Blown Film Internals

Blown Film Process Systems & Consulting

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Introduction

by Daniel Joseph

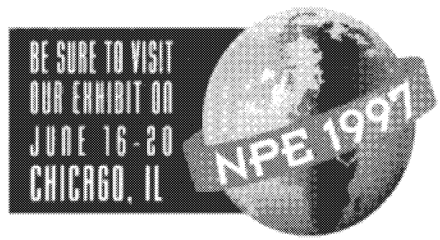
*W*elcome to this, our first installment of Blown Film Internals. We are happy to be able to provide you with a timely information source that is loaded with solutions . . . not just answers. Our goal is to keep you up-to-date with new technology and solutions geared specifically for blown film extrusion.

In Blown Film Internals, you will find articles on all aspects of internal bubble cooling, our specialty. You will also find articles about blowers, ducting, installation pitfalls, and operator training guidelines. We want you to be as informed as possible about our equipment and how it relates to your other extrusion equipment.

We will also keep you informed of the trade shows we will be attending. We would welcome the opportunity to see you and help you find cost effective solutions for your application.

The IS-IBC1® system is designed with field upgrades in mind. Be sure to watch for new product and upgrade notices. We make sure each update is field upgradeable so that every user of our equipment has the opportunity to improve without repurchasing all new equipment.

Our goal is for you to find this newsletter worth keeping as an ongoing reference tool.



BOOTH #N5294

You are Invited

D.R. Joseph, Inc. will have our proven line of blown film products on display at the NPE 97 show and would like to formally invite you to come and see what's new. We will be located at Booth #N5294 in the North building. Please come by for a special demonstration of our latest innovation: the LFC1™ layflat controller for non-IBC blown film lines. The LFC1™ was specifically designed for fully automatic startup and accurately maintaining bubble size for non-IBC blown film dies.

We will also be demonstrating our patented and proven IS-IBC1® internal bubble cooling system for blown film lines. The IS-IBC1® is a highly accurate controller of IBC blown film bubbles, and hundreds are operating in virtually every industrialized country throughout the world. The IS-IBC1® has three new features that will be available this year: the blower balance system (which is currently available), a hand-held diagostics tool, and a graphical diagnostics tool. These new features will be on display at the show.

Please stop by for a special demonstration on all of our products and new features available for 1997. We will have courteous and helpful attendants on hand to answer all of your questions. We look foward to seeing you at the show.

To Our Customers:

*W*e would like to take this opportunity to let you, our customers, know how much we appreciate your business. We have been in business for 10 years and a lot of that has to do with our outstanding OEM and customer base. We are committed to listening to our customer's needs and finding solutions for those needs. If there is anything we can do to make our products better, please do not hesitate to contact us with your suggestions.

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Increasing Production Rate without sacrificing Layflat Variation

by Daniel Joseph

Depending on the material, increasing the production rate can increase layflat variation. Obviously, this is a problem, since quality should not be sacrificed for quantity.

There are two possible sources that are common causes for the increase in layflat variation:

- **Poor distribution of cooling air (either internal or external)**
- **Low melt strength**

An IBC system with poor distribution of air flow can operate satisfactorily if the air flow is run slow enough. This is a common solution for many who have older IBC systems. Turning the air flow down low enough will achieve a stable bubble. Of course, this defeats the goal of increasing production rate. Most of the problems that cause increased layflat variation occur within the first five inches above the die lip. IBC air flow can cause film surface instabilities, particularly if the air is mechanically directed upward. It is better to direct the air in a horizontal fashion or angled downward. Dual lip air rings must uniformly lock the film to the forming cone. Without a uniform lock completely around the forming cone, layflat variation and excessive gauge variation are the sure result.

If you suspect the problem is coming from the air ring, look at the following settings:

