

Chair design at HÅG - have the designers used what they have learnt?

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ABSTRACT

HÅG has worked with documentation of environmental and resource aspects of their products for many years. As part of this work, HÅG has carried out life cycle assessments (LCA) and obtained environmental product declarations (EPD, Type III) for 10 of their office chair products.

The global warming impact arising from production and use of a HÅG seating solution is strongly dependent on type and amount of materials, and the amount of recycled materials in the components of the chairs. The most important materials in the chairs, as far as environmental impacts are concerned, are aluminium, steel and the plastic materials polyamide (PA), polyurethane (PUR) and polypropylene (PP).

HÅG's aim has been to incorporate this new environmental knowledge into their product development and the design of new seating solutions. In this paper the authors present the environmental results of a new seating solution design, compared with HÅG's existing chairs and with an evaluation if HÅG has succeeded in incorporating environmental issues in a good way in the design process.

Background

HÅG has a high profile in Norway and in the office furniture market as a result of their work with environmental and resource aspects of their products. As part of their investment in environmental documentation and environmental improvements, HÅG has chosen to carry out life cycle assessments (LCA) [1] and obtain environmental declarations (EPD, Type III) [2] for 10 of their office chair products [3].

This initial work has been further developed, with a project focused on the role of suppliers in product development and environmental improvement of the chairs. This collaboration has led to the generation of many practical ideas for changes that can improve the environmental profile of the office chairs. Some of the suggested improvements can be carried out for the suppliers' existing products, others require more systems based solutions (e.g. better recycling systems), while some will involve HÅG working on design and product development. This work was also presented at the LCM 2005 Conference [4].

The global warming impact arising from production of a HÅG seating solution including all materials and components, and use over a 15 year lifetime varies between 20-70 kg CO₂-equivalents. This impact is strongly dependent on the type and amount of materials and content of recycled materials in the components. The most important materials in the chairs, as far as environmental impacts are concerned, are aluminium, steel and the plastics polyamide (PA), polyurethane (PUR) and polypropylene (PP) [4, 5].

HÅG's aim has been to use this environmental knowledge by incorporating environmental issues into their product development and the designer phase of new seating solutions. During the last two years HÅG's designers have been designing a completely new seating solution platform 'Alpha G4', and the environmental performance of the new platform was analysed this spring (2007).

Methodology

After the 10 existing chairs were analysed and the first supplier project was finished summer 2005, the results

were presented to the involved parties. HÅG participated with both employees with environmental, purchasing, market and design functions in the company. The aim of this meeting was to inspire both the suppliers and the different functions in HÅG for the upcoming work. The design of the new seating solution platform started directly afterwards. The design process was made mostly by HÅG's own staff, and had focus on four main criteria: ergonomics, aesthetics, quality and environment.

Early in 2007 the designers had reached a point where they wanted to analyse the new seating solution with respect to the environment before further development work. STØ then got the necessary data (materials and amounts) to make a screening LCA of the Alpha G4 solution. Only global warming potential is shown, as acidification, eutrophication, photochemical ozone creation potential and primary energy consumption show a similar pattern.

Results

In figure 1 the product specification of the Alpha G4 is shown together with HÅG's existing office chairs which according to HÅG have the same functionality. Both average with equal weighting and average based on sales volumes are shown.

