

Eastman's Glass Polymer Captures Personal Care Market and Provides Opportunities for Food Packaging



Wesley A. Freimuth
University of Wisconsin – Stout
Menomonie, WI
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Abstract.

Eastman's Glass Polymer is an innovative new material that is pushing the limits of 'high-end' polymer resins. The polymer is designed to acquire the look of glass and the mechanical abilities of plastics. Its properties make it extremely popular in the personal care/cosmetics industry. The Glass Polymer also has great potential to be used in the food industry.

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Eastman's Profile.

Headquartered in Kingsport, Tennessee, U.S.A., Eastman Chemical Company manufactures and markets more than 1,200 chemicals, fibers, and plastics products. The company is the world's largest supplier of polyester plastics for packaging. It is also a leading supplier of coatings, plastics, cellulose acetate, and basic and specialty chemicals. Founded in 1920 to supply basic photographic chemicals for Eastman Kodak Company, Eastman Chemical Company became an independent publicly traded company in January 1994. The company has approximately 12,000 employees and had 2004 sales of \$6.6 billion (1).

Eastman's Creative Polymer.

By launching a new breakthrough resin, Eastman has made it possible to produce thick walled bottles that look and feel like glass. The new Eastar AN001 was introduced at the Luxepack 2001 show, the leading cosmetic packaging exhibition held in Monaco, France. Eastman received unusually positive early reviews when the first samples of the new Eastar AN001 were presented to potential customers and end users. *"Some customers were so convinced the bottle itself was made out of glass that they thought we were talking about the plastic cap,"* says Vincent Gugumus, European marketing manager for consumer markets at Eastman Specialty Plastics (2). Since the new polymers introduction in 2001, Eastman has developed a family of these resins. The Eastar AN is the premier material. It provides the most clarity, good chemical resistance, and is the easiest to injection mold. The Eastar DN is the toughest material. With a notched izod of 21.7 J it proves to be incredibly shatter resistant. The Eastar GN is the most versatile material. It can be manufactured with up to 1 inch of wall thickness while keeping water like clarity. The Eastar EB is made to combine the

best of all the glass polymers. It is designed to improve on toughness, melt strength, chemical resistance, color, and clarity. The family of resins has been named ‘The Glass Polymers’.

Aesthetic Characteristics Match Glass.

The Glass Polymer portrays glass like clarity. The clarity of the material makes it very difficult to distinguish from glass. The light transmission rate is over 90% after the material has been manufactured into a bottle or jar. For Matis’s facial cream packages a transparency rate of 91% was achieved while keeping a continuous thick wall. The Glass Polymer is completely capable of being colored or tinted by simply applying additives. A high gloss finish can also be accomplished with the polymer. An important issue for many cosmetic companies is that the clarity and sheen of the Glass Polymer is as good as, if not better than, glass (3).

The Glass Polymer has a high end feel. Any type of finish may be used from a dull graspable finish to a glossy smooth finish. The thick walls leave a rigid feel. Contrary to glass, it leaves a warm inviting feeling to an interested customer's hands. *“The unique properties of the Glass Polymer allowed us to create a bottle with a deeply sensuous design that conveys a particular visual and tactile sensation, thanks to its unique 'non-cold' touch and its unexpectedly light weight,”* said Isabelle Blondeau, Marketing Manager for Plastrohm Group Packaging Division (4).

Mechanical Properties Exceed Glass.

The Glass Polymer promotes strength. The rigidity of the material is one of the reasons it is often confused with glass. It can be manufactured to be as thick and hard as glass. However, this characteristic does not mean that it is brittle, the material is shock and shatter resistant. This makes it perfect for bathroom and shower usage giving the producer a

low liability risk from breakage and personal injury. Vincent Gugumus says, *“It is virtually unbreakable – so there is no danger of damage to luggage or clothes, there is no loss of contents and there is less risk of personal injury. Containers made from the Glass Polymer are even safe in children’s hands”* (5). The shock resistance combined with excellent clarity and rigidity make it a major innovation and a deciding factor in choosing a material. Puig Prestige Beauté chose the glass polymer for its new fragrance called Falcon because it is aimed at the on-the-go market, so finding a material that would be light but hard-wearing was a primary concern. As glass did not really fit the bill, the fact that Eastman's Glass Polymer resin is light, difficult to break, and tough made it a viable option (3). The glass polymer has all the strength advantages of glass and none of its weaknesses.

