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Abstract

Comparison of textile products in the marketplace often discovers new information that can be influential in purchasing decision-making. In cleanroom facilities, both disposable and reusable textile garments meet the particulate standards from most rigorous to the most basic levels. However, the reusables offer two other important benefits, lower cost and lower environmental impact. The environmental and economic benefits when cleanrooms select reusable textiles are now clearly defined in detail and can be used by both suppliers and customers to add to their own environmental sustainability scorecards. It is important that such comparisons be quantitative, transparent, and utilize as equivalent as possible products, in order to have credible, usable information for decision-makers. Over the years, two categories of cleanroom textile products have been the subject of decision-making comparisons, reusable versus single-use. The objectives of this paper are to aggregate the reusable product benefits into a quantitative U.S. environmental and economic national evaluation of reusable textile garments for cleanroom use when the decisions are made to move away from single-use cleanroom textile products. That is, for all the cleanrooms currently using reusable textile garments, what national environmental improvement has occurred because disposables are not used?

This environmental analysis was from cradle-to-end-of-life (CTEOL) for each disposable cleanroom package. Reusables analysis covered the CTEOL of the small number of new cleanroom packages that are then laundered 80 cycles or 40 cycles for laundered/sterilized. The current reusable cleanroom market (14.1 million packages) was assessed to be 60% nonsterile and 40% sterilized and the total market is 50% reusable and 50% disposable. Additionally, in order to capture the full benefit of reusables for a future market, 87.5% reusables was analyzed (12.5% are mandatory disposables). For the current cleanroom users of reusables there is a cost reduction of 58% over disposables giving an economic savings to the U.S. cleanroom sector from reusables of about \$120 million/year. This is also saving the total U.S. about 136 million MJ nre / year (38 million kWh) and about 8.4 million kg CO_{2eq} annually (removal of about 1,650 cars/yr). If the cleanroom sector moves toward greater environmental sustainability, as well as achieving lower operating costs, the environmental and economic benefits of selecting reusables (now 24.7 million cleanroom packages per year) will become even more impactful. Currently the economic savings to the U.S. cleanroom sector from reusables is \$120 million/year. The maximum hypothetical case of reusables at 87.5% of the market would yield an U.S. national savings of nearly \$2.1 billion/decade to the cleanroom sector bottom line, as well as 2.4 billion MJ nre savings in energy or removal of about 29,000 cars/decade.

Keywords: cleanroom reusable textiles; economic and environmental benefits, U.S. national benefits of reusables