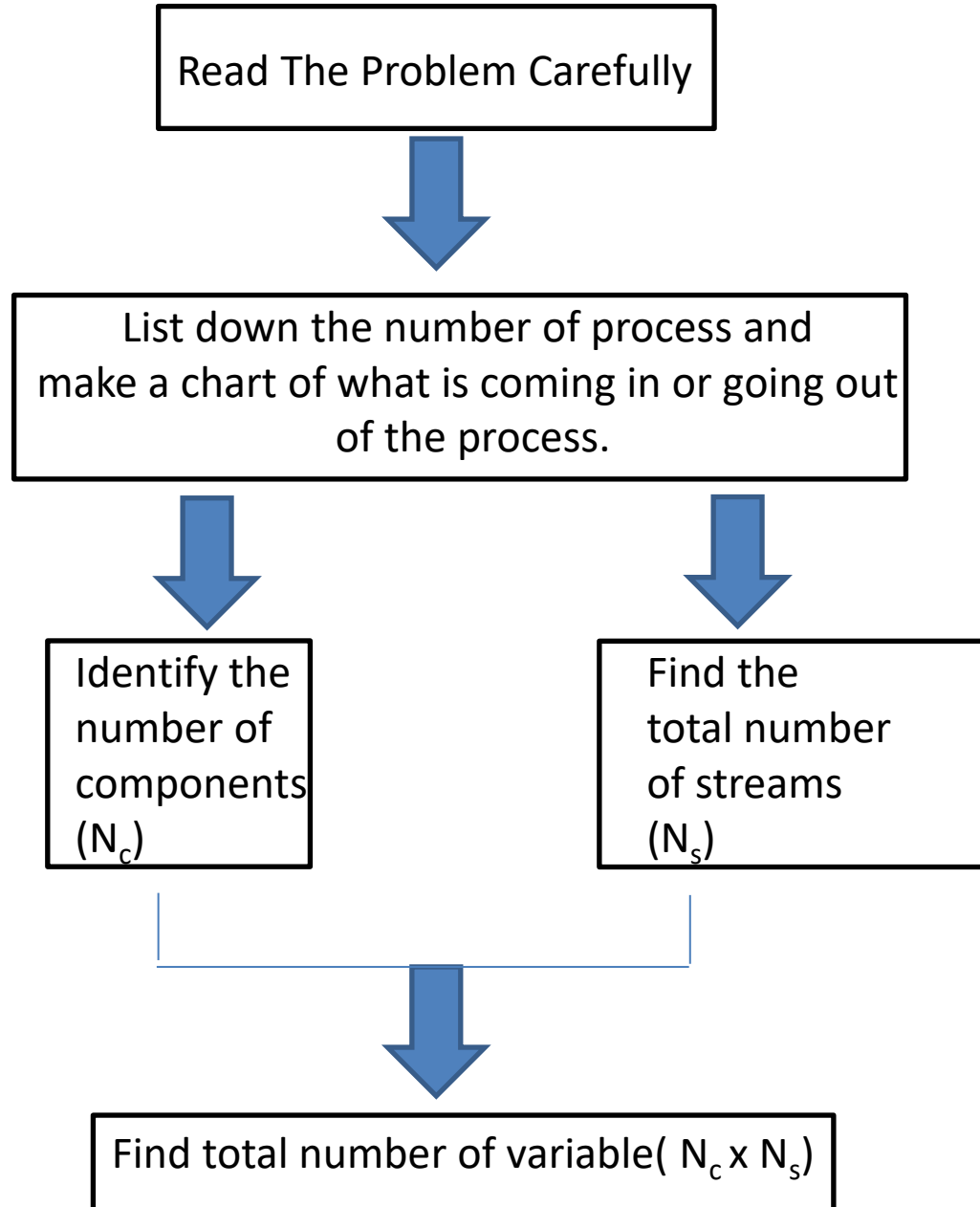
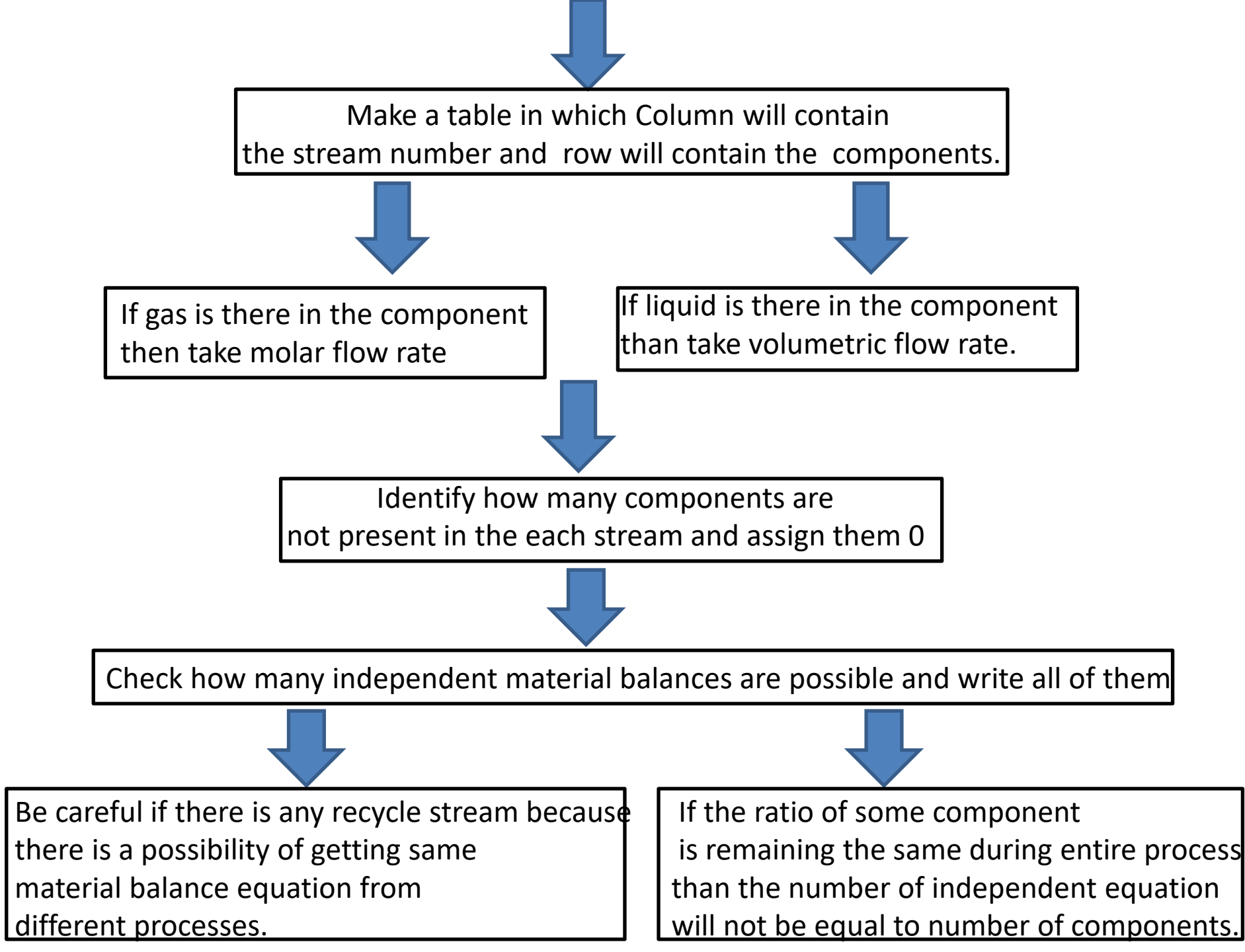


# Steps for solving generic Material Balance Problems





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graph TD; A[ ] --> B[Make a table in which Column will contain the stream number and row will contain the components.]; B --> C[If gas is there in the component then take molar flow rate]; B --> D[If liquid is there in the component then take volumetric flow rate.]; C --> E[Identify how many components are not present in the each stream and assign them 0]; D --> E; E --> F[Check how many independent material balances are possible and write all of them]; F --> G[Be careful if there is any recycle stream because there is a possibility of getting same material balance equation from different processes.]; F --> H[If the ratio of some component is remaining the same during entire process than the number of independent equation will not be equal to number of components.];
```

Make a table in which Column will contain the stream number and row will contain the components.

If gas is there in the component then take molar flow rate

If liquid is there in the component then take volumetric flow rate.

Identify how many components are not present in the each stream and assign them 0

Check how many independent material balances are possible and write all of them

Be careful if there is any recycle stream because there is a possibility of getting same material balance equation from different processes.

