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HOW THE CHEMICAL AND MATERIAL MANAGEMENT IN THE AUTOMOTIVE INDUSTRY BECAME A QUALITY IMPROVER FOR LCA STUDIES IN THE VOLVO GROUP

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ABSTRACT

The complex nature of the automotive industry has forced it to develop chemical and substance lists and to harmonize these to a common list, the Global Automotive Declarable Substance List (GADSL). The International Material Data System (IMDS) includes this and other lists from REACH and the End-of-Life (ELV) Directive. It also includes the weight of different materials and substances. This turns IMDS into a source for LCA studies. The time saved for the Life Cycle Inventory (LCI) is at about 90 %. The quality of LCA studies is also increased. Although there are secrecy aspects to take into account for Material Data Sheets (MDSs), there is now a foundation for improved DfE, remanufacturing and recycling.

INTRODUCTION

It is a difficult task to guarantee chemical substance safety in the automotive industry; there are many different parts and chemical substances, and the supply chains are complex. Therefore, the Volvo Group has worked for a long time with risk minimization by using the Volvo issued black and grey chemical lists for prohibited and declarable substances in articles (Bruhn et al [1996], Hall Jennifer [2000], STD 100-0002, STD 100-0003). Current legislation is the basis for the most part, but Volvo also puts a lot of effort into foreseeing future legislation that will affect the automotive industry, and this is mirrored in the lists. Nowadays, these lists are complemented by the Global Automotive Declarable Substance List (GADSL) which is a common automotive industry list for automotive parts. Weight, material and substance data for the parts are collected through the common automotive International Material Data System (IMDS) where these data are checked against various lists such as the GADSL, the REACH and the End-of-Life (ELV) Directive's metals lists. Volvo started to work actively with IMDS in 2009 and now many but not all parts have Material Data Sheets (MDS) in IMDS. MDSs for Volvo parts are uploaded to a database at Volvo that can be regarded as a gatekeeper for chemical substances. Here, a check is made against the black and grey lists as a complement to the other lists checks. The background for the IMDS system is mainly the ELV Directive, which currently stipulates 80 % reuse or recycling rate, with a total recovery of 85% and prohibition of certain heavy metals (lead, mercury, cadmium and

hexavalent chromium). Today, the Volvo black and grey lists are used for chemicals in the production processes and for parts where there is a risk that employees will enter into physical contact.

To complete the picture of chemical substance management, it is worth mentioning that, to secure chemical products used in the Volvo Group, the complete recipe is given by the supplier under a strict confidentiality agreement for assessment at Volvo. This is done outside of IMDS.

The Volvo Group has a long tradition of analysing the whole life cycle of vehicles in order to minimize the environmental impact. Therefore, LCA studies are made when new technology and vehicles are developed (Kantz, 2000).

A bonus effect of all this effort of keeping track of chemical substances and materials is that LCA studies at the Volvo Group can now be performed much faster and with better quality, as described below.

METHODS

As a rule, LCA studies on vehicles are extremely time-consuming due to the inventory phase. Without Material Data Sheets (MDS) from the IMDS, the LCA practitioners have to do manual work such as searching for part numbers in the product data management system where the data are often imprecise. The data series usually contain gaps, why the LCA practitioner has to consult the original designer or purchaser to obtain information. Data for the small amounts of, e.g., additives or trace metals are often not mentioned.

Inspired by Koffler et al, 2008, the Volvo Group now uses the IMDS database for LCA studies. The Volvo "gatekeeper" database can create Bill of Materials (BOMs) by connecting to the product data management and prototype systems. By using these connections, material data for the parts are uploaded for a specified vehicle. Since the data are very specific − there are hundreds of materials and even more material names, but the amount of LCI data for the production of materials is limited −, Volvo uses a module for translating material names to names that have LCI data in the LCA software. Sometimes, the material name matches exactly a material for which we have LCI data for material production, while other times an approximation has to be made. Translation is done once for each material name; thus, if the material occurs repeatedly, the translation is done for all instances. Manufacturing data for parts will also be added to this module.

LCA calculations are also simplified by using the DfX extension to the GaBi software since the structure for the BOM is ready-made in the computer software.

RESULTS

In such cases where all parts are reported in the IMDS, which is the goal, the Volvo Group has managed to speed up the LCA studies by about 90 %. To a large extent, data quality is also improved. This enables Volvo to increase the number of LCA studies so as to assess the achievements in environmental improvements and to guide, internally within Volvo, Design for Environment.

A complementary result is that we now, thanks to the IMDS, can sum up the number of different elements and chemical substances in vehicles and also to know the weights. Technically we can, of course, trace everything back to the individual parts, but we must be careful not to misuse data and especially not to communicate them to the purchasing departments or others who are working with business cases. However, there may be opportunities to initiate collaboration with suppliers in order to minimize the use of scarce elements, to increase remanufacturing opportunities and to contribute to more efficient recycling.

DISCUSSION

IMDS output data cannot be better than the input data, and there are of course issues in data quality, e.g. for electronics. But still, IMDS is a big step forward both for substance assessment and the LCA.

CONCLUSIONS

IMDS has opened the door to more efficient and quality-assured LCA studies in the automotive sector. There is now a basis for more environmentally conscious design, more remanufacturing and better recycling.

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