

The Film & Coating Connection

"Spreading the News"

Issue #10

January, 2007

In This Issue Read About....

- Tips to Improve Blending
- Low Cost Source for Flexible Packaging Information
- Considerations When Purchasing FTIR Lab Equipment
- Purging Materials and Techniques
- Benefits of Producing a Quality Product
- Useful Internet Resources, Industry Events...and more....



Blending? Beware!

Today, almost all film and extrusion coating operations blend various components together to produce the flexible substrates they market. Whether mono-layer or co-extrusion, the use of concentrates or multi-polymer blends is common – and for a variety of reasons:

- + Tailored End-Use Properties
- + Extrusion Process Improvements
- + Improved Conversion
- + Reduced Cost



Although blending offers a host of potential benefits, there are several things to keep in mind in order to avoid potential problems.

Concentrate Carrier Resins

The quality and type of carrier resins used in concentrates can be critical. Many concentrate producers select the carrier resin based on how well it works in their process. While this may not pose a problem in many applications, basic properties such as melt index, gel level, and antioxidant type and amount can have a significant effect when the concentrate is used in a blend.

Multi-Polymer Blends

When blending polymers together to achieve specific end-use properties, do not forget about the stabilization packages and other additives that are present in the individual components. The additives in each blend component must not only be compatible, but because they will be diluted when blended, must be collectively functional at the diluted levels. At low levels, some additives can have a deleterious effect on properties such as gel and color formation.

Reprocessed and Post-Consumer Regrind (PCR)

Although the use of "repro" has become an economic necessity in today's market, it can be a delicate balancing act. Every time a thermoplastic is exposed to another heat history, it is subject to change through thermal oxidation. Depletion of antioxidants can lead to increased gels and charring inside the extruder. If used in excessively high loadings, the improved economics associated with the use of "repro" can easily be erased by poor quality and downtime to clean equipment.

Equipment & Operational Considerations

When blending, it is imperative that the extruder deliver polymer to the die that is thermally and compositionally consistent. Since blends are often comprised of materials with very different bulk densities, it is important to minimize transfer distances once the blend is prepared to prevent post-blend segregation of the blend components prior to

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 2007 – This annual conference covering the latest developments in polyolefins will be held February 25-28, 2007 at the Wyndham Greenspoint Hotel in Houston, TX. Check out www.spe-stx.org/PolyolefinsConference.htm for more information.

Package Design 07– Package Design 07 is a highly interactive conference focused on packaging design for efficiency, performance, distribution and point of sale impact. The conference will be held January 30-February 1, 2007 at the Sheraton World Resort in Orlando, FL. Check out www.bnpevents.com/PS/Conf.htm for more information.

Global Pouch Forum 2007 – The Global Pouch Forum & Technology Exhibition (formerly known as the Stand-Up Pouches Conference) is an event that will focus on market trends, technologies, equipment, materials, and processes for stand-up and all pouch formats. The conference will be held May 1-3, 2007 at the Renaissance Vinoy Resort and Golf Club in St. Petersburg, FL. Check out www.bnpevents.com/PS/Conf.htm for more information.

SPE 2007 ANTEC Conference – The SPE ANTEC, the leading technical forum for providing cutting-edge technological issues and information pertinent to the needs of the plastics industry, will be held May 6-10, 2007 at the Duke Energy Convention Center in Cincinnati, OH. Check out www.4spe.org/conf/antec07/index.php for more information.

TAPPI European PLACE – The 11th annual European PLACE Conference will be held May 14-16, 2007 at the Astir Palace Hotel, Athens, Greece. This event will focus on latest developments in materials and equipment used in the fields of Polymers, Laminations, Adhesives, Coatings, and Extrusion (PLACE). Check out www.tappi.org/s_tappi/doc_events.asp for more information.

reaching the extruder. It is also important that the hardware design (screw and barrel type) and extrusion conditions can deliver a homogenized melt stream to the die.

Regulatory and Compliance

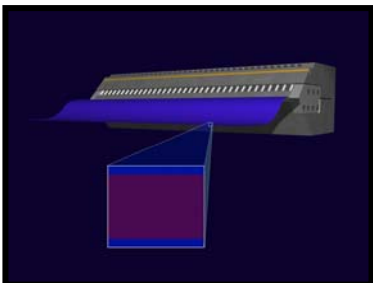
If a substrate produced using a blend of concentrates or polymers is targeted for a regulated market such as food packaging, it is important for the producer to test this product to make sure it is compliant. This is true even if the individual components used to produce the substrate meet the desired level of compliance. Because of possible interactions between the blended components, as well as the effects of extrusion conditions, there are no guarantees that the final substrate will be compliant simply because the pre-blended components are compliant.