If the ratio of some component is remaining the same during entire process than the number of independent equation will not be equal to number of components.



Search out the relation given in the question and calculate degree of freedom as follows  
(If any reaction is taking place then one unknown variable will be introduced that is  
'extent of reaction'.)

**df =**

**(Total Variables)–(Known Variables)–(Independent Material Balance)–(Number of relations)+(Number of reactions)**



If you have to find the variables which are involved only in one of the process and then focus on that process and calculate the df and solve the question.

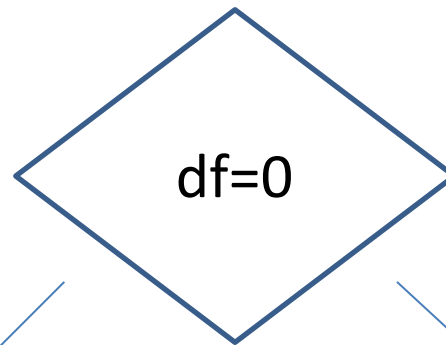


If you are asked the most of the things then do the df analysis



If you are asked only about End product then (Combined all the process) and calculate df.





Yes

Solve all the equations and you will get the value of all the unknown variables

No

$df < 0$

The problem is over specified and can be solved

$df > 0$

there is possibility that you were asked to find ratio of some of the variables. By this your information your  $df$  will be decreased

Read the problem statement again because there is a possibility of some hidden information (relations) in the question itself. Take the basis, it will reduce  $df$  by 1

After this write the equations and solve the problem according to the given question