LCA FOR LIFT SYSTEMS

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ABSTRACT

In the late Nineties Schindler had conducted a LCA to evaluate the relevant environmental impacts and find improvement potentials of their lifts. One important result was that the main environmental impacts don't result from the material production, processing and logistics but during the use phase and depending on the type of disposal. These results as well as eco design tools were used to improve the lift system and a recent LCA showed that the environmental impacts per functional unit could be halved compared to the old lift. LCA is still used for environmental decisions. This year, for example, the use of neodymium for motors was analysed with a LCA. Furthermore the LCA information is used for costumer information given as EPD type III declaration.

INTRODUCTION

In the Nineties the focus of ecological decisions was often on single pollutants or specific materials known to be problematic in regard to a specific aspect. In the late Nineties Schindler elevator Ltd wanted to know the comprehensive environmental impacts. So they conducted a LCA (Schindler, 1999) to evaluate the relevant environmental impacts on a sound base and find improvement potentials of their systems. For the disposal taking place in the future different scenarios were calculated. An adequate disposal and a worst case scenario were chosen taking into account the estimated percentages for recycling, incineration and landfill for the different materials and components. For the electricity in the use phase the European electricity mix was used. Different environmental indicators such as GWP, acidification, CED were calculated as well as single score indicators such as ecological scarcity (UBP 97) and eco indicator. The results of this old study are given in this paper, taking into consideration that UBP 97 was the most current method at that time.

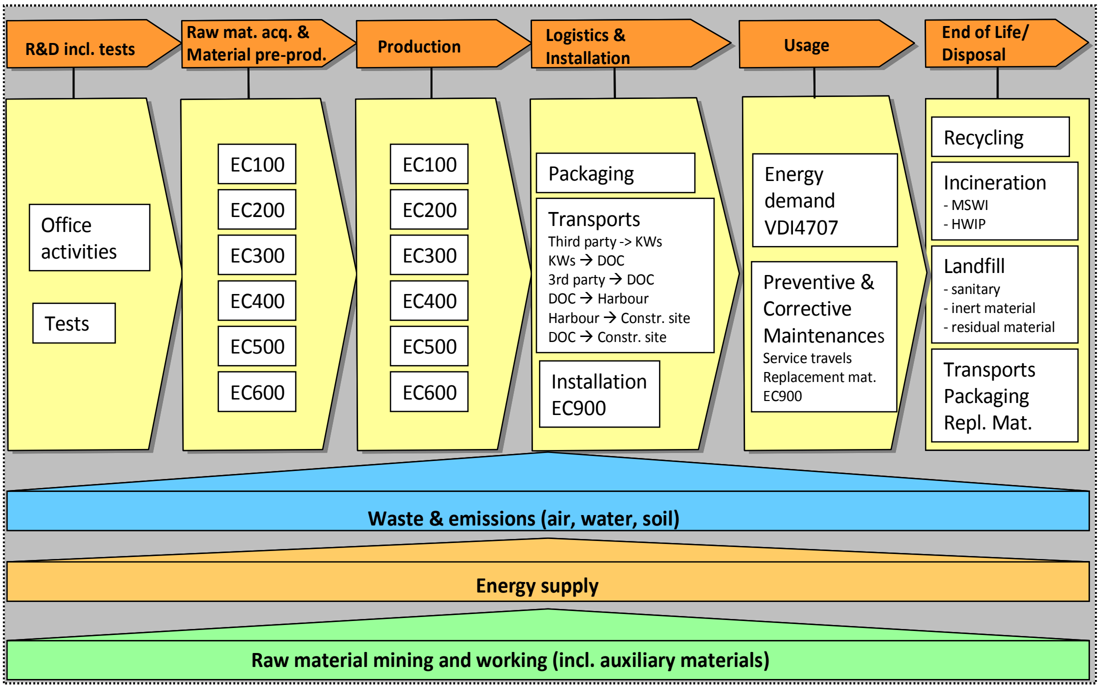

Figure 1: Life Cycle model for an lift used in the LCA.

LESSONS LEARNT FROM THIS FIRST LCA

At that time these results were more surprising for the environmental manager than they would be from today's perspective. The main environmental impacts arise during the use phase and in the worst case of disposal on the end of life treatment. The production of the materials, the processing and the logistics are of minor relevance. To improve the end of life impacts the customer care provided services for redemption and informed the customers about the importance of end of life. Concerning the use phase another astonishing result was that the impacts from the drive were less than 50%. The other impacts came from standby, ventilation, lighting etc. The R&D department was asked to reduce the impacts of the use phase. The environmental manager developed an easy to use eco design tool for the developer containing LCA indicators for the most relevant materials and possible alternatives enabling them to make their choices of the materials accordingly.