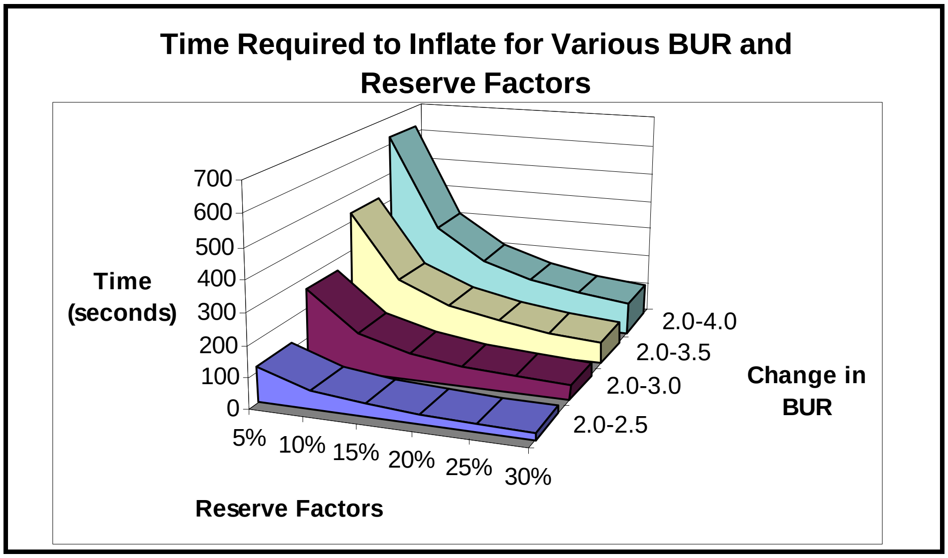
- Note the percentage the air ring blower is running as compared to the percentage of the IBC blower. If the air ring blower is running significantly higher than the IBC supply blower, consider slowing the air ring blower and increasing the IBC air exchange rate. In many cases, the imbalance of external cooling to internal cooling can cause bubble instability.
- Try either of the following: Raise the outer forming cone adjustment and increase the air ring blower slightly; or Lower the outer forming cone and decrease the air ring blower slightly. The goal is to achieve a uniform lock.
- Low melt strength materials do not support added air flow. The bubble surface can become very shaky and eventually the IBC system performance can deteriorate to the point of losing control altogether. Try to balance the external and internal air flow as much as possible and also look at lowering the air temperature. The goal is to maintain a stable bubble at the higher production rate. By using colder air, you do not have to be concerned with the problem of added turbulence.
- Finally, remember to record your successes and your failures. Many times your failures become useful as troubleshooting guidelines. Successes are a useful guide on how to repeat the results the next time the job is run. Do not forget the operators! Keep the operators informed of new settings for each job and make the information available so they have an up-to-date source of information when running a particular job.

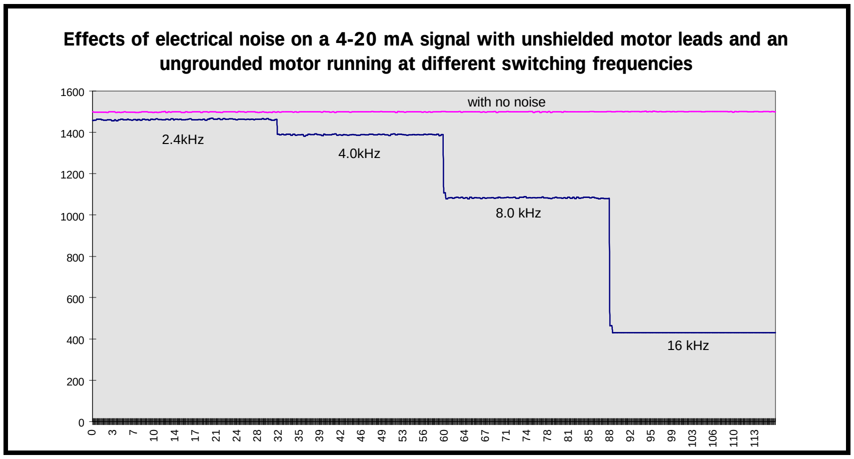
Production Rate with Faster Order Changes

by Daniel Joseph

To achieve the best possible productivity gains, there has to be additional air flow to the IBC. As production rates and IBC air flow go up, the remaining air flow capacity goes down. A system tuned for maximum rates uses most of the available air flow capacity. The running conditions must be optimized when increased production rate and faster order changes are important. Achieving faster order changes requires reserve air flow capacity. The figure below shows an example of bubble inflation time for four different blow up ratio changes based on increasing reserve factors. Reserve factors define what percentage of air flow capacity is remaining when the line is running in production.

Production lines using nearly all the available air flow capacity will have long bubble inflation times. The





example in the figure shows the time required to complete inflation for a blow up ratio change from 2.0 to 4.0 is over 10 minutes when the reserve factor is 5 percent. If the reserve factor is increased to 30 percent, the inflation time reduces to less than 2 minutes.

The described trade-off appears to be easily solved by increasing the available air flow capacity. This is an option, but only when available air flow capacity does not already exceed the maximum possible air flow rate through the die (the air flow bottleneck).

VSDs and Variable Switching Frequencies

by William Jackson

Variable speed AC motor drives are used extensively throughout the plastics industry. Any application that requires running at multiple speeds (blowers, nips, extruders, etc.) is likely to have a variable speed drive (VSD) controlling the motor.

VSDs control an AC motor by simulating a sine wave output to the motor. This is done by "pulsing" the voltage output to the motor. The frequency at which the output is pulsed is called the "switching frequency" or the "carrier frequency." Originally, the switching frequency on most VSDs was fixed at around 2 kHz. Over the last several years, many VSD manufacturers have started making the switching frequency adjustable. Some go as high as 16 kHz. Unlike personal computers, however, faster is not necessarily better when it comes to switching frequencies. Faster switching frequencies can cause many problems and have few advantages.