The elasticity and elongation of the material help to produce complex designs; in fact, the Glass Polymer has an elongation of 320%. It also has a longer crystallization period to provide better quality and clarity to a finished package. A few other advantages that the polymer incorporates are low creep, low thermal expansion, and high dimensional stability. The great mechanical properties of the resin provide the manufacturer with a wide range of design options.

Comparative Chemical Resistance.

The Glass Polymer provides a complete barrier. A main reason glass is widely used in the cosmetics industry is due to its excellent barrier properties and corrosion resistance. The Glass Polymer introduces a near perfect barrier for the cosmetics industry. The thickness of the material reduces oxygen transmission rates and prevents the escape of aromas. *Figure 1* distinguishes the Glass Polymer’s oxygen barrier characteristics from other widely used polymers. The material is designed to prevent interaction with the product on the chemical

level. This eliminates product and package scalping and breakdown of the package. Chief executive officer of Matis Robert Walock claims, *"For us, like all health and beauty manufacturers, corrosion is a serious issue – hence, natural glass was the choice material until now"* (6).

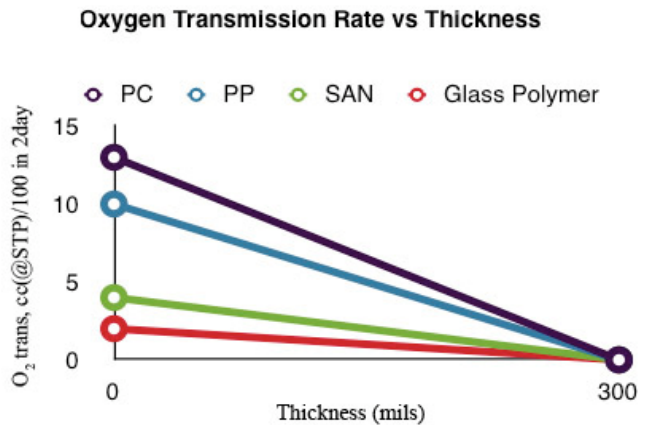


Figure 1 (16)

Advantages and Simplicity in Manufacturing.

The Glass Polymer fits close tolerances. The polymer is capable of being machined to exact dimensions which has been a challenging task to accomplish with glass. The cap is able to close onto the threads with little room for air, thus the soft layer inside the cap of a jar or bottle is no longer needed to make hermetically seal the container. Uniform wall thickness and inside dimensions combined with the rigidity of the material help to guarantee fewer problems in calculating the headspace of containers, thus leading to more effective filling processes. Both the variant dimensions of glass and the flexibility of thin polymers may cause problems with company filling machinery. Vincent Gugumus says, *"Before the Glass Polymer, the cosmetics industry only had the choice between thick walled clear bottles made from glass, or shatter resistant but thin and squeezable clear bottles made from plastics. Now the Glass Polymer combines the benefits of both types of material"* (5).

The Glass Polymer has versatile processing options. The polymer can be used on injection molding, injection blow molding, injection stretch blow molding, and extrusion blow molding equipment. No need to buy new equipment or change processes for the new material. For many companies this is an advantage to be able to manufacture the package

without outsourcing. Molds can be made to fit any type of new and innovative design due to the material's great mold release. *"The Glass Polymer resin gives us the opportunity to blow mold thick walled bottles with the shine and feel of glass but without compromising the polymer's inherent mechanical properties,"* says Dr. Matthias Rebhan, Rebhan Director (7).

Also contrary to glass, complex shapes can be achieved with the polymer. Molds can be made to manufacture any size, shape, texture, thickness, and thread type. The Glass Polymer also provides decoration options, including embossing, sketching, hot stamping, chrome-plating, and combining with metals or other natural fibers. Xavier Leboucher, packaging development team director for Puig Prestige Beauté claims, *"The Glass Polymer resin provided us with the perfect solution from both a design and processing standpoint. It was the only material we encountered able to survive the plating treatment and still achieve a metallic layer with a stretched, smooth finish"* (8). The Glass Polymer is also scratch resistant, keeping the finish unblemished during transportation and consumer use. The Matis Company eliminated its problem of scratched containers by switching to the innovative material for their new facial cream jars (6).

Improve Package Appeal While Saving Money.

The Glass Polymer provides great opportunities for a reduction in costs. Companies can dramatically decrease the amount of spending put into a product line by converting from glass to the Glass Polymer (*figure 2*). The polymer has clear advantages in manufacturing including 'in house' operations, universal equipment, and effective filling operations. These savings could be put back into designing unique, stand alone packages for a product. Companies could also boost sales by converting from ordinary plastics to the Glass Polymer with minor price fluctuations.

