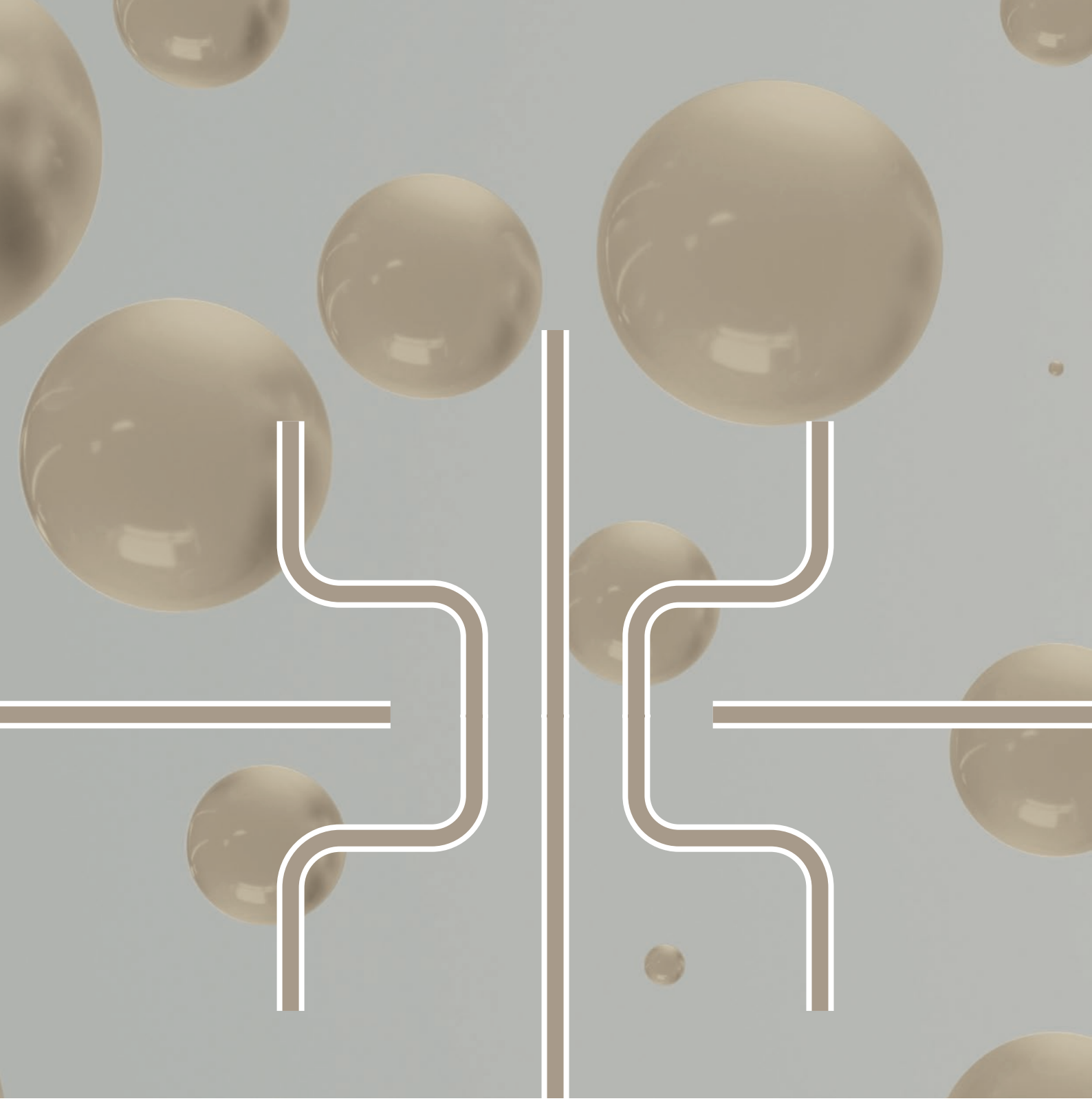


An innovative foaming agent
to reduce material and resin consumption

Functionalities:
Ecocell® – Lighten up!

POLYFIL USA

CONSTAB GER

Working together for the future of plastics.

