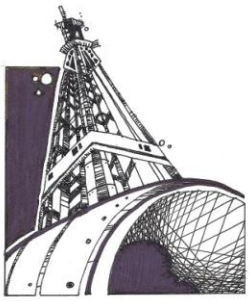

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New Foam Applications: Balancing Properties, Performance, Process Ability and Environment Impact

One of the first tasks for the design engineer in his role to develop a new product is to define the balance of physical properties of the various components of the total structure. For example, when designing an automotive seating structure, the rigid frame, energy absorbing seating support base, cushioning layers and outer covering are all considered independently and how they will perform together in the final structure. Doing a straightforward sorting of plastics by key properties, performance temperature, resistance to certain chemicals, barrier properties, FDA, UL status etc. will yield a list of candidates that may be used alone but are more likely to be used in conjunction with other materials in compounds, as a component in a composite or as a critical functional member of a complex structure. Normally, that list is further sorted by process ability in the injection molding or film, sheet or foam processes. Very often, linear polyolefin's such as Linear Low-Density Polyethylene or Polypropylene offer an ideal balance of physical properties but are not selected because of their poor melt process ability, especially in foam applications. Polymer scientists, design engineers and processing experts continue to collaborate to find creative solutions to demanding new application performance requirements resulting in polyolefin's showing up where they would not have been expected.

New polymer technologies along with process innovations are enabling the use of specialty polyolefin's in markets normally dominated by Polyurethane or Polystyrene Foams. Over the 20 plus years, cross-linking technologies using chemical and electron beam irradiation methods have enabled the use of Low-Density Polyethylene in higher temperature applications such as automotive headliners. While these materials perform well in the application, they are no longer thermoplastics because of the cross-linking and cannot be reprocessed in melt applications and don't fit well into segregated recycle streams. Radiation processing by electron beam has commercially been used on a large scale to induce long chain branching in linear polymers and is one way to improve their process ability in the non-crosslinked extruded foam process.

There are excellent examples of where innovative companies have combined proprietary extrusion processes and die technologies with high melt strength (radiation induced branching) polyolefin resins to create unique foam structures that offer a unique balance of high compressive strength and resilience with high stiffness and a high heat distortion temperatures (>180^{o}F) in ultra low density (0.2 pcf) foam board. This balance of foam properties, coupled with its high heat resistance has enormous commercial implications particularly in automotive applications.

By incorporating high melt strength (long chain branched) polyolefin components with property modifiers in specialty compounds, polyolefin's are finding their way into new cushioning, seating and bedding structures. Innovative bedding industry leaders re-engineered mattress perimeter support and profile height support designs by incorporating extruded closed celled polyolefin foams into the structure. The Polyolefin Foam, because it is not cross-linked like Polyurethane foam is fully reprocessable and recyclable. Today, there is an enormous emphasis on sustainability and environmental impact. Reprocess ability, recyclability, compostablility or biodegradability is no longer just buzz words. We are now beginning to see the commercialization of plastics polymerized from non-petroleum based feed-stocks that can be regenerated. One leader in the automotive seating industry, in their effort to address these issues and to make the automotive seating systems smaller and lighter have introduced several new concepts which will go into some 2011 models. Foam polypropylene gives the seat its structural shape and primary support. This may be the first use of Polypropylene Foam in a seating application. A soy based urethane foam is used for padding plus a layer of padding created made from a waste product of the timber industry.

Radiation processing of linear polyolefin's and other polymers to improve melt process ability, particularly in the production of low density foams, may be the key element in utilizing that ideal balance of physical properties for your application. The capacity, know-how and experience are currently available through E-BEAM Services Inc. Contact us and see how our experts can help you incorporate the properties you need into your application.