

Blown Film Internals

D.R. Joseph, Inc. Blown Film Process Systems & Training

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What will you know tomorrow?

Several weeks ago, I sat in on a DRJ hosted seminar by Dr. Chris Rauwendaal in which I learned to my surprise that to move polymer down an extruder, the screw should have very little friction and the barrel should have relatively high friction. I also learned that new extruders are available that rotate the screws up to 1500 rpm and generate extremely high production rates from relatively small extruders. It seems some basic fundamentals of how things work and what was possible had eluded me.

By the same token, some of you reading this may be unaware it really is possible to increase production rates by up to 15% just by changing to a high performance IBC control solution. Or that it is possible to hold the bubble with a special soft roll sizing cage (and increase production rates) and not leave roller marks on the film. Or that it is possible to create a strong machine direction seal on film up to 150 microns (6 mil) thick, or on thinner materials at line speeds upwards of 900 feet per minute (275 meters per minute).

It goes without saying that none of us have learned everything about our industry. As our workforce transitions from one generation to the next, brain drain occurs. Facts and SOPs fade to myths and black holes until the next generation relearns the same lessons. At which point, there are epiphanies and congratulatory slaps on the back as foundational blown film principles come back into focus. I suppose it is more exciting to learn new things "the hard way," but it really is the most time consuming, the most costly, and the most sleep depriving method of all. Of course, one does not easily forget a lesson learned "the hard way."

When I started in the blown film industry back in 1987, it was ripe with companies who wanted to increase production rates and quality on existing machines by leaps and bounds. It seemed like everyone was sure there was plenty of room for improvement and they were actively looking for the upgrade technology. Today it seems there is an overdependence on what vendors offer on their new lines and not much effort spent on

redeveloping existing machines. The problem is the existing machines take up most of the floor space. So improving those machines actually helps the bottom line to a greater extent than one new fantastic (and very expensive) machine.

Our theme for this newsletter is to help you learn new things for tomorrow's challenges and help improve the bottom line of those existing machines. You will find articles about how DRJ is working not just on improving blown film technology, but is also developing a training experience for those new to blown film extrusion using our Blown Film Lab. There is a tech tip article about our high performance Seal-Cut sealing system. We have an article explaining "Operation Clean Sweep," an SPI initiative we support to help keep resin pellets out of waterways and marine areas – something every blown film producer should consider supporting. The Upgrade Corner returns with a list of significant upgrades to our control systems to consider for the next budget cycle. We also have an article covering bubble cages with the latest in the wide range of available sizes and roller surface technologies.

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Training the Next Generation

As part of DR Joseph's continuing quest to refine and improve blown film control solutions, while also educating our customers on operation and training, DRJ is happy to announce that the DRJ Blown Film Lab is now open, and has already seen its first few successful seminars.

Most recently, DRJ Labs hosted Dr. Chris Rauwendaal for a 3 day seminar on Understanding and Optimizing Extrusion. Part of the seminar involved an exciting hands on demonstration of extrusion principles in a lab session where attendees operated the 3 layer blown film line.

With the unique advantage of conveniently seeing the blown film process from the die to the winder, attendees were able to better understand the extrusion process as a whole, and also directly observe cause and effect changes that are characteristic of the complete extrusion process.

New QC Equipment Adds Value

DRJ Labs is now equipped with a variety of state of the art quality control equipment.

The equipment recently added includes:

- Offline Capacitive Thickness
- Elmendorf Tear
- Dart Impact
- Tensile / Peel Strength
- Haze / Gloss / Transmission
- Coefficient of Friction
- Color Spectrography
- Burst Testing
- FLIR Thermal Imaging
- Fiber Optic Inspection
- Testing Oven
- Resin Dryer

The reason for having a QC Lab is simple, but at the DRJ Blown Film Lab, we are creating the environment to train the next generation in the ability to make film, test film, adjust the process, and then retest



Upcoming Events

DRJ Labs will be hosting Dr. Kirk Cantor on November 11-12, 2015 for a seminar entitled *Blown Film Extrusion*.

This two-day program provides a broad overview of blown film extrusion, including materials, hardware, and processing methods.

On November 13th, 2015 DRJ will again host Dr. Kirk Cantor, presenting on *Extruder Maintenance*. This one-day program focuses on proper maintenance of polymer extruders, both single screw and twin screw.