Kafrit Group

Kafrit Group is a leading producer of Masterbatches and Compounds for the plastics industry and currently employs more than 1,000 people. In 2025, we achieved approx. 400 million USD turnover with an available capacity of more than 175,000 MT. Moreover, the company is active on a global scale and has set up production sites all over the world.

All of this began in 1973 when the company was founded in Israel. Since then, the company has grown primarily via acquisition.

Today, the Kafrit Group is a global network of leading plastics additive, color masterbatch and compound manufacturers, operating production and development sites in Israel, Germany, China, the USA, Canada, Sweden and India.

Its companies include **Kafrit Industries (1993) Ltd. in Israel, CONSTAB Polyolefin Additives GmbH, Delta Kunststoffe AG and Finke Colors GmbH in Germany, China's Suzhou Constab Engineering Plastics Co. Ltd., Polyfil Inc. and Badger Color Concentrates Inc. in the USA, the Canada-based Kafrit NA Ltd. and ABSA Resin Technologies Inc., Addvanze AB in Sweden, CONSTAB Polyolefin Additives India Pvt. Ltd. and 51 % of Plastics App Ltd.in Israel.**

With more than 50 years of experience in the plastics processing industry, we can draw on high levels of expertise and technical know-how. Kafrit Group follows a publicly available sustainability agenda and has made it to one of the cornerstones of our corporate strategy.

Our unbridled dedication to quality and technology makes us to one of the leading business partners in the plastics industry. Our customers value our passion and appreciate our commitment. Moreover, they recognize our world leading services and consider our products as among the best within our industry.

We develop and produce cost-efficient solutions which will enhance the completion of high-quality end products in many areas of the plastics industry, such as packaging films (BOPP, BOPE, CPP, PE), PC sheet, agricultural films and derivatives, biopolymers, flame retardant applications, PEX, pipes, fibers and nonwovens.

- KAFRIT IL 1
- KAFRIT NA 2
- POLYFIL USA 3
- CONSTAB GER 4
- CONSTAB CN 5
- ADDVANZE SWE 6
- DELTA KUNSTSTOFFE GER 7
- ABSA RESINS CAN 8
- BADGER COLOR USA 9
- CONSTAB IND 10
- Finke 11
- PLASTICS-APP 12

Unite talent and technology to drive the future of plastics, together.

This purpose is the driving force of our organization. The reason we do what we do, why we come to work every day. And although our group is made of many different companies around the world, our purpose unites us.

These three pillars support our purpose

TOGETHER TO THE FUTURE

The world doesn't stand still, and nor do we. We're always looking ahead, searching for new ways to grow and thrive. To push our technology and keep working on the next generation of solutions to benefit our customers. Working together in perfect synergy to achieve something great, today and tomorrow.

TALENT

Around the world, we have hundreds of talented colleagues and partners. All with unique skills, multidisciplinary knowledge, and deep industry experience. Innovators with brilliant ideas and the drive to see them through. People striving for excellence in everything they do.

TECHNOLOGY

After decades in the plastics industry, we have more than high levels of expertise, a strong focus on customer service, and vast technical knowledge. We also have a burning passion for innovation and transformation. A passion that drives us to seek out new solutions, new machinery, and fresh ways to give our customers just what they need.

Together we have the power to drive the future of plastics – within our community and around the world. And we'll keep doing it, today, tomorrow and always.

But the real magic happens when we work together. There's a spark, an energy. A belief that anything is possible. And that's how we provide the best solutions for our customers.

And with the latest technology in our hands and new innovations within our grasp, there's only one question. How far can we go?

Experience the new high performance products

Research that takes us to the top

Throughout our company history, research and development has always been a key area of our expertise. Kafrit Group employs a staff of more than 1,000 people who work on innovative products and make use of our vast pool of knowledge developed over 50 years in the plastics industry. Our experts optimize and develop additive concentrates, flame retardants, color concentrates, and compounds for various applications.

Kafrit Group enjoys a close partnership with renowned research institutions such as the Shenkar University in Israel and various universities in Germany. Moreover, we maintain a strong co-operation with well-known suppliers including machine manufacturers who recommend our products for use in combination with their machines.

What is Ecocell®?

Ecocell® is a patented technology that infuses microscopic air bubbles throughout the polymer during the conversion of that polymer into a finished item.

