THE BARRIERS TO AND DRIVERS OF A CIRCULAR ECONOMY FOR THE BLINDS AND SHUTTERS INDUSTRY IN THE UK

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Abstract

Blinds and shutters create privacy in residential and commercial buildings; they can also be used to keep rooms cool when sunny and to minimise heat loss at night or in winter, which reduces use of air conditioning and heating, associated energy inputs, carbon and other outputs and costs. In addition to controlling temperature, they also reduce glare and control light levels, all of which contribute to general health and well-being. In many instances however these products are not used correctly and consequently their potential is not fully realised. Consequently a streamlined LCA was undertaken to measure overall environmental impact and to promote the value of blinds as passive and sustainable energy saving products in a typical house in the UK. The LCA also shows that recycling has a lower impact than other end-of-life scenarios although at present the majority of blinds and shutters are either landfilled, down-cycled with construction waste, or incinerated with energy recovery. The materials used in conjunction with component design, assembly, and disassembly processes indicate that it is technically feasible to develop a Circular Economy for this industrial sector to conserve resources and energy although there are a number of barriers to its development; therefore this paper concludes by discussing these barriers and drivers for change in order to help businesses to develop a Circular Economy and to bridge the gap between theory and practice.

Keywords

Circular economy, blinds and shutters, barriers, challenges and opportunities

1. INTRODUCTION

Blinds and shutters have been used around the world for hundreds of years to cover unglazed and glazed window openings; although the precise origin and date of invention is unknown, early examples using natural materials such as bamboo and reeds were developed in the Far and Middle East and slatted wooden 'venetian' type blinds were developed in Persia prior to widespread use across Europe and America. Patents dating from the middle of the 18th century record the development of blind mechanisms and various types of blind (e.g. roller, slatted, pleated vertical,, panel) made from natural and synthetic materials (including wood, textiles, aluminium, and plastics) are currently available. Both blinds and shutters are used for privacy and contribute to building aesthetics, while shutters (which are usually made from wood or metal) also enhance security. Their correct use also helps to keep buildings cool in the summer and warm in the winter although what is 'correct'

varies according to geographical location and type of blind (opaque, semi-opaque, roller, slatted, fit-to-window etc.). Changes in weather and climate mean that their significance is increasing [1] because correct use contributes to human wellbeing by controlling glare, natural light levels, and interior temperature (which is particularly important for the very young and the elderly) while on-going research suggests that reduced glare, appropriate temperature and daylight in the workplace enhances productivity.

As passive aids to temperature control and thermal comfort blinds and shutters also reduce energy consumption, associated CO_2 and other greenhouse gas emissions, heating costs (during the winter) and cooling costs (during the summer). To date the emphasis of most life cycle research has been carbon inputs and outputs [2, 3], although measurement of this alone can be misleading [4]. This paper briefly describes a more comprehensive and accurate LCA of blinds and related energy savings in a typical house in the UK; the study demonstrates the benefits of recycling at end-of-life which suggests that a Circular Economy is technically feasible. This is particularly important considering that, in the UK the average life span of domestic blinds is 5 years and that in 2013 for example £565 million of domestic blinds were sold in the UK alone [5] (which is estimated to be 5 million units). The paper concludes with a discussion about the current barriers to and potential drivers of the development of a Circular Economy for this sector.

2. LIFE CYCLE ASSESSMENT OF DOMESTIC BLINDS

To date the majority of research about blind use relates to commercial rather than residential properties and consequently this LCA study considers use of blinds in a typical UK house to address this lack of data. The functional unit in the model is one average house with 7 manual blinds that cover a total of 14.5m^2 windows.

2.1 Methodology

A streamlined LCA that uses the EcoIndicator 99 method and hierarchical weighting set in SimaPro was carried out to measure the impact of 4 popular types of blind: a polyester blackout roller blind, a linden wood venetian blind (50mm slats), an aluminium venetian blind (25mm slats) and a vertical blind (89mm polyester vanes). The blinds were reverse engineered and the materials (polymers, metals, and wood) and manufacturing processes (including injection moulding, machining, guillotining, surface coating and braiding) for each component were determined and assessed. Best case (100% recycling) and worst case (100% landfill) end-of-life scenarios were also modelled. The impacts of the 4 types of blind with the differing end-of-life scenarios were then combined and averaged to create two final sets of results, which were then combined with the impact of various levels of energy use to determine the overall impacts of domestic blind use in the UK.

Numerous variables affect energy savings from blind use including blind type, fit to window, materials and colour, (which influence transmittance, absorption, and reflection of light and heat and U-value), building orientation, type of glazing and occupant behaviour. Therefore it is not possible to determine precise energy savings so a generic model based on typical criteria was developed as follows: very few homes in the UK have air-conditioning so the energy savings in the model are related to average annual household energy consumption for space heating (11,160 kWh). Similarly the model includes double glazing, which is installed in most residential properties in the UK. Providing that blinds are open during the day and fully closed at night, potential energy savings of 15% have been identified [6] and included in the model; in order to account for variations in user behaviour however energy savings of 5%, 10% and 20% are also included in the model. Average product life is about 5 years but this varies depending residents' interior decorating preferences, blind type and quality so the model also includes 3, 10, 15, and 20 year lifespans.