November 2-3, 2015, Daniel Joseph will be presenting at Plastics Technology's Extrusion 2015 Conference. Mr. Joseph will be discussing Advances in Control Technologies to Boost Blown Film Quality, Cut Costs. DRJ will also be exhibiting a table top at the Conference to meet individually and discuss the DRJ line up of solutions.

For more information on upcoming events, in addition to a course description on our hosted events, visit: <http://www.drjosephinc.com/Events.html>

film; which takes the QC lab to another level. The idea is to train process engineers how to quantitatively refine the process to help create competitive products. It improves the return on investment for the QC equipment and it allows your process engineers to be proactive instead of reactive.

For example, our DRJ Seal-Cut testing service now uses the burst tester and tensile tester to fine tune the seal strength to a degree not possible without this equipment. These quantified tests can tell us if we are on the fringe of failure, whereas the simple burst to failure test cannot provide that information. Our customers receive a more customized sealing solution from us as a result.

In addition to serving as a training facility, the Blown Film Lab is available to rent on a daily basis. Possible reasons for renting the lab would include:

- 1) Resin formulation trials including film property testing
- 2) Small prototype production runs for customer testing
- 3) Team training sessions

Operation Clean Sweep™

Although plastics are recyclable and should not be littered, too often they end up on beaches or in our marine environment. Industry frequently partners with governments to prevent litter, but there is one aspect of marine debris where the responsibility is completely ours. We're talking about raw plastic pellets -- spilled in manufacturing plants or in transit -- that are washed down storm drains and end up in our oceans and waterways. It can be a bigger problem than many realize and the solution rests solely with us. D.R. Joseph has recently signed on as a supporting member of Operation Clean Sweep (OCS) to give our customers the tools to keep resin pellets out of the environment.

Operation Clean Sweep is an international program designed to empower and aid employees of the plastics industry and others handling pellets to keep resin pellets out of the marine environment. Operation Clean Sweep was created with the many levels of the resin plastic business in mind; including resin manufacturers, plastic processors, trucking and rail companies transporting the pellets, and the plastic machinery and equipment companies that use the resin pellets. Operation Clean Sweep is a simple step to help strengthen your company's sustainability initiatives, safety record, financial bottom line and reputation in the industry.

Becoming a member of OCS is simple. Visit www.opcleansweep.org and sign the pledge. You will immediately be able to take advantage of all of the OCS tools posted online. These include customizable checklists for both employees and managers to conduct site and equipment audits. Also included are posters to hang around the work place to help encourage everyone to help reduce pellet waste.

You will receive an OCS flag, a certificate of participation and an OCS logo to highlight your company's commitment to sustainability.

D.R. Joseph is committed to a sustainable future. With the involvement of companies such as yours, we can keep resin pellets where they belong: in our plastic products, not in the ocean. What are you waiting for? Take the OCS pledge!



A Cage for Any Size Bubble

D.R. Joseph is the North American Representative for Gammatec Sizing Cages of Milan, Italy. Gammatec cages represent a bench mark for sizing cages throughout industry and are synonymous with quality and performance at an economical price.

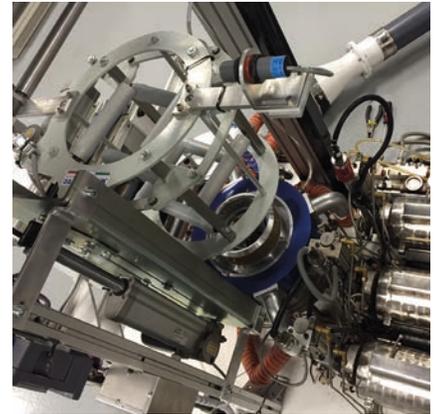
To accommodate large bubbles, the new Gammatec Roll08 BIG013 cages can stabilize bubbles up to 41.5 ft (12.65 m) layflat widths. A strong, reinforced design assures a solid, long lasting cage to stabilize large bubbles. No longer is the bubble too big for a quality bubble cage. This solution is ideal for geomembrane or agricultural film production.



Likewise, Gammatec has something to offer for those running much

smaller lines as well (down to 35mm /1.3 inch layflat).

