Electron beam sterilization system for PET bottle beverages

Hitachi Zosen Corporation has successfully developed an electron beam sterilization system for PET bottle beverages incorporating a nozzle type electron beam emitter made by Advanced Electron Beams, Inc. (AEB, based in Massachusetts). Designed for standard domestic production lines filling 500-ml PET bottles at a rate of 600 bottles per minute, the sterilization system will be exhibited at JAPAN PACK 2011 (Japan International Packaging Machinery Show 2011) in the coming fall. Under a business development agreement signed in February this year, Hitachi Zosen has exclusive domestic rights to AEB’s eITB16 “in the bottle” nozzle type electron beam emitter.

Hitachi Zosen plans to install a trial system at the Chikko Works in July this year for verifying sterilization levels throughout the PET bottle interior.

The eITB16 nozzle type electron beam emitter has external nozzles of 16 mm diameter that are inserted into the PET beverage bottle and generate a low-energy electron beam that sterilizes only the PET resin surface. Unlike previous high-output electron beams, the AEB electron beam emitter does not degrade the PET resin or produce unpleasant odors, and is therefore ideally suited to PET bottles for beverages. And unlike larger electron beam sterilization systems, it does not require a dedicated shielded room or chamber.

Conventional aseptic bottling systems for beverages typically sterilize PET bottles prior to filling by spraying the insides with hydrogen peroxide or peracetic acid reagents then rinsing out with aseptic water. This approach is problematic on several fronts: it requires large quantities of both chemicals and water; wastewater must be properly treated; there is the danger of chemical residue remaining in the bottle; and PET resin may be degraded by the chemicals. Electron beam sterilization involves no chemicals or water and therefore eliminates all of these problems in a stroke.

Hitachi Zosen is also looking to develop applications of electron beam sterilization for the medical and chemical industries.
Figure 1: ITB emitter

Figure 2: Electron beam sterilization system