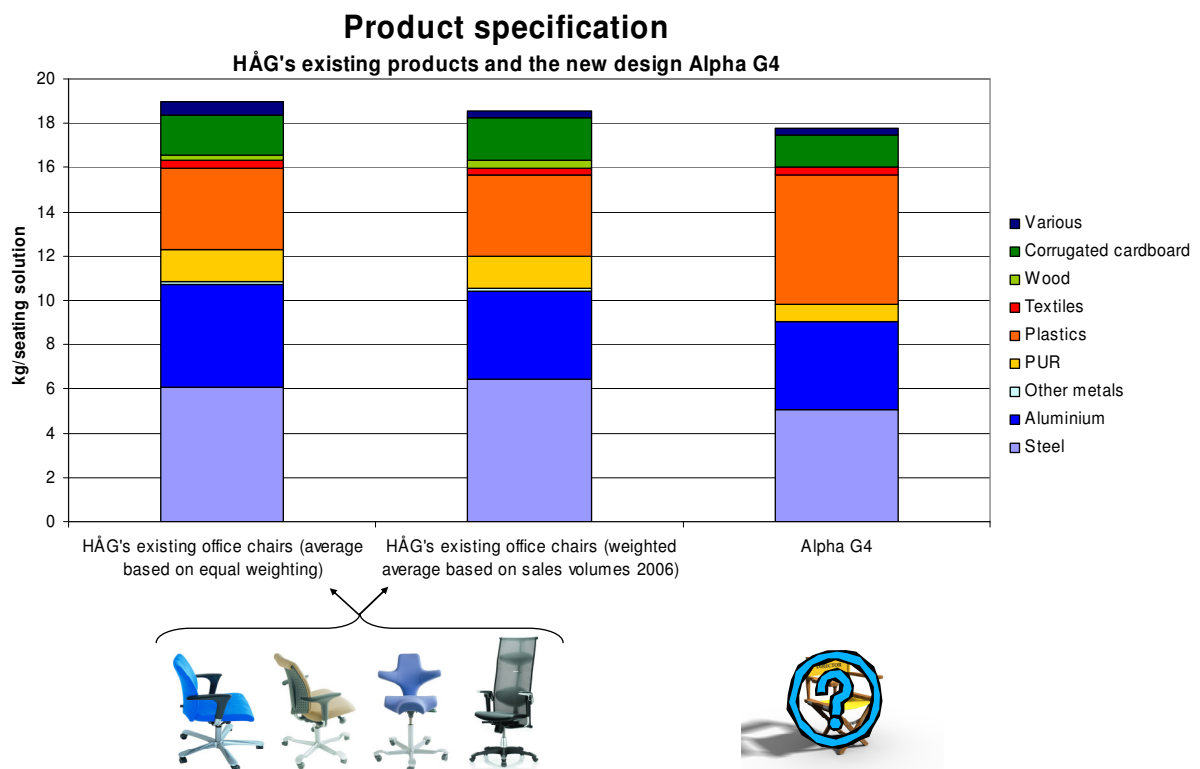


Figure 1: Material specification of HÅG's existing office chairs and the new design Alpha G4

The EPD project showed that, as far as environmental impacts are concerned, aluminium, steel and plastics were the most important materials in the existing solutions. In Alpha G4 we can see that the amount of plastics has increased, and that the amounts of steel, aluminium and PUR have decreased. So has the total weight of the chair, which has 93% of the weight of the average existing seating solution.

Since the environmental impact to a high degree depends on the material recycling rates, two scenarios for the new design were identified; one with production and transportation data based on European average and one based on data from the best supplier HÅG has for each material (table 1).

Table 1: Data sources for the two Alpha G4 cases

Data sources	Alpha G4 Case 'European average'	Alpha G4 Case 'Best supplier'			
	Production and transportation data	Recycling rate	Transportation data	Supplier	Country
Steel	Based on European average (energy consumption, recycling rate, distances etc.)	100 %	Specific	Borggårds Bruk	Sweden
Aluminium		100 %	Specific	Rolvøy Metall	Norway
Other metals		-	-	-	-
PUR		0 %	Specific	Westnofa	Norway
Plastics (PP)		100 %	Specific	Lycro	Norway
Plastics (PA)		100% recycled PET	Specific	Lycro	Norway
Plastics (POM)		50 %	Specific	Lycro	Norway
Textiles		0 %	Specific	Gabriel	Denmark
Wood		-	-	-	-
Corrugated cardboard		50 %	Specific	Smurfitf Norpapp	Norway
Various		-	-	-	-

In figure 2 the global warming potential for HÅG's existing office chairs (specific data) are shown together with the results for the two Alpha G4 cases.

One can see that the greenhouse effect from the newly designed chair is 23% higher than the average existing chair (equal weighting) if the components are produced and transported from average European suppliers. If the best suppliers based on environmental performance are used, the greenhouse effect from the new chair will be 32% less.