Ecocell® contains a combination of additives in a pelletized polymer base that when heated above 393°F (200°C) releases a small quantity of carbon dioxide creating an air-pocket or foam cell in the polymer.

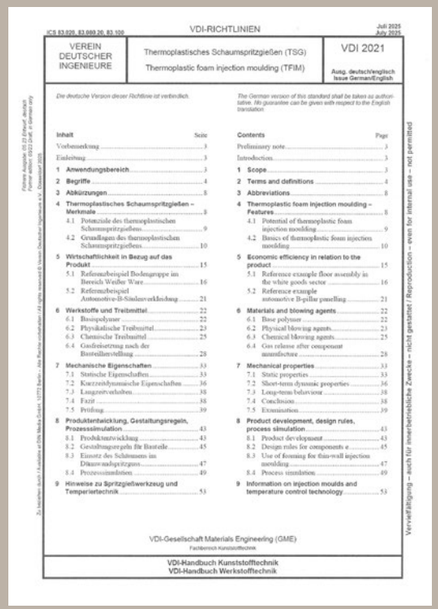
The foam cell diameter is usually about 125 microns, and, depending on polymer type and process, sometimes smaller. At this size they are invisible to the naked eye.

With Ecocell® it is possible to reduce the density, and thus, resin consumption, by up to 35 % using conventional processing equipment and over 50 % in processes specifically designed for foaming.

Further Technical Guidance

For comprehensive information on thermoplastic foam injection moulding, please refer to the VDI Guideline VDI 2021 – Thermoplastic Foam Injection Moulding (TFIM). The guideline covers design principles, materials, processing and quality aspects of foam injection moulded components.

For further information, please scan the QR code or contact our experts to discuss your specific foaming application and processing requirements.



ICS 83.020, 83.080.20, 83.100 VDI-RICHTLINIEN Juli 2025 July 2025

VEREIN DEUTSCHER INGENIEURE

Thermoplastisches Schaumspritzgießen (TSG)

Thermoplastic foam injection moulding (TFIM)

VDI 2021

Ausg. deutsch/englisch
Issue German/English

Die deutsche Version dieser Richtlinie ist verbindlich.

The German version of this standard shall be taken as authoritative. No guarantee can be given with respect to the English translation.

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Fachbereich Kunststofftechnik

VDI-Handbuch Kunststofftechnik
VDI-Handbuch Werkstofftechnik

Ecocell® is protected under Patent No.: US 8,563,621 B2

Reduce resin consumption by up to 50%

What makes Ecocell® different from traditional Chemical Foaming Agents?

There are three features of Ecocell® that make this product different than present day foaming agent technology:

Formula

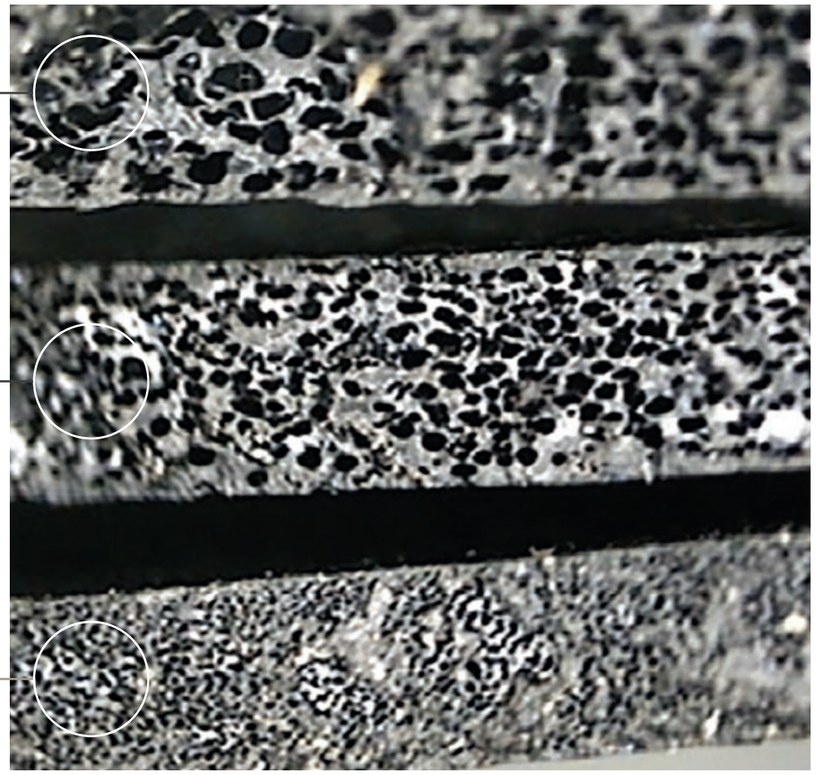
The ingredients used in Ecocell® are different than those used in all the conventional endothermic and exothermic foaming agents. The by-products are different, there is less water given off upon activation, and the pH is neutral.