2.2 Results

Results for the integrated energy and product LCA show that in all scenarios but one, use of blinds during the heating season has a lower environmental impact than not using blinds. The impact of the blinds themselves is of course 'unchanging' whereas the benefits of energy saving are determined by the variables listed above although it is evident that savings increase over time. The one example in which use of blinds has a higher impact than not using blinds is that with 5% energy saving over 3 years and the blind sent to landfill at end-of-life because the impact of the blind is not counterbalanced by the reductions in energy consumption. In all examples in the model however the impact of sending the blinds to landfill is higher than that of recycling at end-of-life, which indicates that a Circular Economy for this sector will be environmentally beneficial.

3. A CIRCULAR ECONOMY FOR BLINDS?

At present the majority of blinds are either sent to landfill, incinerated with energy recovery or crushed to form hard-core as part of the building demolition process either before or at end of functional life, which is a waste of resources and a missed business opportunity.

In the UK 73% of blind manufacturing companies employ 1-5 people in small 'cottage' type businesses [5] where products are assembled by hand and blind components are designed accordingly. This assembly process also means that specific types of blind can be 'upgraded' and a number of manufacturers already supply replacement textile and similar components to customers, who reuse the mechanical components. This, in addition to recyclability and the relatively simple disassembly and materials separation processes all lend themselves to the development of an alternative non-linear economy.

3.1 The barriers to a Circular Economy for the blinds industry

Currently there are a number of barriers to change however, one of which is the perception of these products as fixtures and fittings internal blinds have been primarily marketed as decorative and fashionable products that can be easily replaced and discarded, which has a negative impact on perceived value. This is compounded by the relatively low retail price and limited understanding and promotion of their energy saving potential by retailers, installers, and end-users. In addition to incorrect use, incorrect specification by building professionals also means that the full potential of blinds as aids to thermal comfort, reduced energy consumption and costs is not being realised because much available data in building information and performance software packages and standards is outdated and inaccurate [7]. Finally there are no significant incentives to remanufacture, or recycle blinds, although this may change as discussed below.

3.2 The drivers for a Circular Economy for the blinds industry

These barriers are considerable they are not insurmountable and could be overcome; factors such as changing perception and technical innovations (such as motorisation and automation) could be drivers of change in this sector. Although most domestic blinds are manual the installation and use of motorised and automated blinds is becoming more prevalent in commercial buildings and could increase significantly in the UK domestic market as the advantages of remotely controlled cordless child-safe blinds and 'smart homes' is promoted. Financial incentives in the Netherlands have driven installation of motorised and automated blinds in new build properties and they could also boost the UK market.

The electrical and electronic components in motorised and automatic blinds will increase costs and embodied impact, but light and temperature responsive blinds will also optimise use, improve thermal comfort, and minimise energy for space heating (providing that the blind specification is correct), which could have a positive impact on perceived value.

Moreover prior studies clearly show that increased purchase costs have a positive impact on perceived value [8], the indirect impact of which should extend product life as consumers keep blinds until they no longer function or reuse electrical and mechanical components and update and replace textile components as described above.

The inclusion of electrical and electronic components means that blinds will be subject to WEEE legislation and grinding as construction waste or sending to landfill will no longer be permissible and collection of motorised and automated blinds will be mandatory to separate out WEEE materials. The remaining materials and components could be incinerated with energy recovery but the fact that the blinds will be partly disassembled makes complete disassembly (and therefore reuse and recycling) more economically attractive.

As stated above blind specification is often incorrect and performance compromised, (which has an adverse impact on perception); unfortunately standards and data in software programs have not kept pace with developments in the blinds and shutter industry. Therefore data quality must be improved and software amended to ensure that models are accurate and present the real benefits of blind use, which will facilitate the development of better building standards that improve thermal comfort, reduce energy consumption and environmental impact; in turn these factors will change perception of blinds and shutters from fixtures and fittings to important functional building elements as a result of which perception of their value will change.

4. CONCLUSION

This paper clearly shows environmental benefits of blind use in a typical house in the UK particularly when recycled at end-of-life; this in conjunction with the fact that materials and manufacturing processes lend themselves to simple disassembly and separation illustrate the potential for a Circular Economy in the sector. Although there are a number of barriers to its development, these can be overcome by combining financial incentives, technical innovation and improving the perceived value of blinds. These same changes will drive the development of the Circular Economy, although it will be essential for businesses to develop alternative strategies and practice if blind sales decrease as a result of extended product life. Future work will include LCAs and economic studies of motorised and automated blinds to inform industry and encourage this transition from a linear economy to a Circular Economy.

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