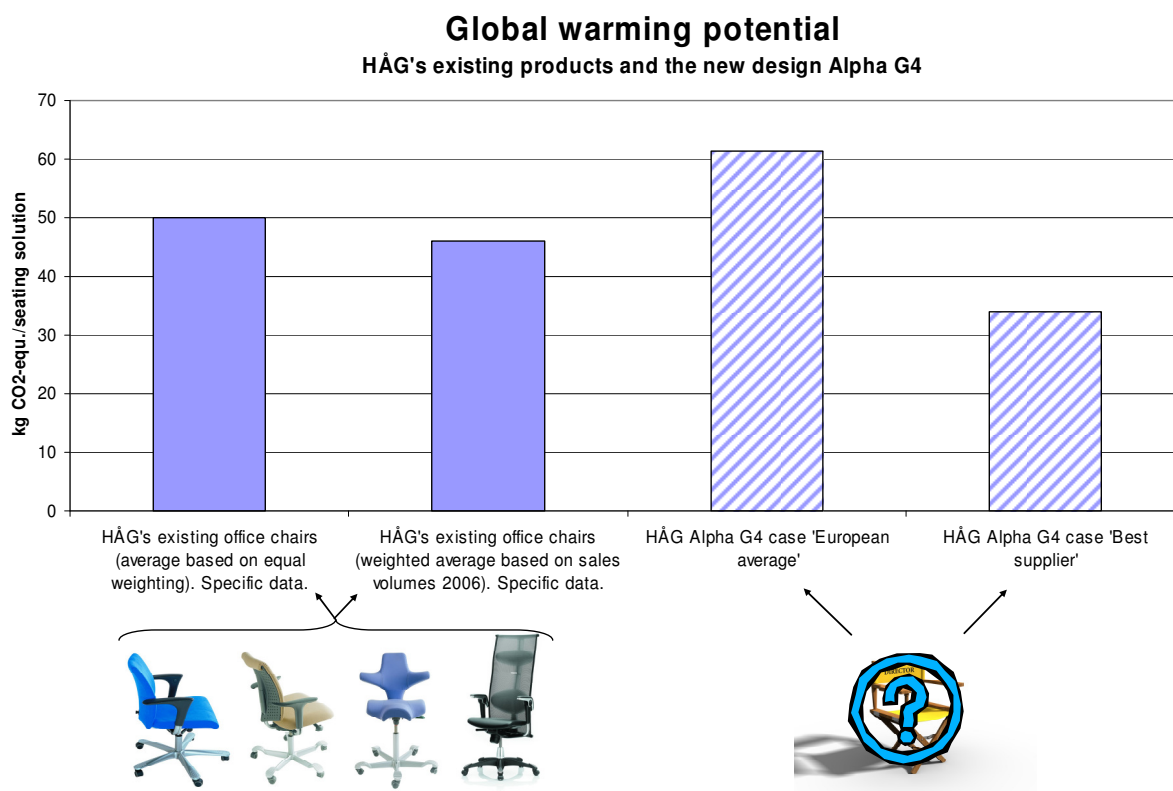


Figure 2: Global warming potential from production and use of an average HÅG office chair (specific data) compared to the two Alpha G4 cases ('European average' and 'Best supplier')

Discussion

HÅG's aim was to incorporate environmental issues into the design phase of new seating solutions. The newly designed chair consists to a large extent of materials which were known to be burdensome, but since the chair is lighter than the existing office chairs, the potential for a better environmental profile is present. In addition, the designers have used materials with a high potential for recycling, and the Alpha G4 case 'Best supplier' is 32% better than the average existing chair when it comes to global warming potential.

To make a quantum leap in regard to environmental impact from these chairs, it seems necessary to use new and more environmental friendly materials with better strength, so that it is possible to use less materials and make lighter chairs.

A positive experience is that the product development group in HÅG wanted to make this environmental analysis before the design was completely fixed, and they will use this information in the last phase of the development process of Alpha G4. An important aspect is the importance of choosing the right suppliers. This means that the designers should also cooperate closely with the purchasing function to purchase the right materials.

Conclusions

HÅG has worked hard to incorporate environmental knowledge in their product development and the design phase of new seating solutions. The result is a lighter chair with less steel, aluminium and PUR. In addition, an important aspect is to choose the right suppliers. Internal cooperation between different departments in HÅG is essential in this matter. To reduce the environmental impact even more, it seems to be necessary to use other materials with better strength and less environmental impact.

HÅG should continue their focus on supplier cooperation and make sure that the environmental, design, market and purchasing departments work closely together.

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