POSTER PRESENTATION – NATO FELLOW

Application of life cycle assessment and sustainable process index to process design

Teresa M. Mata and Carlos A. V. Costa LEPÆ – Laboratory of Energy, Process and Environmental Engineering Chemical Engineering Department, Faculty of Engineering, University of Porto Rua dos Bragas, 4050-123 Porto, Portugal

In this work a general approach for the flow and generation of potential environmental impacts through a chemical process is introduced. Sustainable process indexes (SPI) and Life cycle assessment (LCA) are powerful and general analytical tools. They help to identify more sustainable solutions in the process industries and assess their potential environmental impacts (PEI). In this work a process simulation model is presented as case study and analysed from an environmental impact perspective. It was built using the process simulation program: PRO/II® of Simulation Sciences Inc.

Introduction

Companies facing the task of promoting sustainable development must have ways of measuring progress towards that goal. The use of SPI is a simple way of substituting all the available information in order to support a decision making process. It is based on the balancing of a process over material and energy flows, i.e. an environmental input-output analysis and gives a picture about the environmental status of an activity. LCA is widely accepted as a methodology that enables quantification of environmental impacts and evaluation of the improvements throughout the life cycle of a process, product or activity.

Design and retrofit of processes is a creative activity whereby we generate ideas and then translate them into equipment and processes for producing new materials or for significantly upgrading the value of existing materials. The purpose of design and retrofit of processes is to find the best process flowsheet, i.e., to select the process units and interconnections among them and estimate the optimum design conditions. There are some constraints that must be considered during the process design including safety, environmental, operational, economic and others. Therefore tools are needed for design decisions.

NATO-fellow poster presentation

In the design and retrofit of processes with environmental care, some existing or new technologies could be integrated to minimise the wastes generated by the process (e.g., absorption, adsorption, condensation, membrane process, a new catalyst, expert systems) or simply by recycling and reuse some waste streams. A list of alternative solutions can be proposed for each decision, therefore generating a list of process alternatives. In many cases, no heuristic rules or guidelines are available to make decisions about the structure of the flowsheet and/or to set the values of some of the design variables. Using sustainable processes indexes, the penalty paid in the time required to screen more alternatives is not very high and thereby an increase in efficiency could be obtained. The use of indexes or indicators are not new; several authors have implemented them to evaluate the potential impact that chemical emissions have on the environment. RETURN TO CONTENTS PAGE