Pictured below is a cage retrofit on DRJ's lab scale blown film line, featuring the same technology and cage geometry that make Gammatec the preferred sizing cage manufacturer in the industry.



Other developments include the addition of the Extreme No Stick carbon fiber rollers. These rollers are optimized for contact with extremely sticky films.



Roller material can easily be changed and cleaned in a fraction of the amount of time that is traditionally required with segmented Teflon rollers, and often times, at a mere fraction of the cost.

A certified lifting option is now available, for lifting components off of the die for maintenance.

TECH TIP

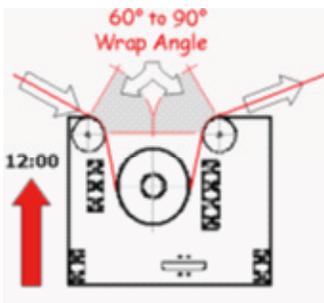
Proper Setup & Maintenance of the DRJ Seal-Cut

This tech tip focuses on setting up the Seal-Cut for the best results. The tips here are not only valid for setting the unit up for the first time, but also serve as a guideline for optimizing the Seal-Cut. You might want to revisit your set-up and procedures if you find excessive build-up on the blades, rough film edges, inconsistent sealing or if you have to keep raising the seal temperature to seal and split the film.

There are a number of things to put on your checklist when setting up the Seal-Cut in line with your processing: Placement, Alignment, Setting the Bow Rollers, Tension Control, Seal Element Blade Dwell, and Setting the Temperature.

Placement: Start with considering the placement of the unit. When mounting the unit, it is important to consider the wrap angle of the film in and out of the unit. The film must make sufficient contact with the bow rollers in order to properly spread the web. Also consider operator access to clean the seal element.

Position the idle rollers or winder such that you can obtain a 60° to 90° wrap angle as pictured below.



Alignment: When the Seal-Cut is not aligned with the web, multiple problems will result such as: build-up on one edge of the film, and inconsistent sealing. If you find that one seal is strong while the opposing seal is weak, chances are that

the film is not aligned when entering the Seal-Cut. For best results, a measuring tape will not cut it – it's best to use a laser alignment tool such as the one pictured to ensure that the web is square to the unit.



If the winder or roller after the Seal-Cut is not even with the unit, you may notice build-up on one edge of the film as well.

Setting the Bow Rollers: The bow angle on both rollers is adjustable and should be set according to the entrance and exit angle of the film. Start by putting the bow roller straight up at the 12 o'clock position, then moving it to 1 and 2 o'clock, which is typical. Test various positions to reduce wrinkle formation. Too much bow on the outlet will cause the film to pull away from the element too soon which will result in poor sealing; 3mm of separation is what we are looking for.

Tension Control: The number one requirement for good seal making is stable web tension. Pulsing tension (common tension issues come from very long distances between driven rollers or sticking tension control dancers) will ruin any sealing process. Assuming that Seal-Cut unit is properly aligned, you should also make sure tension is not set too high; which causes machine direction waves in the film as shown below. Reduce tension to eliminate these waves.



If you are running the Seal-Cut offline from an extruder, you may want to consider some sort of adjustable tension control.

Seal Element & Blade Dwell: Setting the blade dwell changes the amount of time the film is on heat versus the time that the film is cut (seal time vs cut time). Typically, the dwell is set at the 6 o'clock position (element facing straight down). Introducing the cut sooner can cut reduce edge build-up, but can also lead to premature and weak seals. Adjusting the cut too late leads to issues with the film not separating completely.

Setting the Temperature: The Seal-Cut is designed to seal at lower temperatures than a hot knife. This avoids polymer crystallization which leads to brittle sealing. Be sure to educate your operators on this concept, as they will want to run the Seal-Cut like a hot knife and falsely believe that a hotter seal temperature leads to a better seal.

Before setting the Seal-Cut temperature, it is a good idea to calibrate the unit with the ambient temperature. Be absolutely sure the blade is at ambient temperature prior to calibration.

A good temperature to start for most applications is 200°C, and then reduce the temperature in 10° increments until the seal fails. Then increase the temperature 10° to establish your production temperature. Overheating causes build-up on the blade and seal.