Cell Size

The cell size of Ecocell® is typically in the range of 100 microns allowing it to be used in processes where conventional endothermics fall short. The larger cells produced by traditional CFAs have a greater negative effect on appearance, printability, draw down and physical properties. Parts made with Ecocell® are smoother, more opaque, have greater draw down potential and retain physical properties better than conventional systems.

Activation

Ecocell® has only one activation point whereas conventional endothermics have two. Ecocell's® reaction occurs at 393˚F (200˚C) and matches well to the processing temperatures for the polymers it is intended to be used with. Conventional endothermics have two activation points; one at approximately 320°F (160°C) and another at approximately 395°F (201°C). The first activation temperature usually causes pre-expansion, loss of gas, large cells and cell collapse.



Ecocell® is protected under Patent No.: US 8,563,621 B2

In what applications or processes can I use Ecocell®?

The following is a list of applications and processes that Ecocell® has successfully been evaluated in:

- Art Board
- Blow Molded Articles for Automotive
- Cast and Blown Films
- Center Core of Building Composites
- Closure Gaskets/Liners
- Coaxial Cable Insulation
- Decorative Ribbon
- Extruded Sheet
- Fiber
- Injection Molding-Automotive etc.
- Structural Foam Molding
- Nucleation of Physically Foamed Sheet for Packaging
- Nucleation of Wire and Cable Insulation
- Foam Wire and Cable Insulation
- Plastic Lumber
- Profile Extruded Moldings
- Structural Foam Molded Handling Systems
- Thermoformed Trays and Tubs
- Tubing

Advantages of Ecocell®

Ecocell® is ideal for reducing material consumption and overall energy costs and production time

• Less material consumption • Density reduction • Elimination of sink marks • Reduction of residual stress • Reduction of warpage • Lower material viscosity • Shorter cooling times: increased output • Reduction of electricity usage	standard chemical blowing agent
• Uniform, very fine cell structure • Residue-free reaction • Biobased ingredient • Food approval • Single activation point	additional advantages of Ecocell®

How do I use Ecocell®?

How much do I use?

Ecocell® comes in a pellet form and should be used at 1 % to 2.5 %. Using it at a lesser amount will cause inconsistent foaming and poor incorporation or mixing into the polymer melt. More than 2.5 % may reverse the effects of foaming, over saturate the resin with gas and cause overnucleation where cell walls rupture causing large voids, poor surface and an increase in density.

How do I mix it with my resin?

Being a pellet, Ecocell® can be used in the normal way one uses a color or additive concentrate. It can be physically blended with the resin or fed at the hopper with a volumetric or gravimetric feeder. It is not recommended that a mix of Ecocell® and resin be vacuum conveyed over long distances as separation will likely occur because of pellet density differences.

What are the recommended processing temperatures?

The activation temperature of Ecocell® is exactly 393˚F (200˚C). Somewhere along the process a melt temperature of 393˚F (200˚C) degrees must be exceeded for the chemical reaction to occur. The foaming process will decrease the viscosity of the molten resin so extrusion temperatures can be set lower than that for unfoamed polymer. It is preferable that the reaction takes place in the highest-pressure areas of the process to keep the evolved carbon dioxide in solution until the material exits the die. This is usually the metering section in a typical extruder. The throat should be below 393°F (200°C) degrees to prevent pre-activation in this low-pressure area of the process.

What are the recommended process conditions when using Ecocell®?

