

The Summary of the Ph.D. Thesis

MSc. Anna Śliwińska

In a paper entitled "Quantitative assessment of environmental burdens from the process of methanol and electricity co-production", issues related to the assessment of **environmental burdens from multi-output processes** were addressed. Assessment of environmental burdens has been performed using the **Life Cycle Assessment (LCA)**.

Environmental assessment of products or technologies often requires comparison to other competitive products or technologies that perform the same function as assessed. Such a comparative analysis enables selecting the preferred technology in terms of the environmental impact. However, in the case of multi-output technologies that have many functions, the question arises how to compare the environmental burdens of such technologies to the environmental burdens of competitive (reference) technologies? How to choose reference technologies? Comparative analysis of environmental burdens from the multi-output technology and a competitive reference technology requires so called "**allocation**". All the environmental burdens from the multi-output technology related to consumed resources and materials as well as emissions of gases and particulates to the air, solid wastes and wastewater throughout the production chain (the "life cycle") should be allocated and assigned to individual products.

In the study the question was posed: **what is the impact of the allocation on the results of environmental assessment?** The scientific aim of the work was **the choice of the allocation method in the assessment of environmental burdens from multi-output technologies**.

In the paper the life cycle assessment of an exemplary object of the research were performed – the technological chain from cradle to gate of the process of joint production of methanol and power in the process of coal gasification. Two methods were used: system expansion (consequential life cycle assessment, CLCA) and the allocation proportional to the coefficients based on the existing relations between the products (attributional life cycle assessment, ALCA). In the consequential life cycle assessment two ways of calculations proposed in the literature were used: avoided burdens approach and the system enlargement. The obtained values of environmental burdens were compared to the values of environmental burdens of a reference technology. The critical discussion of the results were conducted.

The works carried out can be applied in the **comparative analyses of multi-output technologies with reference technologies**. Issues raised in the study are important not only in multi-output technological processes, but also in the multi-input processes (eg. waste management), and in the processes of reuse or recycling.