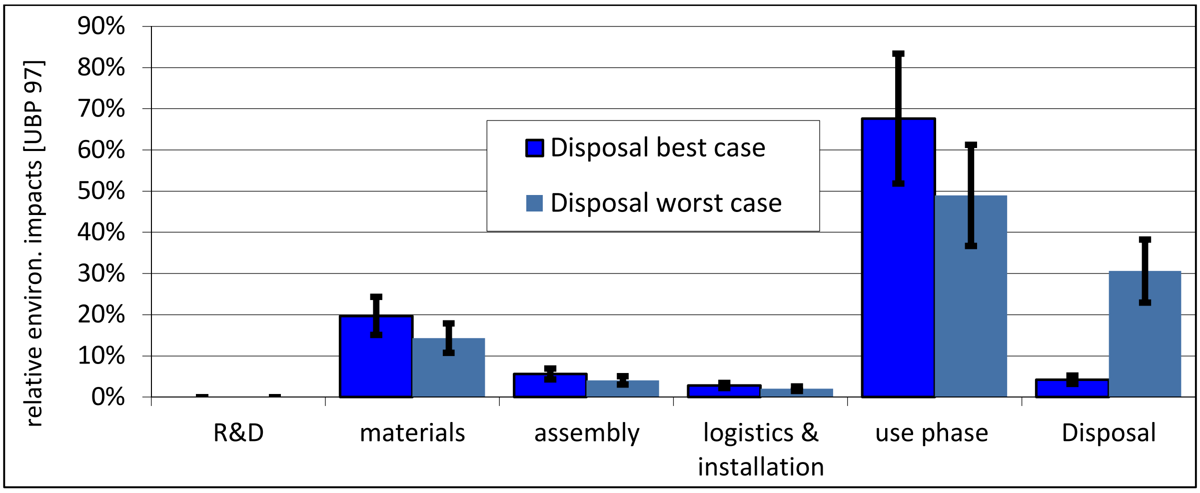

Figure 2: Environmental impacts of the main life cycle phases of the lift S100T in the year 1999 measured with the method ecological scarcity 97, life span 30 years. The black bars give the uncertainties as σ.

RESULTS

In the year 2011 a full LCA was conducted on the follow up lift system (Schindler, 2011). For this LCA the eco design tool was used to provide the amounts of the relevant materials and processing steps.

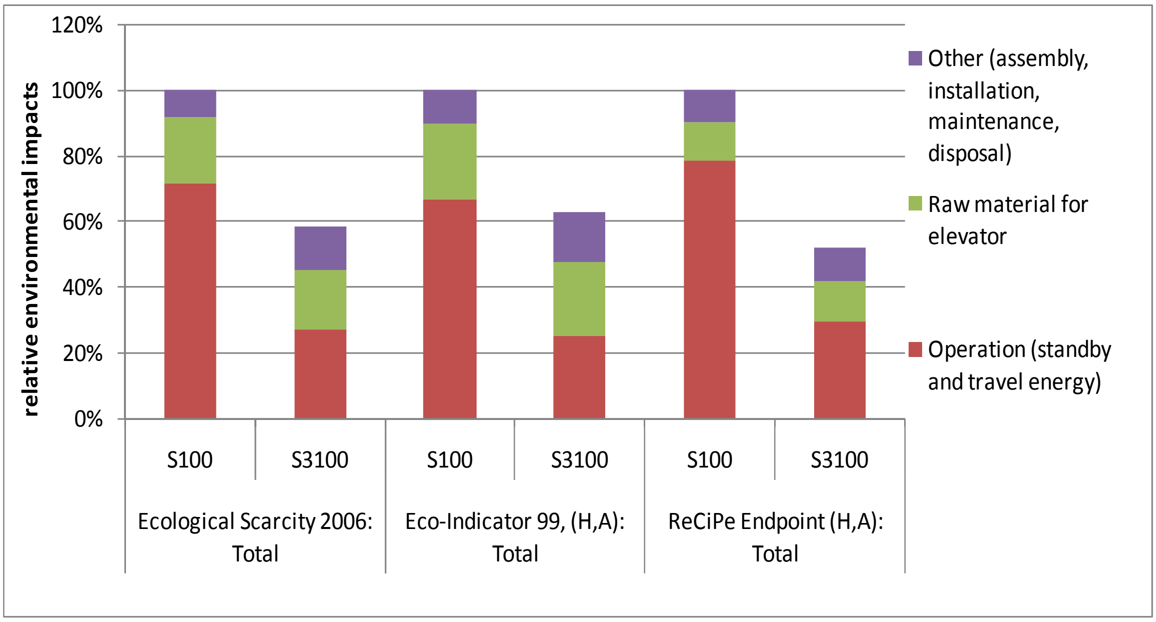

Figure 3: Comparison of the environmental impacts from the old lift (S100) and its successor (S3100)

This full LCA has shown that the environmental impacts per functional unit (t km) could be halved compared to the old lift system. This LCA also indicated the current hot spots. Now, because of the reduction in energy use the environmental impacts of the materials become more relevant.

DISCUSSION AND CONCLUSIONS

The LCA approach is still used for important environmental decisions because it is a powerful tool giving insights into the whole life cycle. This year, for example, a LCA was conducted to analyse whether from an environmental perspective, the use of neodymium for the motor is a good choice. This question rose because of the fact that synchronic motors with neodymium are more efficient on one side, while on the other side the production of neodymium is related to a variety of environmental impacts. For this purpose the production of neodymium metal from neodymium oxide, the magnet and the motor production were analysed using LCA and compared to an asynchrony motor as well as a synchronic motor with ferrite. This analysis showed that the production of 1 kg of Neodymium metal has higher impacts than other used metals. However because of the fact that the overall material use for a synchronic motor with neodymium is lower than an equal, synchronic motor with ferrite does not lead to higher environmental impacts. On the other hand the asynchronic motor tends to have lower impacts than the synchronic motor but also lower energy efficiency. So the overall analysis showed that the results depend mainly on the utilization and the electricity mix. The synchronic motor with neodymium is the better solution for lifts in the high rise segment. The asynchronic motor has advantages for small lifts with low trip numbers especially if the electricity mix used does not have high environmental impacts (Beuret, 2013).

Furthermore the LCA information is used for costumer information given as EPD type III declaration according to ISO 14’025.

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