Sheet and Profile Extrusion

Temperature: A typical temperature profile for low or high density polyethylene, polypropylene or polystyrene is as follows:

In this profile the die is set below the activation temperature of the Ecocell® to produce the smoothest surface possible by preventing additional activation on the surface of the extrudate. The feed is set below the activation temperature to prevent pre-foaming and the transition section is set high enough to begin melting of the polymer while building pressure. The metering zone is preferably where most of the activation of the Ecocell® takes place and where pressure is high enough to keep the CO_2 in solution and prevent expansion of the polymer until it exits the die.

Section	Temperature˚F	Temperature˚C
Feed	385	196
Transition	395	201
Metering	420	215
Die	390	199

Screw RPM: To prevent activation and, thus, foam expansion from occurring too soon, an RPM setting of 25-30 or above is recommended. The higher pressure and lower residence time caused by high extruder speed is desirable.

Cooling: It is uncommon to require any special cooling methods other than that used for cooling unfoamed polymers. Contrary to popular belief, the foamed polymer will cool faster than solid material as there is less mass and the melt temperature exiting the die is cooler due to the endothermic nature of the chemical reaction.

Die Gap and Drawdown: It is desirable to keep drawdown of the polymer exiting the die to a minimum. Drawing down the polymer after it exits the die will elongate the cells causing thinning of the cell walls and possible cell collapse and rough surfaces. Foam expansion actually occurs outside the die so if die gap adjustments are not made to accommodate this, the drawdown could present a problem. Through experience, we recommend using the following formulation to determine what die gap is ideal to minimize drawdown.

Die Gap = (1-(Dr / 3)) x T where:

Dr = Desired weight or density reduction

T = Target thickness of the finished sheet or film

Example: A weight reduction of 30% is desired in a 60 mil (1,5 mm) thick sheet

Dr = 30 %

T = .060 inches (1,5 mm)

Die Gap = (1-(0.3/3)) X .060

(1- 0.1) X .060

.9 X .060

.054

In this example the die gap should be set to 54 mils (1,37 mm) to obtain a 30 % weight reduction in a 60 mil (1,5 mm) sheet.

Injection Molding

The injection molding process presents some limitations to the processor who is considering the use of Ecocell® to reduce material usage. Part thickness, gating, mold design etc. all impact the potential weight reduction in a part.

However, Ecocell® offers other advantages besides weight reduction for the molder such as:

- Elimination of sink marks
- Reduction in cooling time due to the endothermic nature of Ecocell's chemical reaction.
- Reduction and Elimination of warpage.
- Reduction of molded-in stresses
- Elimination of voids via nucleation (see below)

Ecocell® is protected under Patent No.: US 8,563,621 B2

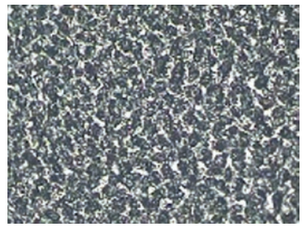
Post Extrusion and Thermoforming

The same methods used to print, corona treat, laminate, cut, etc. solid/unfoamed polymer materials should be used for foamed materials as well. Because there is a reduction in mass, many of these post extrusion processes will see an advantage obtained by foaming with Ecocell®. Materials will be easier to cut (extending knife wear), and it is usually necessary to reduce oven temperatures when thermoforming.

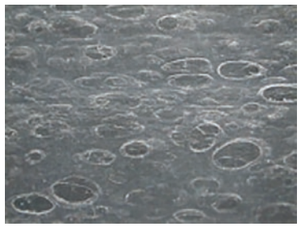
Blown and Cast Films

It is well to note that foaming films will reduce some properties greater than the corresponding weight or density reduction achieved. Tear strength in the machine direction, dart impact and tensile strength will be adversely affected and it is recommended that films foamed with Ecocell® be used only in non-load applications or applications able to withstand the decrease in physical properties.

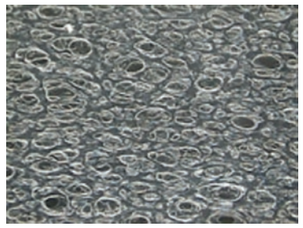
Resin choice is an important factor in determining the quality of the foamed film. For obtaining a film with the smallest foam cells and best weight reduction, a conventional low density polyethylene is recommended. Linear low density polyethylene appears to produce larger cells with a greater chance of blow through and cell collapse. The following photographs at 30X show the cell morphology in different resins.



