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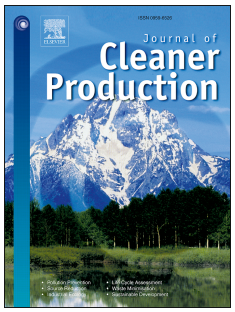

Integrating environmental impact assessment into new product development and processing-technology selection: Milk concentrates as substitutes for milk powders

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Integrating environmental impact assessment into new product development and processing-technology selection: milk concentrates as substitutes for milk powders

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Abstract

Environmental-impact reduction potential is great early in new product development. To exploit this potential, this study evaluates novel combinations of existent processing technologies. Process engineering is combined with an environmental product assessment along the supply chain.

In the dairy sector, drying milk into milk powders is a highly energy-intensive process. This study investigates whether switching from *milk powders* to new products known as *milk concentrates* diminishes the overall environmental impact along the supply chains of dairy-containing products. A comparative life cycle assessment (LCA) is conducted, which considers individual processing steps that can be combined and operated in various ways to generate a multitude of different skim milk concentrates. For relevant environmental indicators such as cumulative energy demand, global warming potential, eutrophication potential, and acidification potential, concentrates were found to have a lower environmental impact than powders, even if the former are trucked up to 1000 kilometers. This break-even distance is a conservative estimate. It depends upon the environmental impact of raw-milk production. The concentrate with the lowest environmental impact is produced by a combined concentration with reverse osmosis and evaporation to a dry-matter content of 35% and preservation via subsequent pasteurization. This holds for all indicators except eutrophication potential, for which this concentrate is the second-best option.

This study identifies the frame within which milk concentrates are an advantageous substitution for milk powder and demonstrates the value of applying environmental assessment to product development and processing-technology selection.