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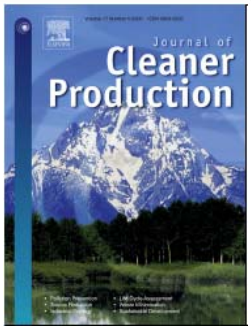
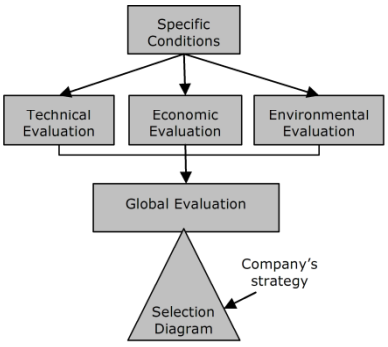
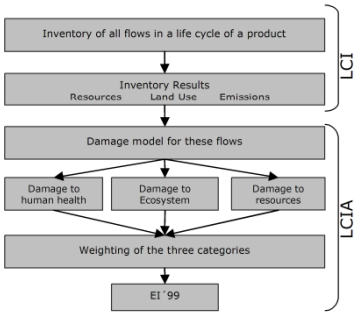


A Life Cycle Engineering model for technology selection: a case study on plastic injection moulds for low production volumes

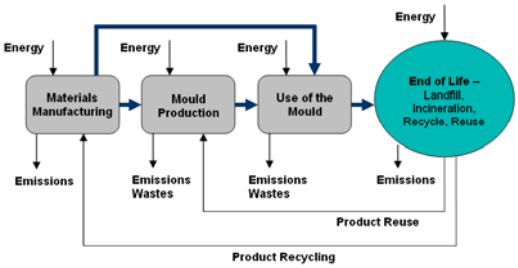
The selection of the most appropriated technological solution to produce a certain mould able to competitively produce parts in polymeric materials is a multi-disciplinary activity, which integrates different knowledge fields and professional domains. The selection decision should capture not only the technical performance required for the mould to produce the final part in the expected quantities and intended quality, but also the economic issues and environmental impacts originated all along the mould life cycle. In this paper a Life Cycle Engineering (LCE) model is proposed to support the selection of alternative technological solutions through the integration of these three analysis dimensions underlined by the LCE approach. The model proposed has the novelty of integrating the three dimensions through the use of easy-to-read ternary diagrams allowing the identification of the ''best domains'' of each technological alternative. With the integrated analysis, the present model fosters the global comparison of alternatives according to different business scenarios and corporate strategies, supporting an informed decision-making process. The model was applied to a case study aiming the production of very small production volumes of polymeric parts. Two candidate technologies were evaluated: one involving a mould made of a spray metal shell backfilled with resin and aluminium powder and another based on the machining of aluminium.



Proposed LCE approach



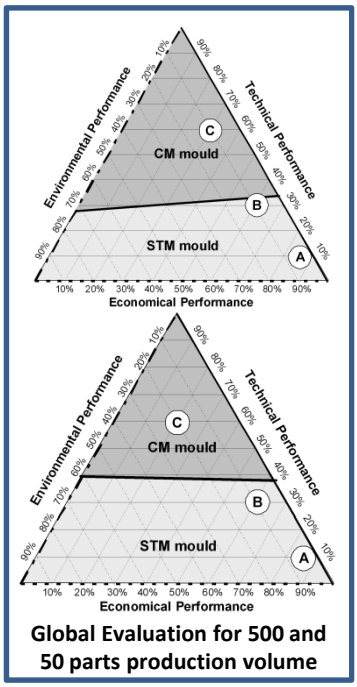
LCA Model



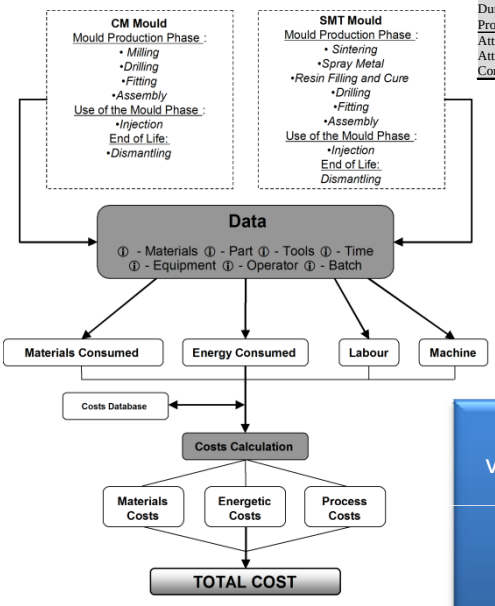
Injection moulds Life Cycle

	Capability (E)	Robustness (F)	Reliability (G)	Durability (H)	Production Time (I)
Capability (E)	0	E2	E1	E3	E2
Robustness (F)		0	F1	F3	F2
Reliability (G)			0	G2	G1
Durability (H)				0	I1
Production Time (I)					0
Attrib. score (points)	8	6	3	0	1
Attrib. score (%)	44	33	17	0	6
Corr. Attrib. score (%)	43	32	17	2	6

Pairwise comparisons of the attributes of the use of the mould stage



Global Evaluation for 500 and 50 parts production volume



LCC Model

Technical evaluation is performed using a Multiple Attributes Decision-Making (MADM) method and the Simple Additive Weighting (SAW) method, which allow a logical approach to fuzzy problems.

Considering very low production volumes the STM mould is the ''best mould'' in terms of economic and environmental aspects, while CM mould has a better technical performance.

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