Ecocell® in Low Density Polyethylene



Ecocell® in Linear Low Density PE



Ecocell® in a blend of LDPE and LLDPE

The Extrusion profile for foamed or cast films is similar to that of extruded sheet as follows:

These temperatures are guidelines and can be changed depending on the situation. The foaming process will decrease the viscosity of the molten resin so extrusion temperatures can be set lower than that for unfoamed polymer. The temperatures above take into consideration the 393°F (200°C) decomposition of Ecocell®. The concept is to prevent activation of the Ecocell® until it reaches the high pressure section of the metering zone keeping **the CO_2 in solution and preventing expansion until the material exits the die.**

Section	Temperature ˚F	Temperature ˚C
Feed	385	196
Transition	395	201
Metering	420	215
Die	390	199

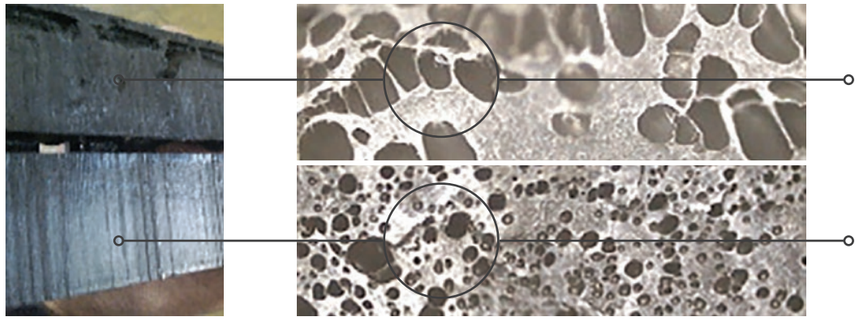
Screw RPM: As in other extrusion processes an RPM setting of 25 – 30 or above is recommended to prevent activation and, thus, foam expansion from occurring too soon. Higher pressure and lower residence time caused by high extruder speed is desirable.

Screen Pack: Screens of 40 mesh (40 µm) and higher are recommended and, contrary to popular belief, the pressure drop across the breaker plate is not so critical as long as the pressure forward of the metering zone maintains or exceeds 1000 PSI (70 bar).

Die Gap and Drawdown: To maximize properties, prevent cell elongation, and to keep the cells small, minimizing draw down is critical. In films, the experience has been to keep the draw down under 10:1 for cast film applications and 20:1 in blown film applications. Larger drawdown ratios can be employed but cell elongation with aspect ratios of 3:1 or higher are likely. This will further reduce properties; especially tear strength in the machine direction. A 0.040 inch (1 mm) die gap was used to produce the cell structure in the 2 mil (44 µm) films shown in the previous pictures.

Ecocell® Nucleation

In regards to weight reduction, it has generally been considered that parts with a thickness below .125 inches (3 mm) are too thin to achieve any appreciable weight savings due to high fill pressures and small gating. However, in many cases Ecocell® has reduced part weight up to 10 % in parts as thin as .060 inches (1,5 mm). Often it is just a matter of evaluating Ecocell® in the process to determine weight savings. General recommendations to improve the potential for weight reduction are to reduce flow length by center gating the part, have the flow of the material go from thin to thick, use as large a gate size as possible and supply generous venting.



Standard Endothermic CFA used at 0.3 % as nucleant with nitrogene. Large cells and numerous voids.

Ecocell® used at 0.3 % as nucleant with nitrogene. Small cells and voids eliminated.

Processing Temperatures:
A typical temperature profile for molding polyethylene, polypropylene or polystyrene is as follows:

Section	Temperature ˚F	Temperature ˚C
Zone 1 (at hopper)	390	199
Zone 2	420	216
Zone 3	420	216
Nozzle	390	199

In this profile, zone 1 is set below the decomposition temperature of the Ecocell® to prevent pre-activation and the nozzle is set colder to reduce drool. A shut off nozzle is preferred but not necessary.

Additional process recommendations: Fill rate should be a maximum of 4 seconds, there should be no hold pressure or cushion since this will collapse the cells as they are forming, and shot size should be adjusted for the expansion of the polymer.