Take Advantage of Low Cost Source for New, "State of the Art" Information

Since Sealright corporation commercialized the first extrusion-coated milk carton stock in the 1950's, converters have been asking similar questions. Why can't I run faster and wider? How can I improve the barrier, sealing, and physical properties of my product? What can I do to improve productivity with little to no capital investment? Why is my competitor's product outperforming mine? How many layers can I coextrude?

The answers to many of these questions are readily available for very little cost and can be found with minimal effort. How?...by attending any of the various packaging conferences or trade shows. There you will find material suppliers and equipment manufacturers eagerly showcasing new materials, equipment advances, and process knowledge which can be readily applied to improve productivity and overall product performance.

For example, at the latest TAPPI PLACE conference, the last question was firmly answered by Gary Oliver of Cloeren Incorporated that as few as one to as many as a thousand layers are now possible with new micro-layer technology. Gary stated that while Cloeren utilizes a patented technology, other equipment manufacturers such as EDI Corporation license a Dow combining method to offer micro-layer technology for flat dies. This should make a product developer have sweet dreams, and a production manager have nightmares. For the QC department, only barrier and



physical testing will quantify these results. As an example, a recent Plastics Technology article highlighted the use of Micro-Layer technology by Nike and 3M, amongst others, to take advantage of the benefits that this technology can deliver. Gary confirmed what the same Plastics Technology article describes, that commercial cast film lines with 11, 17, 75 and 450 layers are currently being used in commercial production.

At the same conference Duane Smith of Black Clawson / Davis Standard described a high speed cast film winder capable of automatically producing in-line slit finished rolls off the film production line every 25 seconds. This highly automated four spindle center/surface winder can produce virtually scrapless roll sets with shippable quality roll formation that equals rolls produced from an off-line slitter / rewinder. With a line speed of 2,400 FPM and no rewinding of parent rolls, the productivity level exceeds virtually all the existing cast stretch lines in existence.

This is an example of only one conference. Many others are excellent resources for learning about advances in the packaging industry. Examples of other conferences and tradeshow pertaining to the packaging industry are FlexPackCon, ANTEC, AMICAL, NPE, CMM,

Processing Tips

"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.

Purging Materials and Techniques

Purging of an extrusion system is an important and necessary step when removing residual material in the extruder such as material or color changes, or when flushing the system of contaminated or degraded material. Purging is preferred over the tedious and time consuming process of dismantling the extrusion system and mechanically removing the residual material. The purging tips outlined below can help to improve and shorten the purging process, thereby reducing the amount of materials and downtime required to do an effective purge.



The material selected to introduce into the extrusion system to purge should provide maximum flushing, scouring, and penetrating actions while being chemically compatible with the material being purged. Ideally the purge material

should have a higher viscosity, at the same processing temperature, than the material being cleaned from the system. For example, a 1.0 melt index LDPE will effectively purge a 3.0 melt index LDPE. However, the viscosity should be low enough so that the extruder output rates can be varied and that high output rates can be achieved during the purging process, without exceeding the maximum back pressures and extruder motor loads.

To improve the scouring and penetrating power of the purge material, common additives such as antiblocking agents (talc and SiO₂) and calcium carbonate can be added to the purge material at fairly high loadings. To further improve the scouring and penetrating power, a small amount of water (1-2 ounces) can be added to the purge material, which will produce a foaming action and will assist in reaching dead spots in the extrusion system. Water purges can be very effective. However, caution must be taken not to introduce too much water into the system, to ensure water is added as close to the feed throat as possible, and to watch for out-gassing at the feed throat and as the water exits the die, producing a foamed extrudate. Small amounts of polymer processing additives (PPA's) can also be added to the purge compound to help release material stuck to the walls of the extrusion system. PPA's have an affinity to metal in the molten state, and can act as a lubricant or release additive in the extrusion system.

Some polar materials such as nylon, EVOH, oxidized polyethylene and color concentrates can be especially difficult to remove from the extrusion system. In these cases using a resin that is chemically compatible will improve the purge. To achieve this, a functionalized LDPE, such as maleic anhydride grafted LDPE, can be blended into the purge resin and used to purge the polar material. It is important to remove all of the functionalized LDPE from the extrusion system before shutting down.

