Implementation of the Standing-Wave Design for Non-Isocratic Systems

A summary of the iterative procedure required to solve the ideal SWD equations is given in Fig. AF1. Given column parameters, isotherm parameters, feed flow rate, and feed concentrations, the procedure shown in Fig. AF1. will yield the zone velocities, port velocity, and plateau concentrations. The initial guesses for $C_{s,1}$ and $C_{s,2}$ should be less than $C_{f,1}$ and $C_{f,2}$ respectively. After the initial guesses are made, the plateau concentrations are calculated using the Hodograph solutions. These concentrations can be used to calculate the retention factors. From there, the zone velocities can be determined. The velocities are then checked using the mass balances. If the hodograph solutions and the mass balance give the same results, the solution converges, otherwise the new concentrations are used as the initial guess and the process is repeated.

The procedure to solve the Standing-Wave Design equations in non-ideal systems is shown in Fig. AF2. The results from the ideal solution should be used as the initial guess in the non-ideal solution. This will decrease the required iteration times and improve chances of convergence. The process of solving for the zone velocities and plateau concentrations follows a similar pattern. In this case, the mass transfer parameters are needed to solve for the zone velocities, and the decay coefficients are also required. Otherwise, the zone velocities are calculated based on the retention factors, and the plateau concentrations are calculated using both the hodograph solutions and the mass balance similarly to the ideal case.

