A NEW APPROACH IN THE DESIGN OF AIR STRIPPING COLUMNS FOR THE TREATMENT OF GROUNDWATER CONTAMINATED WITH VOLATILE ORGANIC COMPOUNDS

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Abstract

Volatile organic compounds are a common source of groundwater contamination that can be easily removed by air stripping in columns with random packing and using a counter-current flow between the phases. This work proposes a new methodology for the column design for any particular type of packing and contaminant avoiding the necessity of a pre-defined diameter used in the classical approach. It also renders unnecessary the employment of the graphical Eckert generalized correlation for pressure drop estimates. The hydraulic features are previously chosen as a project criterion and only afterwards the mass transfer phenomena are incorporated, in opposition to conventional approach. The design procedure was translated into a convenient algorithm using C++ as programming language.

A column was built in order to test the models used either in the design or in the simulation of the column performance. The experiments were fulfilled using a solution of chloroform in distilled water.

Another model was built to simulate the operational performance of the column, both in steady state and in transient conditions. It consists in a system of two partial non linear differential equations (distributed parameters). Nevertheless, when flows are steady, the system became linear, although there is not an evident solution in analytical terms. In steady state the resulting system of ODE can be solved, allowing for the calculation of the concentration profile in both phases inside the column. In transient state the system of PDE was numerically solved by finite differences, after a previous linearization.

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