The Seal-Cut is relatively low maintenance when contrasted with hot knives. It is good practice to clean the blade every so often with the included cleaning tool. Build-up on the seal element will lead to a shortened life span and less than perfect sealing.

Keeping these set-up/optimization points in mind when looking at your production will help keep maintenance down, and the end customer happy with their seals.

Increase Net Saleable by 7% for nonIBC Blown Film Lines

For a nonIBC blown film line, there is no inherent control of layflat as there is on IBC lines. Without a width control system, a nonIBC line will drift in size (most often smaller) due to air leaking from:

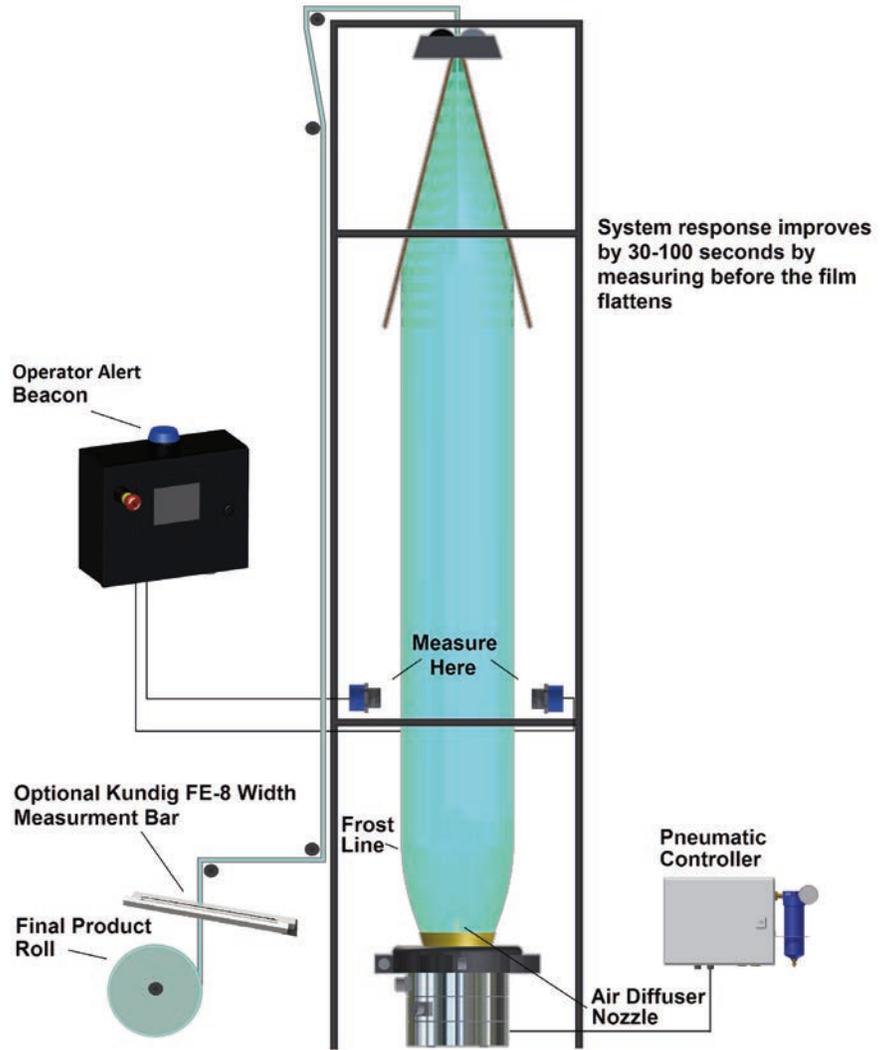
- Pinholes, occasional gels or carbons in the film
- The bottom of the die
- The primary nip roller

Without a width control system, after startup, the bubble diameter will become oversized. The internally trapped air is heated by the exposed die surface, increasing bubble diameter until it reaches a steady state temperature. This process can take up to thirty minutes depending on bubble diameter and tower height.

Seasoned operators can account for some of these effects, but the operator cannot monitor the line constantly. Small holes, gels, and other issues that cause the bubble to suddenly lose size often result in losing the bubble entirely. Every time this happens, at least 30 minutes of production is lost while operators are rounded up to restart the line.

