

Environmental references in the life cycle assessment of chemical processes: application to the aluminium trifluoride manufacture

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In this work, a methodology to normalize life cycle impact assessment values associated to wastewater treatment stage in aluminium trifluoride production as case study is summarized. The use of data from the European Pollution Emissions Register (EPER) is considered as a solid base to create a set of emissions-based normalized values that can be applied to compare chemical process options. Data from BREF documents is assumed to create similar sets in terms of resources consumption. Results from both normalization steps can be used to describe the environmental performance of a facility in a multiscale context (from facility scale to national scale).

1. Introduction

Results of the Life Cycle Impact Assessment (LCIA) step in a typical Life Cycle Assessment (LCA) study are not easy to integrate in the Chemical Engineering Processes (ISO, 2001). LCIA values from a defined scenario for comparison purposes can make them useless. Additionally, chemical facilities improvements do not take into account the impact of the manufacture in terms of Life Cycle Thinking. Most efforts are focused on an improvement of energy and material efficiency, but the environmental burdens are usually not evaluated. Therefore, LCA must be directly related with process improvements, and simultaneously compared using references in order to clearly describe the meaning of provided information, turn it useful and applicable from an industrial point of view.

2. Proposed methodology to normalize life cycle impact assessment values

By using understandable methodologies to normalize LCA, it is possible to state the environmental performance of processes and products regarding to reference values, as much for emissions as for resources. Normalization is also worth willing if no direct comparison between alternatives is done, being the activity located inside a regional environmental frame. The database selected for emissions normalization in the present work is the European Pollution Emissions Register (EPER, 2007). Chemical facilities emissions on typical pollutants are registered by region, year and type of activity, becoming public data when a threshold value is exceeded. This way, normalization can be done regarding to the entire country, selected regions or threshold values within a

defined sector. Industries can use it for being located in the region-to-country environmental context, giving insight on facility-enterprise environmental performance. Special attention must be presented for temporal and spatial requirements considered as criteria (ISO, 2003).

Resources are frequently not considered as an environmental issue to be normalized. BREF documents reflect the most recent data for European Chemical Industry, proposing Best Available Technologies (BAT) for the different sectors. These documents include resources data being encouraged to be used as reference values in the European context (EIPPCB, 2006a, EIPPCB, 2006b).

3. Conclusions

In the present work, a LCA for aluminium trifluoride was carried out, being based on current reliability data sources. Life Cycle Inventory and LCIA values are normalised by EPER-BREF based-on methodologies. The LCA software SimaPro 7.0 (Pré Consultants[®]) accounts and groups the inventory emissions along the life cycle. Values from inventory emissions were normalized by using EPER data as reference information for threshold values based-on and regional and national comparisons. Resources consumption was based on BREF documents (validated for European sites).

Results from both normalization steps can be used to describe the environmental performance facility in the facility-to-country multiscale context. The functional unit used for the comparison between different data sources is the production of 1 tonne of AlF_3 . Data from (EIPPCB, 2006a, EIPPCB, 2006b, Aldaco, 2007, Eco-Invent, 2005) are used in the life cycle inventory of aluminium trifluoride production.

4. References

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