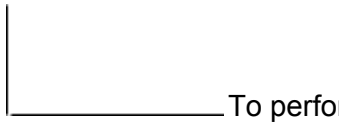
Degree of freedom analysis



To perform degree of freedom analysis draw a flow chart and label it , count the number of variable and the then count the number of independent number of equations relating them. DOF=n_{total}- n_{known} -number of independent relation.

Independent relations :

- MATERIAL BALANCE: For a non nuclear reaction the mass of the components at the output will be the same as the mass of the components at the input . If the process is a reactive process , we can perform the atomic balance. If there are x components and y streams, maximum number of material balances will be x*y.
- Process specifications :in the process some details might be provided relating to the unknown variables
- Physical laws (explicit information): Some variables might be deduced using the physical laws . For example, raoult's law and ideal gas behavior .
- Stoichiometric relations : If the process has reactive components and the equation for the chemical reaction provides us some more information about the unknown variables.

1. If degree of freedom =0, all the independent equations are solvable and we can find all the unknown variables.
2. If degree of freedom is negative then the flowchart is overspecified.
3. If degree of freedom is positive the problem is underspecified and we can't find all the unknowns .