To adjust shot size, decrease the amount of fill until a short shot is obtained and then increase the shot size minimally so a full shot is achieved.

Blow Molding

Ecocell® has successfully been used in the extrusion blow molding process with weight reductions exceeding 15%.

The processing of the polymer follows the same recommendations for any of the extrusion processes mentioned above. A typical starting profile is as follows:

The use of a one stage screw is highly recommended. Screw RPM should be above 25-30 to insure that the Ecocell® is well down stream of the feed section before activation of the Ecocell® occurs.

Section	Temperature ˚F	Temperature ˚C
Feed	385	196
Transition	395	201
Metering	420	215
Die	390	199

There are several theories as to what happens with the foam parison when blow pressure is applied. The foam gas is either squeezed out of the polymer or is solubilized when blow pressure is too high. It is therefore recommended using as low of-
a blow pressure possible when using Ecocell® to obtain the highest weight reduction.

Pressure between 25 and 30 PSI (1,7 to 2 bar) is ideal. Both blow rate and blow pressure are variables that the processor should investigate to maximize weight reduction. Also, a generous amount of Ecocell® may be added to obtain maximum weight reduction as the Ecocell® is less prone to parison blow through than typical endothermic blowing agents because of its very small cell size.

Other

Ecocell® has successfully been evaluated in fiber applications. It has also seen success as a nucleant in physically foamed systems. As more processing information regarding these applications is gathered, we will make it available to our customers.

Polyfil Inc. offers technical assistance if you are looking to trial Ecocell® at your facility. You can contact us at our offices or contact your account representative to learn more about Polyfil's Ecocell® Technology.

Product	Starting LDR	Density g/cm3	Melt Index g/10 min	Resin Recommendation										Comments
				LDPE	LLDPE	HDPE	PP	PS	PA	ABS	PC/ABS	PLA	PET	
Ecocell® L	50:1	~0.930	~11.00	•	•	•	•	•						LDPE Base Resin – recommended for all processes.
Ecocell® P	50:1	~0.960	~5.50	•	•	•	•	•						LDPE Base Resin – recommended for all processes.
Ecocell® H	50:1	~1.052	~5.50	•	•	•	•	•						LDPE Base Resin – recommended for extrusion.
Ecocell® H1	50:1	~0.980	~4.00	•	•	•	•	•	•					LDPE Base Resin – recommended for Injection Molding.
Ecocell® GT	50:1	~1.040	~4.00			•	•			•	•	•	•	HDPE Base Resin – recommended for all processes.
Ecocell® CS	50:1	~1.120	~6.00	•	•	•	•	•						LDPE Base Resin – recommended for sheets, pipes, profiles and Injection Molding.

Special grades are available on request.

Ecocell® is protected under Patent No.: US 8,563,621 B2

About

Polyfil, Inc. – A member of the Kafrit Group

Polyfil, Inc. began operations in 1984. It is ISO 9001 certified and is the largest independent manufacturer focusing solely on the development and production of performance enhancing additive concentrates for polyolefins. Besides Ecocell® and foaming agents, its product line includes multi-functional additive concentrates, gas and odor absorbers, clarifier/nucleators, UV and AO stabilizers, amine, non-amine and non-amide anti-static agents, mineral filled concentrates, anti-oxidants, purge and shutdown compounds, processing aids, release agents, slip, anti-blocks and custom formulated concentrates.

Polyfil's 60,000 square foot (5.600 m²) manufacturing and laboratory facility is located in Northern New Jersey. This modern facility allows Polyfil, Inc. to produce, affordable, high quality additive concentrates.

CONSTAB GER – In the heart of Europe

CONSTAB Polyolefin Additives GmbH is a leading manufacturer of high-quality masterbatches for the plastics processing industry. For over 50 years, we have been developing customized solutions that meet the highest standards of efficiency, quality, and sustainability. Based in Rüthen, Germany, we supply powerful additive masterbatches to customers worldwide for a wide range of applications.

The patented chemical foaming agent Ecocell® sets new benchmarks in injection molding and extrusion. It significantly reduces material and energy consumption while creating a fine and uniform cell structure. The result: lighter components with excellent mechanical properties. Thanks to this technology, we clearly stand out from the competition while simultaneously enhancing sustainability and cost-efficiency.