The only real advantage to having a switching frequency higher than 2 kHz is less motor noise. A motor running with a switching frequency around 2 kHz has an audible "ringing" sound. Increasing the frequency reduces the ringing.

The penalty for running more quietly is substantial. Higher switching frequencies can shorten motor insulation life and, most importantly, cause more electrical noise.

Electrical noise is interference induced from one system into another. For example, if motor wires from a VSD are routed alongside a 10 Vdc signal wire, the 10 volt signal will be distorted; it may read higher or lower than 10 volts. Noise can cause major difficulties in a system and is usually very difficult to isolate. For example, electrical noise may cause a sudden oscillation in a system that has been running smoothly. The oscillation may just as suddenly disappear. One part of a system may malfunction whenever a nearby system is started. These types of intermittent problems can be very frustrating to troubleshoot.

So, what can be done to eliminate noise when using high switching frequencies?

- Do not use high switching frequencies unless you have a specific need to reduce noise. Use the lowest frequency that allows the motor to run sufficiently quiet. Fortunately, all drives that we have seen with high switching frequencies have been adjustable to lower frequencies.
- Shield the motor leads. This does not necessarily mean shielded cable; metal conduit or flexible conduit with metal shielding may be used. If shielded cable is used, consult the drive manufacturer; using shielded motor leads may reduce the maximum allowable separation from the drive to the motor.
- Separate the motor leads and any signal wiring. Obviously, motor leads should not be in the same conduit as signal wires, but it is also important that they not be paralleled in an enclosure or cable tray without separation.
- Ground the motor frame back to the VSD. (This should already be done for safety purposes when the motor is installed.) The VSD will have a terminal marked for the motor ground wire. An ungrounded motor radiates a lot of electrical noise; this effect is magnified at higher switching frequencies.
- Line reactors can be used to smooth the waveform going to the motor. These will be installed at the drive, on the motor leads. Consult the drive manufacturer for guidelines on sizing and installation.

VSDs with high switching frequencies are not the only source of noise you may encounter, but they are a likely place to begin looking when noise may be causing a problem.

Tech Tip

Finding the Frost Line

by Daniel Joseph

Customers frequently ask us about the importance of the frost line position for proper operation of the IBC control system. A related question, also frequently asked, is how to find the frost line.

For most blown film lines, keep the sensors just above the frost line. Two to three inches works well for many products. This applies to contact and non-contact style sensors. Because the size of the bubble changes very little above the frost line, placing the sensor much higher than the frost line will only slow down the system response to the bubble. Because most sensors require a flat surface to get an accurate reading (particularly true for ultrasonic sensors), placing the sensors below the frost line reduces the accuracy of the reading. For co-extrusion (coex) lines with multiple frost lines, instruct the operators to start the sensor position just above the lowest frost line and work up until bubble stability is acceptable.

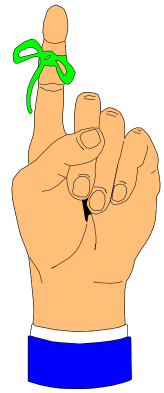
The frost line position is roughly where the bubble reaches the final diameter.

When running clear films, the frost line is easy to spot because it causes a haziness in the film. For lines with opaque films or very low blow up ratio, it can be very difficult to find the frost line. I find these situations best tackled by using a laser guided infrared pyrometer. The laser allows you to see exactly where the pyrometer is pointed. To find the frost line, point the pyrometer at the bubble just above the air ring. Read the temperature of the film. Now slowly raise the pyrometer and observe the temperature dropping as you go up. The frost line will be the position where the rate of decrease in temperature suddenly reduces. These devices are available from D.R. Joseph, and can be purchased with calibration certification.

What's New

LFC1Ô Layflat Controller for Non-IBC Blown Film Lines

- **Proven IS-IBC1® non-contact bubble sensor technology**
- **Automatic bubble inflation**
- **High speed hole recovery**
- **Single operator step to change layflat**
- **Low or no maintenance**
- **Advanced technical & service support**
- **Uses standard compressed air 90-120 psi**



COME JOIN US!!

NPE 1997

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JUNE 16-20

CHICAGO, IL

Questions and Comments

Please feel free to contact us with any questions, comments, or suggestions you may have for our newsletter. If there is a topic you would like for us to discuss, please let us know and we will work to incorporate it in our newsletter.

If you have an associate who would be interested in receiving our newsletter, please pass this one along and fax or write to us and we will make sure they are added to our mailing list. We hope you have enjoyed this, our first, Blown Film Internals newsletter and

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