Additional tips to keep in mind when purging, which are not

and PACK EXPO, to name few.

To remain competitive it is essential that extrusion coating and film converters take advantage of these conferences and shows. It is evident that some companies utilize and implement this information more than others, particularly when you see a coating line running 700 fpm in one plant and 1500 fpm in another and making the same product. We owe a debt of gratitude to the generations of machinery, polymer, and converting pioneers who brought us to the current level of technology and continue to "push the envelope" by introducing new technology. If you are a converter, the expectation on your generation is even greater given the tools and technology available today.

Opportunity is knocking for the right team of converters to take advantage of the off-the-shelf available equipment, technology and materials being offered. Instead of asking what's new, we need to collectively start applying what's new. Packaging conferences and shows are driven by suppliers trying to get the word out on their new products. Consultants and resin suppliers generate problem solving process information. Companies who take advantage of this information will be leading the pack in efficiency, product development, and most of all profitability. More converters than ever are using the resources of their resin and machinery suppliers to help develop new products.

Be fair to your company, employees and shareholders, and put these conferences in your schedule and budget. You have everything to gain and nothing to lose!

You want to purchase an FT-IR for your lab? Here are hints on getting the most "bang for your buck!"

Hint #1: No matter what CSI can do on television, if you put a piece of plastic or an unknown component in a FT-IR analyzer, it is not going to tell you the genetic structure, absolute separation and quantities of complex compounds, or your shoe size...all in under 15 seconds!



A FT-IR is a true workhorse and a very powerful lab tool. It can provide a spectra of unknown materials and films which can be used to quantify additives or copolymers. Several accessories are available depending upon how much you are willing to spend. It is fast, reliable

and easy to use. However, it is definitely not a "little black box."

Hint #2: Commercial FT-IR libraries are very useful, but you need to build your own spectral library. If purchasing a FT-IR, make sure that it has the ability to build an internal library. This application can be customized to a specific company's needs and offer a quick and reliable search for compounds or spectra that may be unique to your operation.

Commercial libraries are also excellent investments but ensure that you purchase the ones that are closest to your industry. For example, if you are in the lamination business and make snack food packaging, you certainly wouldn't be interested in purchasing a library for drug compounds. Some of the better commercial libraries for flexible packaging are Coatings Technology, HR Industrial Coatings, Hummel Polymer and Additives, Sprouse Polymers by Transmission, and US Geological Survey Minerals because more "fillers" and anti-blocking agents are natural mineral compounds. These libraries are available for most FT-IR units. Still the best library will be the one that you build yourself over time.

Hint #3: How to accessories. First, ask yourself what kinds of analyses you need to perform. If you extrude films, coextruded structures or laminations, then you definitely want an ATR accessory. This will allow you to look at surface phenomenon, such as oxidation, additives blooming to the surface (slip, GMS), or co-ex layers. Depending

necessarily material related, are to vary output rates to change the flow pattern within the extrusion system to more effectively purge hard to reach areas (deadspots). It may also be necessary to remove and replace the screen packs during purging and a counter-bored breaker plate will also purge more effectively than a standard breaker plate. Other tips also include rotating the adjustable back-pressure valve on the adaptor, adjusting the deckle settings, and adjusting the vanes on a coextrusion feed block.

Employing these techniques during purging should help to improve the effectiveness of the purge and reduce the amount of time required to purge the line. These techniques may also help to reduce the frequency of manually dismantling and cleaning the extrusion system.

Quality Corner



There is still some misunderstanding concerning the real benefits of producing a quality product or service. In the not so distant past, it was generally believed that quality and production were incompatible: that you cannot have both. This

common misconception was a result of not understanding what quality is nor how quality is achieved.

Reality indicates that quality is the first link in the chain that ultimately leads to capturing the market. There are measurable benefits in three general areas of business. These are 1) benefits to employee, 2) benefits to the company, and 3) benefits to the customer. Some of the benefits of quality to the employee include greater pride in products and services, sense of satisfaction in a job well done, greater job security, and less likelihood of having to redo or repair a defective part.