The Glass Polymer is a logistics savior. Transportation costs can be reduced due to reduced weight of the packaging in both the areas of primary packaging and the elimination of unnecessary protective packaging. The strength and durability of the package would decrease breakage and loss of product during transportation while at the same time requiring less protection. Robert Walock claims, *"With its strength and no brittleness, the Glass Polymer is the safest packaging option: drop it on the floor, and it stays perfectly intact. This is ideal since we export to 70 countries, and are always looking to reduce the weight and the chance of breakage of our products"* (6).

Cost Table (2005)

	Glass Polymer		Glass	
	Inj. Mold (16 cav.)	ISBM (6 cav.)	Clear	Colored
Base Cost	.21	.24	.15	.32
Hot Stamp	.04	.03	.08	.08
Breakage	0	0	.02	.02
Lead Time	.01	.01	.04	.04
Total	\$0.26	\$0.28	\$0.28	\$0.45

Figure 2 (16)

Personal Care Industry Embraces New Design Opportunities.

Eastman's Glass Polymer was developed specifically for the cosmetics and perfume sectors (9). Designers are taking full advantage of the material's versatility. *"It used to be that cosmetic brand owners who wanted to design a transparent bottle had few alternatives for the material selection,"* says Vincent Gugumus, *"The Glass Polymer, without sacrificing qualities such as water clear clarity, excellent chemical resistance and ease of processing, creates new possibilities for cosmetic packaging design"* (4). For the brand owner, this product helps to attract consumers with new designs that would have either been impossible before or too expensive to produce with glass or other plastic materials. Its crystal clarity attribute lets a product stand out from its competitors, helps consumers clearly see the product, and reassures potential buyers of the product's high quality (10). Many distinguished fragrance and cosmetic companies have chosen the glass polymer for their new brands

‘Wave’ Cologne from Ocean Pacific (*figure 3*) uses an inner textured glass sleeve and an outer Glass Polymer sleeve to entrap a blue liquid to create a wave like effect. *“The Glass Polymer was really the only material that was capable of achieving the clarity, wall thickness, and chemical resistance required to produce the bottle,”* says Jim Bigham, Crown Risdon’s director of sales and marketing, closures (11).



Figure 3



Figure 4

Puig Prestige Beauté’s perfume pocket spray (*figure 4*) uses the Glass Polymer as two shells to snap fit around the pocket size spray. The shells are chromium plated. *“Thanks to the excellent decorative flexibility offered by The Glass Polymer resin, we were able to use a variety of treatments, such as lacquering and hot print, to create the desired final result,”* says Xavier Leboucher from Puig Prestige Beauté (3). The Glass Polymer also lightweights the design making it more comfortable to carry.

‘Just Cavalli’ perfume from G Candiani (*figure 5*) uses the Glass Polymer as a tie layer between glass and a high end polymer. The design demanded a material with capable mechanical properties and elasticity to make up for the varied tolerances of the glass. *“The Just Cavalli perfume bottle is a complex object, consisting of three different materials: glass,*

a special resin used for the bottle shoulder and the glass polymer, which is used for the external housing to be snapped onto the other materials,” comments Carlo Candiani (9).



Figure 5



Figure 6

The Matis brand employed the Glass Polymer for its line of face creams (*figure 6*). Chief executive officer of Matis Robert Walock says, *“Its texture reinforces the quality attributes – there is none of the squeezability of PET”* (6). Matis’s objectives were met with the Glass Polymer’s high chemical and scratch resistance. *“After extensive testing, we neither had scratch nor corrosion problems with the Glass Polymer,”* said Walock (6).

Sephora was looking for versatility when they decided on the Glass Polymer for their line of ‘Bain’ body creams (*figure 7*). Other materials crystallized too quickly leaving a whitish film. With the slower crystallization rate of the Glass Polymer there was no film left behind and the package created great clarity. *“Sephora wanted uniquely designed packaging to convey the prestige positioning of its brand,”* says Stephane Arraitz, project manager for Sephora (13).



Figure 7



Figure 8

The Glass Polymer was chosen for the shower gel, ‘Kingdom,’ from Alexander McQueen (*figure 8*). The material allows flexibility and shock resistance, so if dropped it will not break like glass, while still having the same look and feel of glass. *“We required a packaging solution that expressed the core values of the Alexander McQueen label – luxury, elegance and originality. At the same time, being a bathroom product, it was equally important that the product is safe to use and will*

not break if dropped,” said the packaging specifier at YSL Beauté, Charles Pileur (12).

