A Multi-criteria Rough Set Based Methodology for Life Cycle Impact Assessment

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Abstract

Life Cycle Assessment (LCA) is a methodological framework for assessing environmental impacts of products and processes from cradle to grave. It typically deals with the consideration of multiple criteria or multiple impact categories. Its impact assessment phase (LCIA) requires the valuation or weighting of these impact categories to render comparative assessment of alternatives. This paper presents an alternative approach to LCIA utilizing the concept of Pareto optimality and rough set methodology (RSM) in application to a semiconductor assembly/packaging operation. RSM generates the set of rough decision rules from training data obtained from the expressed preferences of a panel of experts. New options are then assessed through Pareto optimality screening and rough decision rule matching. Results show that the ranking of the improvement options from this methodology is similar to the ranking obtained with the use of the Analytic Hierarchy Process (AHP).