Please request for further information:

BOPP
Optimizing BOPP film production
with CONSTAB GER® Masterbatches and Compounds

BOPE
Innovative solutions for flexible packaging films
with CONSTAB GER® CON-X® Masterbatches

New approach to reclosable packaging
Extrudable reclosable adhesive

Functionalities: Kafrit Group Antioxidants
Reliable protection for your plastic products

Flame Retardants
Enlightening solutions with Kafrit Group Masterbatches and Compounds

Polyethylene Packaging, Polypropylene Cast and Calender Films
Rolling to success with Kafrit Group
Masterbatches and Compounds

Polycarbonate and PMMA Sheets
For a transparent view with Kafrit Masterbatches and Compounds

Pipes and Sheets
Customized solutions with Kafrit Group
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Injection Molding, Blow Molding
Injecting new ideas into your products with
Kafrit Group Masterbatches and Compounds

Nonwovens
Adding value to Fibers and Nonwovens
with Kafrit Group Masterbatches

Agricultural Film
Growing success with Kafrit Group
Masterbatches and Compounds

Color and additive masterbatches and conductive compounds made to measure
Customized solutions for your success

Ecocell® is protected under Patent No.: US 8,563,621 B2

Global supply, local partnership:
We are where you are.

KAFRIT IL

Kafrit Industries (1993) Ltd.
Kibbutz Kfar-Aza
M.P. Negev, 8514200, Israel
Tel: +972 8 6809845 | Fax: +972 8 6809846
kafrit@kafrit.co.il | www.kafrit.com

CONSTAB GER

CONSTAB Polyolefin Additives GmbH
Industriestrasse Möhnetal 16
59602 Rüthen, Germany
Tel: +49 2952 8190 | Fax: +49 2952 3140
info@constab.com | www.constab.com

CONSTAB CN

Suzhou Constab Engineering Plastics Co., Ltd.
No. 999 Pangjin Road, Wujiang District
Suzhou City 215200, Jiangsu Province, P.R.C.
Tel: +86 512 63 33 16 54 | Fax: +86 512 63 33 69 87
info@constab.cn | www.constab.cn

KAFRIT NA

Kafrit NA Ltd.
5411-275th Street, Langley
British Columbia, Canada, V4W 3X8
Tel: +604 607 6730 | Fax: +604 607 6736
management@kafrit.ca | www.kafrit.ca

POLYFIL USA

Polyfil Inc.
74 Green Pond Road, P.O. Box 130
Rockaway, NJ 07866, USA
Tel: 973-627-4070 | Fax: 973-627-7344
info@polyfilinc.com | www.polyfilinc.com

ADDVANZE SWE

Addvanze AB
Makadamgatan 19
254 64 Helsingborg, Sweden
Tel: +46 42 445 33 00
info@addvanze.com | www.addvanze.com

DELTA KUNSTSTOFFE GER

Delta Kunststoffe AG
Industriestrasse 48
47652 Weeze, Germany
Tel: +49 28 37 1051-0 · Fax: +49 28 37 1051-810
info@delta-kunststoffe.de | www.delta-kunststoffe.de

ABSA RESINS CAN

ABSA Resin Technologies Inc.
310 Montrose Street
Cambridge, ON, Canada, N3H 2H8
Tel.: +1 519 653 5575

BADGER COLOR USA

Badger Color Concentrates Inc.
1007 Fox St.
Mukwonago WI 53149, USA
Tel.: +1 262 363 5710
www.badgercolor.com

CONSTAB IND

CONSTAB Polyolefin Additives India Pvt. Ltd.
T-7, STPI,MIDC, Chikalthana, Chhatrapati Sambhajinagar
431001, Maharashtra, India.
Tel.: +91 95035 39418
info@constab-india.com | www.constab-india.com

Finke

Finke Colors GmbH
Hatzfelder Straße 174 – 176
42281 Wuppertal, Germany
Tel.: +49 202 70906-0 · Fax: +49 202 70906-230
www.finke-colors.de

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Plastics App Ltd.
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1923000, Israel
info@plastics-app.com
www. plastics-app.com

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