‘Chocolatine’ is a unique scented concept package from Eastman Chemical, Eurofragerance, Rotumba, and EJ Pack (*figure 9*). The jar is thick walled and a square mold which was unable to be obtained from other polymers. Valérie Bouvignies, CPC European Marketing Manager for Eastman Chemical comments: *“We now have a winning combination of products and the technical ability to add an extra functionality to packaging that has not yet been exploited by the industry. Chocolatine offers brand owners exciting new opportunities for differentiation by means of innovative packaging”* (14).



Figure 9

Rebhan, a European leader in the design and manufacturing of bottles, makes a home for the Glass Polymer because of its advantages over glass such as cost, weight, and aesthetics. To make the appearance even more glass-like (*figure 10*), Rebhan has eliminated the visibility of welding lines and has created a thick rounded inner bottom of the bottles

much like a glass bottle would have. Dr. Matthias Rebhan, Director for Rebhan says, *“Using these properties allows us to combine the advantages of plastic with the value and aesthetics of glass to create an impressive effect”* (7).



Figure 10



Figure 11

‘Ether de Iunx’ from 331 International (*figure 11*) has created a clearly innovative design using a combination of the Glass Polymer and electronic lighting. *“The Glass Polymer provides a deep color, but is still sufficiently transparent for the light emission inside the case,”* says Annick Masegla, Director of 331 International (15).

With phenomenal design characteristics, the Glass Polymer has great potential for growth with cosmetics and personal care items. Eastman is currently only marketing the polymer to the cosmetics industry. However, many other industries could benefit by incorporating the Glass Polymer into their packaging options. Growth in the use of this material only shows signs of increasing.

Food Industry Soon to Grasp Glass Polymer?

The Glass Polymer could be used by food and beverage companies to grab customer focus with unique jar and bottle designs. The glass-like appearance and feel is very appealing when breaking into a new market or revitalizing an existing product. The versatility, durability, and chemical resistance make the glass polymer superior to previously used

plastics in the industry. Chief executive officer of Matis, Robert Walock said of his company's choice: *"The Glass Polymer has many advantages of glass, but with none of the drawbacks"* (6).

With U.S. FDA (Food and Drug Administration) approval, the glass polymer is suitable to be used in food contact applications. The thickness of the package material can also determine food preservation. By having a thickness near that of a glass container, the polymer can help to keep food longer than a PET container. The material is designed to prevent chemical interaction, keeping foods and beverages free of unwanted flavors. European business director for specialty plastics at Eastman, David Speicher claims, *"There are many other unexplored tracks for segments in the packaging industry. For instance, Eastar AN001 has excellent chemical resistance. It also doesn't generate any acetaldehyde like other polyesters, when it is processed, which guarantees food contact without any effect on the taste of the product inside"* (2).

The advantages of the Glass Polymer over glass may be enticing enough for companies to consider a switch. Areas of cost savings for companies include loss of product due to package breakage, transportation, 'in house' manufacturing and sterilization of packages, and quicker filling lines. Loss of product due to rough seas, air transport, highways, or warehouse handling can be eliminated with the use of the Glass Polymer. Transportation costs can be cut down due to lighter packaging. Close dimensional tolerances help to reduce problems with filling lines. Product liabilities may be decreased a significant amount by a simple change in packaging materials.

The Glass Polymer is an excellent candidate in material selection for the packaging of food and beverages. The material has the qualifications it needs in the industry, with FDA

approval, no chemical interaction, possible cost savings, and fascinating feel and appearance. The Glass Polymer has great potential to bring innovation to the food and beverage industry.

Eastman's Success in Innovation.

Vincent Gugumus remarks: *"We see tremendous opportunities for new designs using these materials"* (5). The range of packaging possibilities with this new material is wide.

With excellent aesthetic appeal, a high end feel, shatter resistance, great mechanical properties, a complete barrier, versatile processing options, ease of manufacturing, and cost savings, the Glass polymer is quickly growing in popularity among the cosmetics industry.

Companies are showing a great amount of confidence in the material and grabbing the attention of consumers. *"I am delighted to say that the new packaging in the Glass Polymer has been a complete success,"* says Robert Walock. *"The consumers love the unpolished texture we use and, like us, agree that the packaging enhances the product in every way"* (6).

The Glass Polymer resin is helping to push the limits of packaging design, from glass-like containers in simple forms to the most complex of shapes.

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