

Applying Life Cycle tools and Process Engineering to determine the most adequate treatment process conditions. A tool in environmental policy.

Prof. Omar Romero

Instituto Tecnológico Autónomo de México, Industrial Engineering Department
oromero@itam.mx;

The traditional approach used to assess waste treatment technologies is contrasted with a life cycle analysis (LCA) approach. The optimal design of a granular activated carbon adsorption process is used as a model system to demonstrate the advantages of LCA approaches over traditional approaches. The use of LCA revealed that the environmental burdens associated with the wastewater treatment may outweigh the environmental benefit. Economic and environmental considerations regarding the optimum process design are introduced as a basis for decision towards the selection and operating conditions of wastewater treatment technologies.

The analysis of a wastewater treatment technology, under an expanded boundaries system, quantifies the overall environmental impact that may result from the treatment of a wastewater stream. In order to explore differences between a traditional assessment and a life cycle assessment approach, the author has studied a widely used end-of-the-pipe treatment technology: activated carbon adsorption. This process is considered as one of the most effective methods of controlling emissions of volatile organic compounds, VOCs, a class of pollutant that is often presented in industrial wastewater streams.

Further sections of the paper describe design considerations applied in the cost optimised carbon adsorption model, the use of LCA techniques to perform an inventory of all emissions associated to the process system and, its environmental impacts.

Finally, the paper highlights the string advantages that environmental policy makers may have once adopted LCA approaches as opposed to traditional ones. This approach can be incorporated into other existing treatment processes or for process designers.