The LF-Sizer fills this missing piece of automation for nonIBC lines. It uses the same width control technology as found in our patented IS-IBC1® systems that automate startup and size changes, accounts for bubble swell, leaks, and other issues that disturb the process. It won't fix a misadjusted air ring or a surging extruder, but it will keep a stable bubble on size.

So how does the LF-Sizer improve net saleable by up to seven percent? It keeps the line in production up to six percent more over the time span of a month by avoiding bubble drops. It gets the product on size faster during size changes. It reduces oversizing of the film layflat and it can even shut down your extruders should there be a bubble break avoiding the clean-up time from material accumulating in the air ring.



Easy Installation: The installation of the system is very straight forward; ultrasonic sensors (3 or 4) are mounted equidistant around the bubble and at a height roughly twice the average frost line height. Mount the main control panel and the pneumatic control box. Connect the 100-240VAC single phase power to the control panel, sensors to the control panel, plant air to the pneumatic box and connect pneumatic box to the air inlet port of the die. Last step is to install the DRJ supplied air nozzle on top of die.

Easy Startup: Starting the line is a simple matter of entering target width, pressing the AUTO button and starting the line. The system will inflate the bubble from nothing to production automatically. Calibration of layflat sensors requires only the operator to measure web width and enter the

measured value into the system.

For large bubbles, measuring the layflat for calibration at start-up can be difficult, or may require a second person to help measure the actual width. In this case, the Kundig FE-8 measurement bar can be integrated to the LF-Sizer for a one button calibration process saving time, and making the operation safer.

For 2015, we have made the operator alert beacon standard and we have added the enhanced bubble break detector described earlier in this newsletter.

So a simple cost effective solution to cutting down on the safety margin (runaway resin), scrap and improving machine run time makes a big difference, especially when considering the alternative.

Kündig Film Thickness Measurement

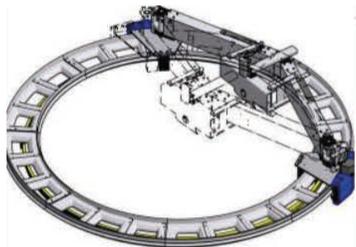
Thickness measurement and control is a very effective way to accurately control resin costs. Gravimetric control ensures the weight per unit length is correct, but an accurate measurement of film thickness and a subsequent control mechanism across the web ensures uniform thickness; thereby avoiding thin spots and gauge bands. The idea being to extrude film that is easily processed by subsequent converting processes – such as laminating or printing. Since 2005, D. R. Joseph has operated Kundig International, Inc. (KI) to provide full after sales support to OEMs and customers using Kundig film Thickness and Width measurement systems.

Some of the popular Kundig Products that KI supports are:

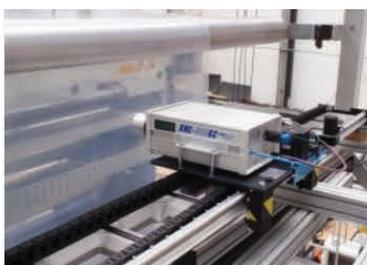
K100 and K300 Contact Measurement Systems



KT300 and KNC400 High Speed Thickness Scanning Systems



KNC-600 Linear Scanner, Thickness Gauge for Cast Film and MDO



Efficiently Maintaining Uptime

DRJ keeps a full line of spare parts for the equipment we sell, but logistically, our customers are encouraged to keep a selection of the critical spare parts, reducing downtime from hours to minutes.

A recent review of our service activities from 2011-2014 shows it takes us an average of 46 minutes to identify an IBC system problem and prescribe the correct action. That is fast, but unless you have onsite spare parts, you are stuck waiting for a courier shipment that could be 24-72 hours away. With down time costs ranging from \$1000 to \$10,000 per hour, having key spare parts onsite is strategic element required to maintain an uninterrupted production schedule.

DRJ also offers PASS service contracts that shorten the time to access a service technician and provide an automatic discount of 5% on all spare parts. If you are in the market for a new system, the 3% discount typically covers the cost for the annual contract.

Below is a list of the most commonly replaced spare parts by system type:

Recommended IBC Spare Parts

- IBC Sensor
- Layflat Sensor
- Proportional Valve

Recommended LF-Sizer Spare Parts

- Layflat Sensor
- Carbon Air Filters

Recommended Seal-Cut Spares Parts

- Seal Element
- Cleaning Tool

DRJ Customer Care Team

The customer care team is here to support you. Our main contact number is: **+1-817-987-2030**.