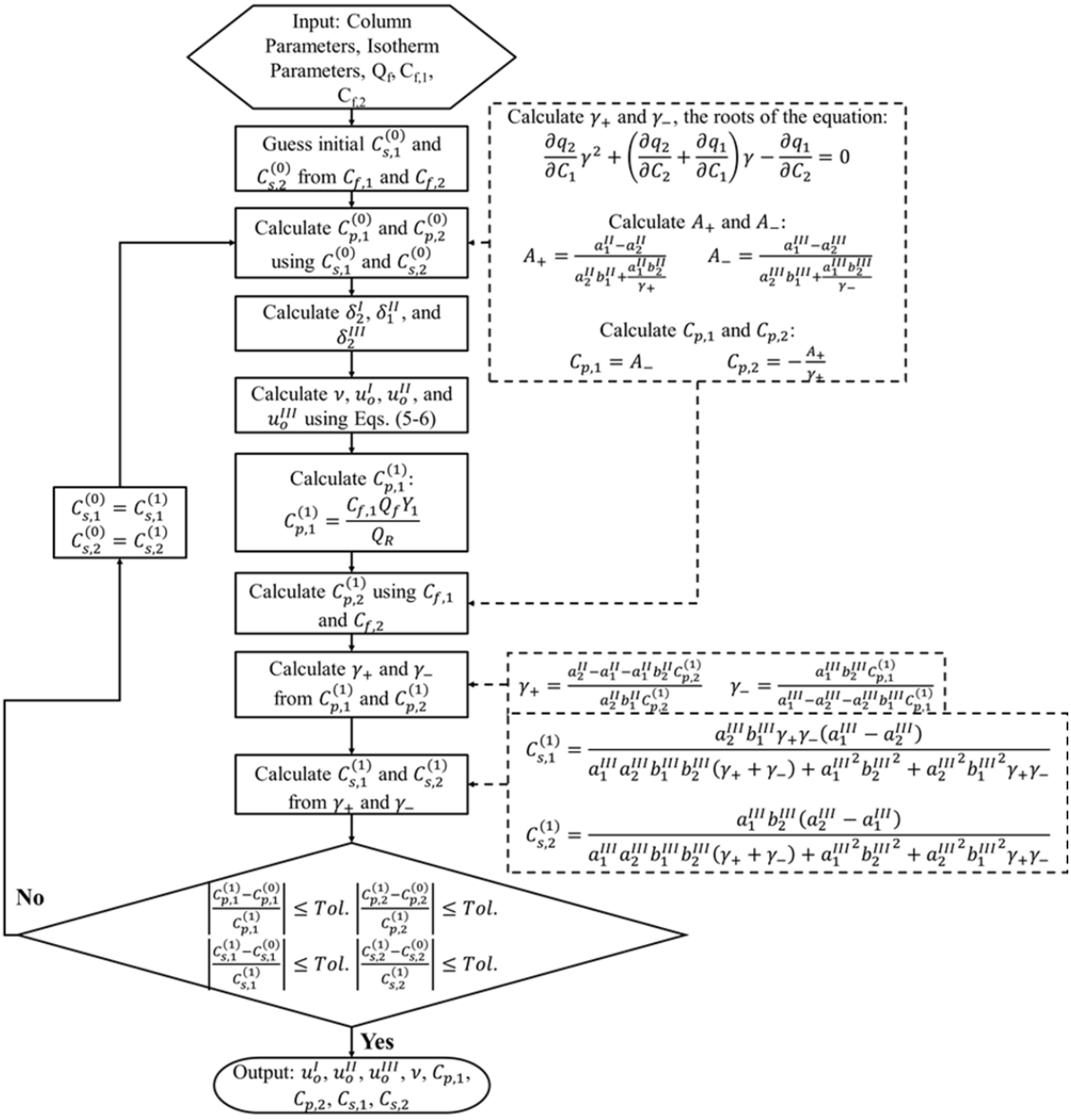

Figure AF1. Algorithm for the implementation of the non-isocratic SWD in ideal systems

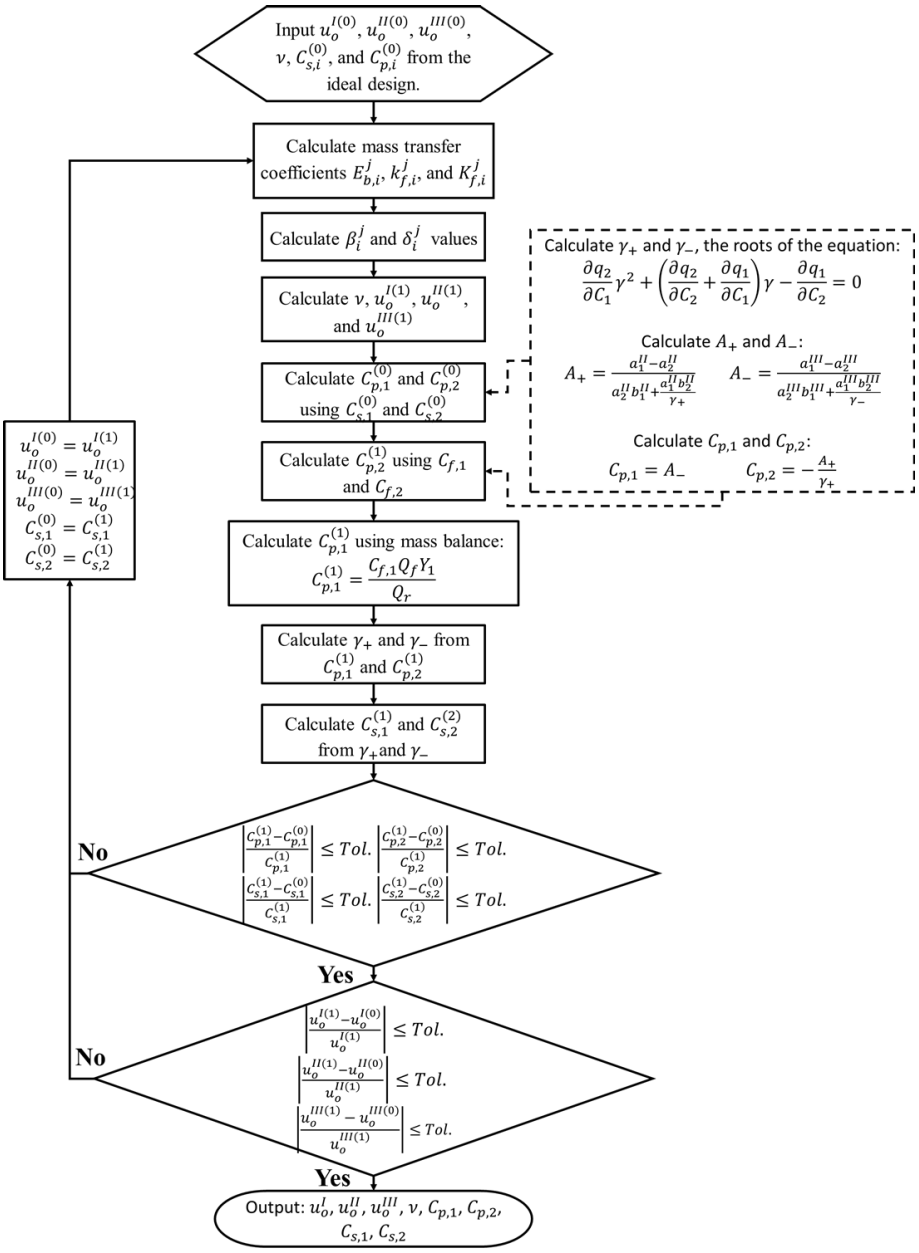

Figure AF2. Algorithm for the implementation of the non-isocratic SWD in non-ideal systems. The ideal solution is used as an initial guess in this system