

A LIFE CYCLE ASSESSMENT METHODOLOGY TO SUIT  
THE APPAREL INDUSTRY

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Department of Mechanical Engineering

University of Moratuwa

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A dissertation submitted in partial fulfilment of the requirements for the Degree of  
Master of Engineering in Manufacturing Systems Engineering

Department of Mechanical Engineering

University of Moratuwa

Sri Lanka

July 2015

## **DECLARATION**

I declare that this is my own work and that this dissertation does not incorporate, without acknowledgement, any material previously submitted for a degree or diploma at any other university or institute of higher learning. To the best of my knowledge and belief, it does not contain any material previously published or written by another person, except where the acknowledgement is made in the text.

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## Abstract

Emissions, waste generation and consumption of resources occur at different phases in a product's life cycle. This is a complex issue characterised by uncertainties and ignorance; and contributes catastrophically to effects, such as global warming, stratospheric ozone depletion, eutrophication, acidification and depletion of resources. Hence, it is important to address these product-related contributions in a more holistic and integrated manner. This research focuses on the development of a methodology to enable easy application of Life Cycle Assessment (LCA) in the apparel industry. The objectives were to study LCA methodologies, identify unique LCA parameters for the apparel sector, develop an LCA approach for the apparel industry and to evaluate it.

By analysing the existing methodologies, an LCA methodology for the apparel industry was developed. It was named as Fibre-to-Fashion LCA. The approach had six main steps to be followed sequentially, namely, goal definition, scope, data, life cycle inventory, life cycle impact assessment, and improvement analysis. These steps also included sub-steps, which intended to guide the users of this approach. It was then applied to a cotton blouse manufacturing company in Sri Lanka.

Fibre-to-fashion LCA provided a systematic and transparent approach to analysis of the environmental impact associated with the product during its entire life cycle. The simplification approaches avoided the complexities and time consuming nature of LCA, and provided veritable means of achieving objectives through a narrow domain. However, interpretation phase was hampered by the number and the heterogeneity of impact assessment results, as well as by the uncertainties arising from data, models and practitioner's choices, which are customary to the LCA approaches.

The environmental impacts due to garment manufacturing were found to be comparatively less and it is only through improvements in fibre and/or fabric performance(s) that the environmental impacts can be altered. There is a distinct limitation on the extent to which the environmental impacts can be modelled in order to map real-life scenarios and further research is needed to establish impact models that are compatible for different special boundaries.

## Keywords:

Sustainability, Life cycle assessment, Life cycle inventory.

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## List of Abbreviations

BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
NMVOC	Non-Methane Volatile Organic Compounds
PM	Particulate Matter



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