| **Absorption Factor (A)** | **Stripping Factor (S)** |

Absorption Factor (A)   **Stripping Factor (S)**

For any stage:

$$A = \frac{Slope\ of\ operating\ line}{Slope\ of\ equilibrium\ line}$$ $$S = \frac{1}{A}$$

Special case:
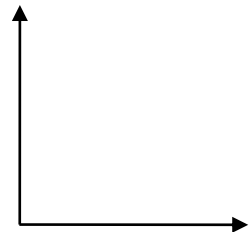
$$y = m\ x$$

$$Y \cong mX \qquad (dilute\ solutions)$$

$$A = \frac{L}{Gm} \quad \cong \quad \frac{L_s}{G_s m} \qquad (dilute\ solutions)$$
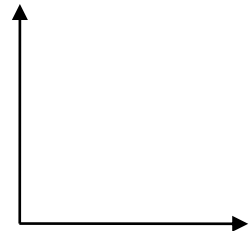
$A > 1$ $\begin{cases} Two\ lines\ converge\ at\ top\ of\ absorber. \\ Absorption\ is\ illimited\ provided\ sufficient \\ plates\ are\ available \end{cases}$

$A < 1$ $\begin{cases} Two\ lines\ converge\ at\ bottom\ of\ absorber. \\ Absorption\ is\ limited\ even\ if\ \infty\ number\ of \\ plates\ is\ available \end{cases}$

For a fixed degree of separation, as A increases above unity, the number of plates decreases (operating line moves away from equilibrium curve) and more liquid will be required giving more dilute solutions.

Optimum A = 1.25 → 2.0

Minimum Liquid to Gas Ratio (Absorbers)

In the design of absorbers, the following quantities are usually specified:

G (G_s) , Y_{top} , Y_{Bottom} and X_{top}

L can be varied and consequently X_{bottom} can be determined (it is function of L)

When less liquid is used (relatively smaller Ls/Gs), the concentration of exit liquid will be greater and the driving force will be smaller. This means that longer time of contact is required for the operation and consequently the tower must be taller.
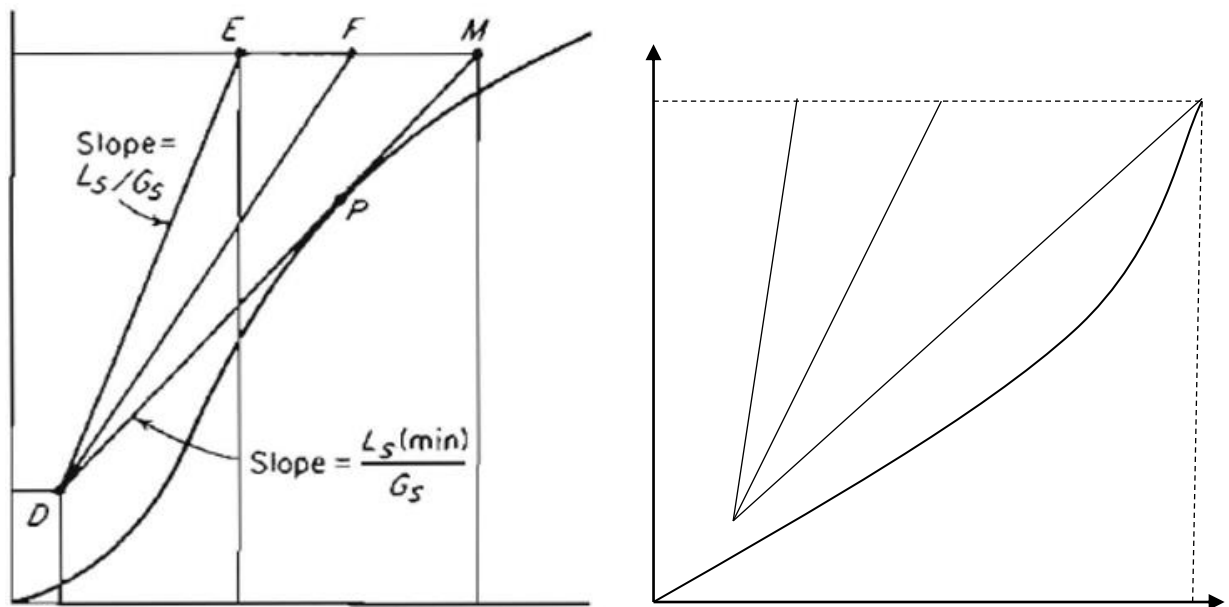

The minimum liquid that can be used corresponds to the slope of the operating line when it touches the equilibrium curve (tangentially or intersection). At this ratio an infinite number plates (or height) will be required to obtain $(X_{bottom})_{max}$.

Co-current Flow:

Features:

1. Used when exceptionally tall column is required, the column is split into two sections: one counter current; the other co-current resulting in savings in large diameter pipes.

Instead of
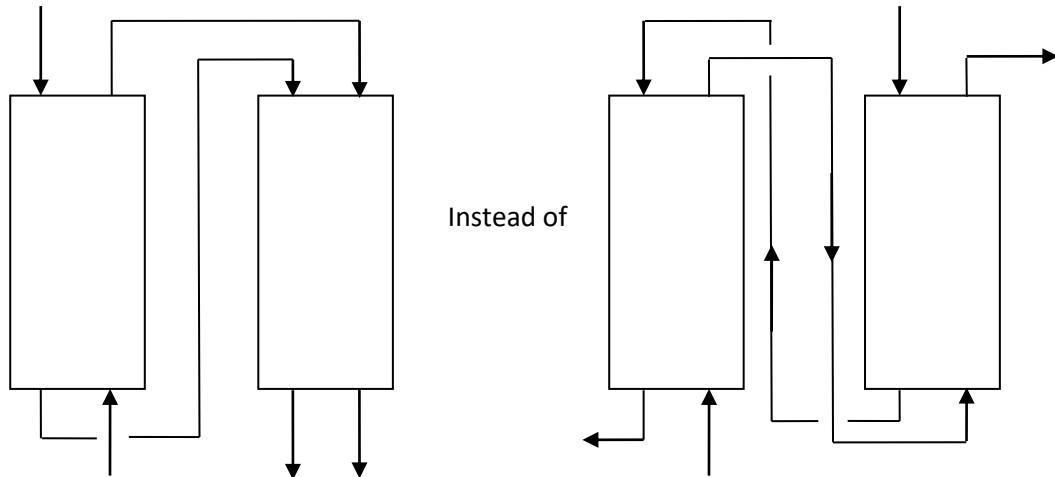
2. Used for absorption of pure substances
3. Used for rapid irreversible reactions
4. Only equivalent to one theoretical stage is required

Material Balance:

$$G_s (Y_1 - Y_2) = L_s (X_2 - X_1)$$

$$-\frac{L_s}{G_s} = \frac{Y_1 - Y_2}{X_1 - X_2}$$

- This is a straight line with slope $-\frac{L_s}{G_s}$
- There is no limit on $\frac{L_s}{G_s}$
- Infinitely tall tower is required to produce vapour And liquid streams in equilibrium

Top

Absorption

$Y_1 > Y_2$

$X_2 > X_1$

Bottom