For the company, the bottom line is profitability. The two primary ways to increase profitability is to lower costs or increase market share. A well defined and implemented quality management system will lower costs by reducing the amount of off-grade material produced. A glaringly obvious but often overlooked fact is that it costs exactly the same amount of money to make a quality product or scrap. The problem is that it can be extremely difficult to cover your operating expenses when you make scrap, and if a company cannot effectively cover operating expenses, it will eventually go bankrupt. Also, a good quality management system will allow you to use production information to optimize processes by minimizing the causes of variability in the system, but also by identifying which capital project will produce the greatest overall benefit. Optimized processes with a targeted capital program sets the stage for any company to lead in lowest cost production.

Another benefit of lower process variability is lower product variability resulting in a more consistent product. A more consistent product made to customer requirements results in higher customer satisfaction and higher customer satisfaction results in more profitability through increased volumes or higher margins. Dr. W. Edwards Deming described this process as the "Quality Chain Reaction:

Quality → Productivity → Lower Costs → Capture the Market".¹

The last and most important benefit of quality is to the

on how much you want to spend or how technical you want to be, there are quite a few from which to choose. A simple ATR removable attachment can easily fit into the sample chamber and pivot to get the best angle for depth of penetration into the sample. Crystals for these are usually not too expensive and, with care, will last a long time. These are especially good for thin films or thick rigid samples (sheeting). These are not very useful for analyzing build-up, small samples, or semi-solid materials.

A diamond or germanium single bounce in chamber ATR attachment is a lot more expensive, but much more versatile for sampling. This unit can accommodate thin films, build-up and other types of contamination quite easily. It's easy to operate, easy to clean and you usually never have to replace the crystal, which can be quite expensive.

Also there are many FT-IR systems that come with microscopes. These are very useful for analyzing gels and small contaminants. If you can afford it, buy it. If not, make sure you get a system that will allow a FT-IR microscope attachment to be purchased at a later date.

Hint #4: Without spending a lot of money on expensive tools, how do I get the best spectra when I'm handed a sample wrapped in a red rag that smells really bad and its origin is unknown?

The answer to that question is very simple: You can't get good spectra.

You can get good spectra if the following correct and inexpensive sampling techniques are employed:

Extruder Build-up (Solids or waxy)

- ✚ Use a clean metal object to scrape off equipment (no cloths or paper towels).
- ✚ Place in clean foil, glass or metal containers to prevent contamination.
- ✚ If slip is suspect, package in glass or foil. If not then a plastic bag is acceptable. Do not use cloths, paper towels or cotton swabs.
- ✚ For troubleshooting films, coatings, and laminations include a "good" sample for comparison with the "suspect" sample whenever possible.
- ✚ If the "suspect" material is surface related, wrap in foil and avoid handling with hands or contact with other plastic material.

FT-IR units are very practical additions to most labs and usually essential for film and coating applications. They are stable, durable and user friendly once applications are developed. There are several vendors for this instrument and quite a few options available depending on how deep your pocketbook is and how technical you want to be.

customer because it is the customer who will ultimately determine a company's success or failure. Benefits to the customer start with meeting or exceeding their expectations. Providing a better product or service will always result in higher customer satisfaction. There is no downside to an effective quality management system, EVERYBODY WINS!

1 Source: "Out of the Crisis", W. Edwards Deming

Internet Resources

AIMCAL Blogs – The Association of Industrial Metallizers, Coaters and Laminators (AIMCAL) has recently launched four blogs. The subject areas of these four blogs are extrusion coating, vacuum web coating, web coating, and web handling and converting. These blogs are additional resources to seek technical solutions from industry experts in the packaging industry. Check out www.aimcalblogs.com

Macrogalleria – The Macrogalleria website, from the University of Southern Mississippi, is an excellent introduction to the world of polymers. This site is designed as a learning tool which is divided into six levels which covers everything from where polymers are found, to how they are made, to how they are processed. Check out www.pslc.ws

Important Contact Information

Chevron Phillips Chemical Sales and Technical Service Contact Information:

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

ext. 6137 Jim Addcox – F&C Tech Service Supervisor
ext. 6121 Clint Cleaver – Extrusion Coating Tech Service
ext. 6315 Kelly Frey – Extrusion Coating Tech Service
ext. 6391 Darrell Landry – Film & 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 Szmuto – Film Tech Service
ext. 6156 Rick Wagner – Film Tech Service

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

K-Resin® SBC and Polystyrene Film Technical Service (740) 374-0262 Jack Frost

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

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.