Environmental Impacts of Vaisala Radiosondes

Environmental impacts of Vaisala radiosondes has been studied in two separate studies conducted by Insinööritoimisto Ecobio Oy; a life cycle assessment (LCA) and a comparison of toxicological effects of different batteries in a post-use environment.

The LCA study covers the whole life cycle of a radiosonde manufactured by Vaisala and assembled at the Vantaa factory, from the production of raw materials, components and energy, transports to the factory and the assembly of the sonde as well as the delivery to customers and the use of the sonde. Data for the study was collected from Vaisala and databases available at Ecobio. The life cycle assessment was made following the requirements of the EN ISO 14040:2006 standard series.

The life cycle of the radiosonde was assessed with the SimaPro 7 LCA software, developed by the Dutch company Pré Consultants bv. The Ecoinvent v.2.2 database, provided by the Swiss centre for Life Cycle Inventories was used as a source of input data in the lifecycle assessment.

In this study the following impact categories are assessed:

- Depletion of resources / Resource use
- Acidification
- Eutrophication
- Global Warming
- Ozone layer depletion
- Toxicity (human, fresh water, marine and terrestrial)
- Smog

Same source of input data has been used to assure consistency in information describing the life cycle phases. Same impact categories and impact assessment method has been utilized when assessing different life cycle phases to assure consistency in the impact assessment. No regional differences or allocations have been applied in the assessment.

The conclusions based on the impact assessment are based on the characterization phase results.

The acquisition of raw materials and components is the most dominant phase in the radiosondes life cycle in all impact categories. In this phase the acquisition and assembly of the Printed circuit board is the most dominant in all impact categories.

The assembly and use phase also have a major impact in some impact categories (abiotic depletion, global warming and ozone layer depletion). In the assembly phase the use of electricity is the most dominant factor. In the use phase the balloon is relevant for the abiotic depletion and global warming impact category and the gas is relevant for the ozone layer depletion category.

Regarding the transports phases (to the factory and to the customers), the air freights are the most significant in all impact categories compared to the road transports.

All the phases of the life cycle were described as fully as possible including acquisition and production of raw materials, transportations, manufacturing and product use. No significant data was missing and the significance of these phases was possible to assess.

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According to the life cycle assessment, the production of the printed circuit board and the electricity used during the assembly has the most significant effect on the environmental impacts.

Due to the uncommon end-of-life phase of the radiosonde it was not possible to obtain input data describing the end-of-lifer phase and hence to quantify the environmental impacts of this phase. The end-of-life phase was hence excluded from the LCA, but has though been evaluated in a separate study regarding different battery alternatives.

The environmental impacts of a used radiosonde were examined in a study were toxicological effects of different batteries were compared. In the study it was assessed into which kinds of environments the radiosondes may fall after their use and which criteria could be used to determine their environmental impacts. As a case study, the post-use environmental impacts of different kinds of batteries were determined using toxicity factors that were created using LC50 and LD50 values of each component used in batteries.

The toxicity factor obtained from LC50 value can be used to estimate toxicity for water environment, LD50 for terrestrial environment. The factors do not have direct correlation to water or soil contamination in nature but they can be used to give an estimate that allows the comparison of different compounds in different products.

The different batteries compared were alkaline, lithium and water-activated batteries. Based on the study lithium batteries had clearly the lowest environmental impacts when all three battery types were compared.

Vaisala's aim is to understand the environmental impacts of their product throughout the whole lifecycle. Based on the previously mentioned studies Vaisala continuously strives to minimize the environmental impacts when developing new products with a focus on significant issues identified above

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