The Future of Chemical-Free Aseptic Packaging

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Three dominant trends are shaping the future of shelf stable packaging technologies in the food and beverage industry. First, sustainable packaging and sustainable manufacturing practices are being adopted across the industry. Corporate social responsibility, the value of green marketing, and preparation for environmental regulation are driving consumer packaged goods manufacturers to reevaluate their packaging strategies. Second, consumer tastes are shifting. The growth of healthy juice, tea, and dairy based drinks requires alternative technologies to conventional hot fill and retort based approaches that limit flavor quality of these less sweet beverages. Finally, a heightened sensitivity to food safety is influencing packaging technologies. High profile foodborne illnesses and consumer concern over chemical contamination are both shaping brand owners' packaging decisions.

Aseptic packaging has particularly benefited from the shift in consumer tastes. New aseptic processes have the capability to produce shelf stable products with far less product heating than hot fill or retort based packaging and less flavor engineering than preservative based products. Additionally, aseptic packaging is being influenced by shifts in preferred package formats and food processing advances that enable flash pasteurization of a broader range of foods. Probably most significant is the continued rise of single serve bottle-based packaging. However, in order to compete with the carbonated soft drinks, energy drinks, and functional beverages marketed to the consumer by the case, in addition to refrigerated shelves, the adoption of aseptic bottle filling in the U.S. must increase. In China, consumer preference for un-sweetened tea based drinks and the lack of cold distribution chains are driving adoption of aseptic bottle filling. Beyond bottles, the adoption of flexible packaging for bulk, single serve, and portion packs is being

accommodated by aseptic packaging technologies.

Aseptic packaging works on the principle of filling a flash pasteurized product in a sterilized package inside of a clean environment. Package sterilization technology is a key component to aseptic packaging lines and is a technology category experiencing significant innovation. Chemical based sterilization technologies currently dominate global aseptic packaging lines. Peracetic acid, the dominant chemical sterilant for bottle sterilization, relies on a water rinse to remove chemical residuals, resulting in large quantities of wastewater and treatment costs. Hydrogen Peroxide can alternatively be used for bottle sterilization, but requires high heat to evaporate the sterilant and has the potential to migrate into plastic bottle walls and then back to the beverage. Hydrogen Peroxide is the dominate sterilization technology for cartonboard-based packs and gable tops. Bulk sterilization of preformed bags, pouches, and caps at offsite gamma irradiation facilities has been adopted for more complex packages where chemical techniques have been difficult to implement. Bulk sterilization has the drawback of requiring a more complicated supply chain, higher unit package costs, and complex procedures for transferring pre-sterilized packages into the aseptic filling zone.

Electron beam-based sterilization technology is gaining in popularity due to its ability to deliver high efficacy, ambient temperature and chemical-free sterilization. Electron beam sterilization can enable lighter weight packaging materials, drastically reduce energy consumption, and eliminate the need for rinse water. Also, since no chemical sterilant is used, there is no risk of residuals migrating to the packaged product. The amount of electron beam energy required for aseptic levels of sterilization is well understood and can be precisely controlled with digital monitoring of electron beam current and voltage. This simplifies process control and makes the process of validating a new electron beam enabled filling machine with regulatory authorities faster and less expensive.

The following are a few examples of the flexibility of low energy electron beams in addressing a range of aseptic packaging applications.

Cap Sterilization: GEA Procomac introduced their Sterilbeam Cap Sterilization system at Drinktec 2009. This system uses two electron beam emitters oriented to treat both sides of caps fed through a specialized, high speed conveyor system. A broad range of caps have been tested successfully. Initial system sales are anticipated in the first half of 2010.

Stick Packaging: The Farmright Group has deployed an electron beam based sterilization system for their DairyStix product. DairyStix are a single portion dairy package that use 50 percent less package material and enable 40 percent more package efficiency than traditional creamer cups. Electron beam sterilization gives DairyStix the advantage of ensuring no chemical residuals and precise microbiological control – key to protecting the DairyStix brand.

Bottle Sterilization: At Drinktec last year AEB announced the availability of the e25ITB, the world's first electron beam emitter designed specifically for sterilizing the interior surfaces of beverage bottles. With a projected Total Cost of Ownership

10-20 percent less than chemical based sterilization lines, electron beam sterilization for bottles carries the added benefits of sustainability (lower energy consumption, lower water footprint, reduced chemical use), lower product costs (lighter weight bottles), and greater simplicity. Currently being integrated into high speed bottle filling equipment, commission of electron beam based bottle sterilization lines is anticipated for early 2011.

With broader packaging trends favoring sustainability, more healthful products, and the need to ensure and communicate product safety to consumers, electron beam based sterilization delivers compelling benefits over conventional technologies. While still early in its evolution, electron beam sterilization is poised for broad based adoption across the full range of aseptic applications.

For more information about electron beam emitters, visit Advanced Electron Beams (Wilmington, MA) at www.aeb.com *[1].*

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