THE DFR LAPTOP CASE STUDY

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Abstract: The Design for Reuse (DfR) Laptop case study will illustrate how fundamental principles of eco-design, can be implemented in an actual laptop product. It will determine exactly what DFR criteria are possible and feasible for a small to medium enterprise (SME). In addition to product specific design criteria, the study will investigate the SME's change from a traditional direct selling business model to a lease based alternative. This change is required to guarantee the company gets their product back at end-of-life (EOL) and ensure their investment in DfR is not lost. A further aspect of the case study being investigated concerns the realisation of industrial symbiosis or industrial synergies between the EEE and construction sectors. This can ensure that in addition to environmental and economic savings from reuse of systems and subassemblies, further new revenues or savings can be achieved from the exchange of material resources/by-products between industrial partners.

1. INTRODUCTION

For high tech electrical and electronic equipment (EEE) products such as laptops a very strong case for eco-design to facilitate reuse activities has been made in academic literature. The high energy and materials consumption resulting from the manufacture of laptop microchips is a major factor for supporting reuse, to recoup the embodied energy consumed in the production process [1-3].

The Design for Reuse (DfR) Laptop case study will illustrate how fundamental principles of eco-design, can be implemented in an actual laptop product. It will determine exactly what DfR criteria are possible and feasible for a small to medium enterprise (SME) to implement on a practical level. DfR is a critical eco-design measure when it comes to promoting reuse of systems and subassemblies and furthermore encourages the adoption of refurbishment and remanufacturing practices in reverse supply chain operations [4].

In addition to product specific design criteria, the study will investigate the SME's change from a traditional direct selling business model to a lease based alternative. This change is required to guarantee the company gets their product back at end-of-life (EOL) and ensure their investment in DfR is not lost. The pilot will establish whether the consumer market for computer products is receptive to a change from a traditional retail model to product service system (PPS) for computer products and services.

A further aspect of the case study being investigated concerns the realisation of industrial symbiosis or industrial synergies between the EEE, construction, automotive and photovoltaic sectors. This can ensure that in addition to aforementioned environmental and economic savings from reuse of systems and subassemblies, that exchange of material resources/by-products can create further new revenues or savings for other industrial partners in the aforementioned sectors. The by-products/material resources considered in scope will not be confined to those produced by the SME, but may include those resources produced upstream in the supply chain for example as a result of component and materials manufacture.

2. APPROACHES FOR ACHIEVING ENVIRONMENTAL IMPROVEMENT

The primary objective of this case study is to meet the following environmental targets:

- *decrease of at least 30% greenhouse gas emissions,*
- *at least 70% of overall re-use and recycling of waste and*
- *a reduction of at least 75% of fresh water utilisation*

The following paragraphs will outline the general approach the study will use to achieve these targets.

A decrease of 30% greenhouse gas emissions will be achieved through lifetime extension, for example prolongation of system lifespan from 4 to 6 years translates to a 50% reduction of "produced" laptops and thus emissions related to production (This assumes of course the manufacture of the D4R laptop results in similar production emissions to a conventional laptop). In the same way the benefits gained through lifetime extension also extend to end-of-life (EOL).

A 70% target of re-use and recycling of waste is already state of the art for ICT, as outlined by the Waste Electrical and Electronic Equipment (WEEE) Directive requirements for EOL EEE. It is reported that among manufacturers in the ICT sector, for products that are handed over to WEEE compliance schemes that a 90% re-use and recycling rate has been accomplished. Consequently, this environmental target is already achieved.

A reduction of at least 75% of fresh water utilisation will again be achieved by lifetime extension strategies. However, reuse of systems and constituent components in the context of computer refurbishment alone will not be the complete solution. It may not be practical or feasible for the company to reuse parts or components for such an extended period of time.

Panel manufacturing is the most water consuming process in computer parts manufacture and therefore this should be an area for improvement. It is not possible to achieve internal water reuse at the panel manufacturer (AUO, Taiwan) as it is already on a worldwide leading level above 90% however, it is possible to achieve water reductions again through lifetime extension strategies.

In addition to reuse of panels in refurbished PCs, further water reduction will be achieved through reuse of panel parts for low level display purposes in buildings. This will help meet the reduction of at least 75% of fresh water utilisation objective above.

3. THE INDUSTRIAL NETWORK

The idea of reusing laptop LCD panels for lighting applications as outlined in the previous section establishes an industrial synergy between the high-tech and construction sectors. Assuming practicality and feasibility of the concept is confirmed, it will demonstrate how a potentially obsolete component for laptop manufacture can be turned into a highly valuable by-product input to another sector. In addition to environmental and economic savings this concept can also have positive social implications, for example supply of affordable lights for low income households.

Another potential avenue for investigation concerns the use of wood off-cuts from the construction sector for the manufacture of laptop housing structure. More specifically this will create an industrial network between a furniture maker and the computer manufacturer. This could be considered a true industrial symbiosis and potentially result in increased revenues and environmental savings for parties involved.

4. CONCLUSION

This paper has provided an overview of the DfR laptop case study to be undertaken by MicroPro Multimedia Computers, a Dublin based computer manufacturer. The study will encompass product eco-design aspects and also demonstrate industrial synergies/symbiosis between the high-tech and construction sectors. A lease based pilot study will establish whether the consumer market for computer products is receptive to a change from a traditional retail model to PPS.

5. REFERENCES

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