For those in North America, you can use our toll free number **800-767-4470**. Below is our updated company directory:

For all sales related questions, orders and quotes or order status: **Trevor Grossklaus** at Trevorg@drjosephinc.com, Ext 18

For installation questions, troubleshooting or compatibility questions: **Gary Wielenga** at Service@drjosephinc.com, Ext 26

For after hours service requests, please leave a message at extension 35

For shipping related questions, tracking, also for support in Spanish: **Ely Leos** at Elyl@drjosephinc.com, Ext 17

For credit requests, invoice inquiries, RMAs, PASS Contracts Service: **Taylor Joseph** at Taylorj@drjosephinc.com, Ext 10

For Kundig spare parts quote and orders, RMAs and support: **Sara Wyatt** at Saral@drjosephinc.com, Ext 19

For press releases, marketing and sales related questions, also for support in Italian: **Michael Pilolli** at Michaelp@drjosephinc.com, Ext 25



...And Max, our mascot, who ensures we are all working hard taking care of you.

UPGRADE CORNER

In the spirit of continual improvement and better serving their clients, D.R. Joseph is excited to announce a host of new features recently added to the 3rd Generation IBC Control System, now currently available to their customers.

WinIBC is a family of 3 solutions that add multiple operating or monitoring points for the IBC Control System. **WinIBC Viewer** adds up to four PC based operating points for remote viewing of the IBC System for supervision, or even for training purposes. **WinIBC Operate** is a good solution for replacing the IBC touch screen completely and moving the IBC operations to a PC based platform which mimics the touch screen itself. **WebView** adds remote alarm monitoring via an RSS feed. With this feature, maintenance can keep track of multiple IBC System faults from one point via RSS feed.

Both the IBC and nonIBC products support **MultiPoint operation** which means you can have multiple operator control touch screens for a single system.

Another convenience feature we've added is **screen capture** to a USB memory stick. This allows operators and technicians to record their running conditions which includes a date time stamp.

Ever wish you could have a system that shuts down the extruders to avoid having to clean a solid chunk of plastic out of the air ring and IBC hardware? The **enhanced bubble break system** does exactly that. The enhanced part includes an extra step of alerting the operator with a xenon beacon and allowing time for the operator to override the pending shutdown if the bubble appears to be recovering. Built in dry contact relays allow interface with E-stop or other stop circuits.

Likewise, ever wish you could shut down the IBC system automatically when the extruders stop? The new

extruder stop feature handles an orderly shutdown of the IBC system which ensures the system does not continue running after the operator stops the extruder.

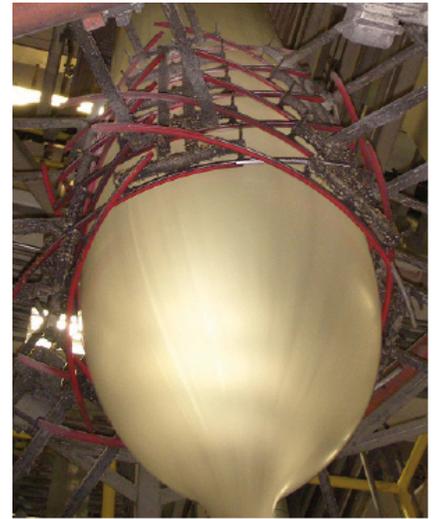
After nearly 15 years of absence, **Neck Height Control** is a feature once again offered by D.R. Joseph that uses a dedicated sensor to measure and regulate the neck height on high stalk bubbles. Control is via air ring speed regulation or air temperature regulation and is also particularly useful for those running high-stalk bubbles or those who have precise requirements for frost line height.

Combo Heat/Cool with Electronic Temperature Control: The need to cool blown film is nothing new, but in some cases, it may be desirable to have the ability to heat the film slightly instead of cooling it. We have worked with Berg Chillers to develop a dual coil device with a dedicated coil for cooling and another for heating.

