Clean and wipe down extruder barrel. Inspect screw and reinstall into the extruder barrel.

*The die cleaning soap, Cloeren Die Soap (Part No. = Die Soap), is purchased from Cloeren Inc. P. O. Box 2129, Orange, Texas 77631-2129 (Phone 409-886-5820).

** Suggested grade of polyvinylchloride used for purging is Dow (Previously Union Carbide) VFD 9400.

Click Here to Return to Newsletter