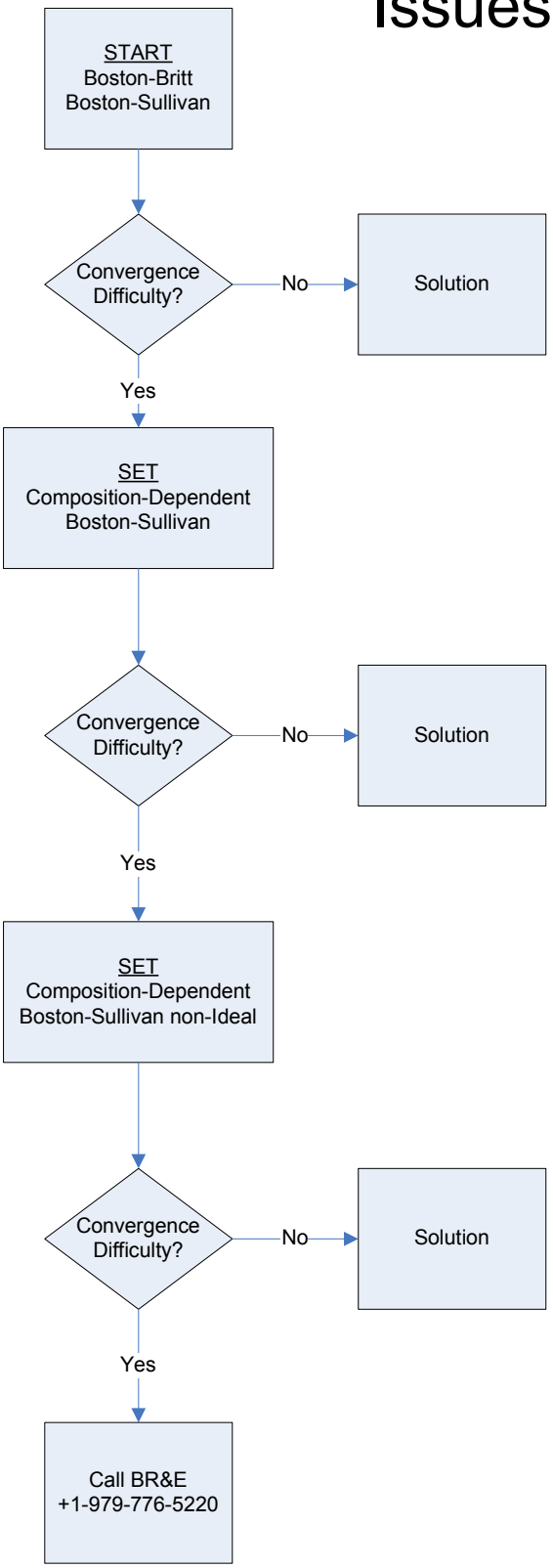
Issues with Column Convergence



Enthalpy Model

Boston-Britt : uses the molar enthalpy of the liquid and vapor phases for the inner loop calculations. This model is usually only a function of temperature. As the inner loop is solving and the flows and compositions of the liquid and vapor phases are changing, the Boston-Britt model will not show any change to the enthalpy. This model works when the enthalpy is not a strong function of composition (e.g. hydrocarbon columns, glycol columns, etc.).

Composition Dependent: For electrolytic property packages it calculates the partial molar enthalpy for all reactive components in the liquid phase on every stage for each outer loop iteration. For non-electrolytic property packages it calculates the partial molar enthalpy of all components in the liquid phase on every stage for each outer loop iteration. As the inner-loop is solving and the flows and compositions in the vapor and liquid phases are changing, the evaluation of the enthalpy is more sensitive to these changes, which aids convergence.
For electrolytic property packages, the Composition Dependent model is usually required for amine stripper columns. The absorber normally does not require the Composition-Dependent Enthalpy Model even for absorbers with high acid gas loadings, however, this model might be required in some cases. For non-electrolytic property packages, the Composition-Dependent model might be useful to help converge columns with extremely wide or narrow boiling point differences between the components (e.g. air separation columns which have only 3 components with a very narrow boiling range).

Inner Loop Model

Boston-Sullivan: uses a technique which linearizes the enthalpy and volatilities and yields a small number of inner-loop variables. The parameters for the enthalpy model and volatilities are calculated in the outer loop while the corresponding vapor and liquid flows are calculated in the inner loop. As the column solves and the error decreases, the parameters calculated in the outer loop begin to reflect the flows in the inner loop and the column solves. The number of inner loop variables is the number of stages plus the number of specifications. This technique is successful when the volatilities are weak functions of the liquid and vapor phase compositions.

Boston-Sullivan Nonideal : calculates the partial molar liquid fugacity coefficient for reactive components in the liquid phase on every stage for each outer loop iteration. For non-electrolytic property packages it calculates the partial molar liquid fugacity coefficient of all components in the liquid phase on every stage for each outer loop iteration. Furthermore the number of inner-loop variables increases by the number of reactive components per stage. For non-electrolytic property packages the number of inner-loop variables increases by the number of components per stage.
For electrolytic property packages, the Boston-Sullivan Nonideal model is commonly used for amine towers which are highly loaded or in the region of rich-end pinch. Strippers operating near minimum reflux also can be solved with this technique. With electrolytic packages, the speed to solve the overall column may be the same. The Boston-Sullivan will be faster for each outer loop iteration, however, it may require a larger number of outer loop iterations. With Boston-Sullivan Nonideal each outer loop iteration is slower, but it may solve in fewer outer loop iterations. For non-electrolytic property packages, the Boston-Sullivan Nonideal should be used only for columns with few components and few stages.