By scavenging warm water from other heating processes, we can provide a much wider range of temperatures to the IBC and or Air Ring. The IBC system has a temperature interface built in along with process trending. By having two coils, the water sources are never mixed and time required to change from a cool temperature to a warm temperature is shortened considerably. If no scavengable hot water is available, a simple water heater can be supplied to create the hot water. Basic range possibilities span from 10°C to 65°C (50°F - 150°F) depending on the available hot water temperature.

Cage Height Management: This new feature allows customers to set the sizing cage height to an exact position (within 3mm for most cages). This is helpful when SOPs require a specific cage height for a specific job. An added benefit is provided when the cage height is well above the operator's head.

Setting the distance by entering a target height eliminates all guess work and ensures the cage is in the right position everytime.



The DRJ system also includes five programmable preset heights and a Maintenance position. Maintenance personnel often need to raise the cage to the maximum height to allow clearance for air ring, IBC or die repairs. With a single push of a button, the cage goes to the maximum height automatically. Best of all, the system has a Previous Position button as well to bring the cage back exactly where it was before.

New Touch Screen Control for the DRJ Seal-Cut: The DRJ Seal-Cut now ships with a 6" color touch screen to carry out operation of the MD sealing unit. New features have also been added, including a one touch cleaning feature, fool-proof temperature calibration, and password protected max temperature settings, helping to ensure that SOP are followed for a given production run. Users can also now select °F or °C for all display screens on the Seal-Cut.



Inops, Potentem Dum Vult Imitari, Perit

Translated literally from Latin; "The weak, when imitating the powerful, end in ruin." This popular quote is taken from the fable *The Frog and Ox* by Phaedrus. In the story, a frog, taken by envy of the size of a nearby ox, puffs his chest to appear bigger in size. When deluded by the fact that he couldn't match up, he puffs his chest in despair so much so that he ends up exploding!



John Rae's Illustration from *American Anthology* (1918)

I think we see this in our industry today. One will "puff up" or tout their products capabilities which breeds idealistic expectations in the minds of customers, claiming to be the "World Leader" offering cutting edge, best in class technology. But wait – send a PO now, and you can have it all at a reduced rate, far cheaper than the original innovators product offerings. Why pay more when you can get the best for less?

Admittedly, it is pretty easy to overstate a product's capability – but where does that leave the customer who overlooks the age old; You get what you pay for...? When evaluating any purchase, make a thoughtful selection; Price, Quality, Performance - now pick two!

It is not a call to complacency, but more a reminder to not overstate a product's capability, and to the consumer; a warning to look beyond inflated marketing, which is usually evidenced by the bottom line in the end.

Outside of evaluating cost, how else can you tell if a producer is overstating a product's capabilities?

There are online reviews; LinkedIn has a nice forum for blown film experts where oftentimes friendly veterans in the field are more than happy to give a review or suggestion.

Some names have been around in the industry for some time and have stood the test of time, so looking at a company's history and market presence can sometimes be an indicator of a good product. These typically are the people who innovate throughout the years, and not only invest significant R&D in their product, but also invest in their customers through educational programs, tech seminars, white papers and articles.

What is the installed base, and what is the post sales aide reputation for the company? Post sale support is a very important factor to consider when evaluating the overall value of one product versus another, especially in blown film where production time is so valuable.

Investing in the right equipment will take some work and attention to details. Your supplier should be willing to work with you to properly size and qualify your investment, and provide a realistic ROI based on real data.

With some caution and an analytical eye, you should be able to easily differentiate the Ox from the Frog - as for the Frog, puffing up in despair and envy; he soon learned that self-conceit leads to self-destruction.

■

End of Life for 8-bit IBC's

As many of you know, May 31, 2013 was the end of support for first generation 8-bit IBC systems sold between 1989 and 2003. This means that DRJ will no longer provide e-mail, phone or onsite support for 8-bit systems. Spare Parts (rebuilt with no warranty) are available on a first come first serve basis, with a limited stock.

Self-Service with Online Knowledge Base

To allow customers the option of self-service, we have implemented a complete library of the 8-bit service documentation. You must be a registered customer to access the knowledge base. To register, visit our home page and navigate to the lower right hand corner. Click on the appropriate Knowledge Base link. There is also a help page to guide you through the registration.

Knowledge Base

Online access to technical Knowledge Base, including manuals and procedures, requires registration. Click [here](#) for help registering.

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