## Standard Tank Configuration

A turbine agitator of diameter ($D_A$) in a cylindrical tank of diameter ($D_T$) filled with liquid to a height ($H_L$). The agitator is located at a height ($H_A$) from the bottom of the tank and the baffles, which are located immediately adjacent to the wall, have a width (b). The agitator has a blade width (a) and a blade length (r) and the blades are mounted on a central disc of diameter (s). A typical turbine mixing system is the standard configuration defined by the following geometrical relationships: -

1- a 6-blade flat blade turbine agitator.
2- $D_A = D_T / 3$
3- $H_A = D_T / 3$
4- $a = D_T / 5$
5- $r = D_T / 8$
6- $H_L = D_T$
7- 4 symmetrical baffles
8- $b = D_T / 10$

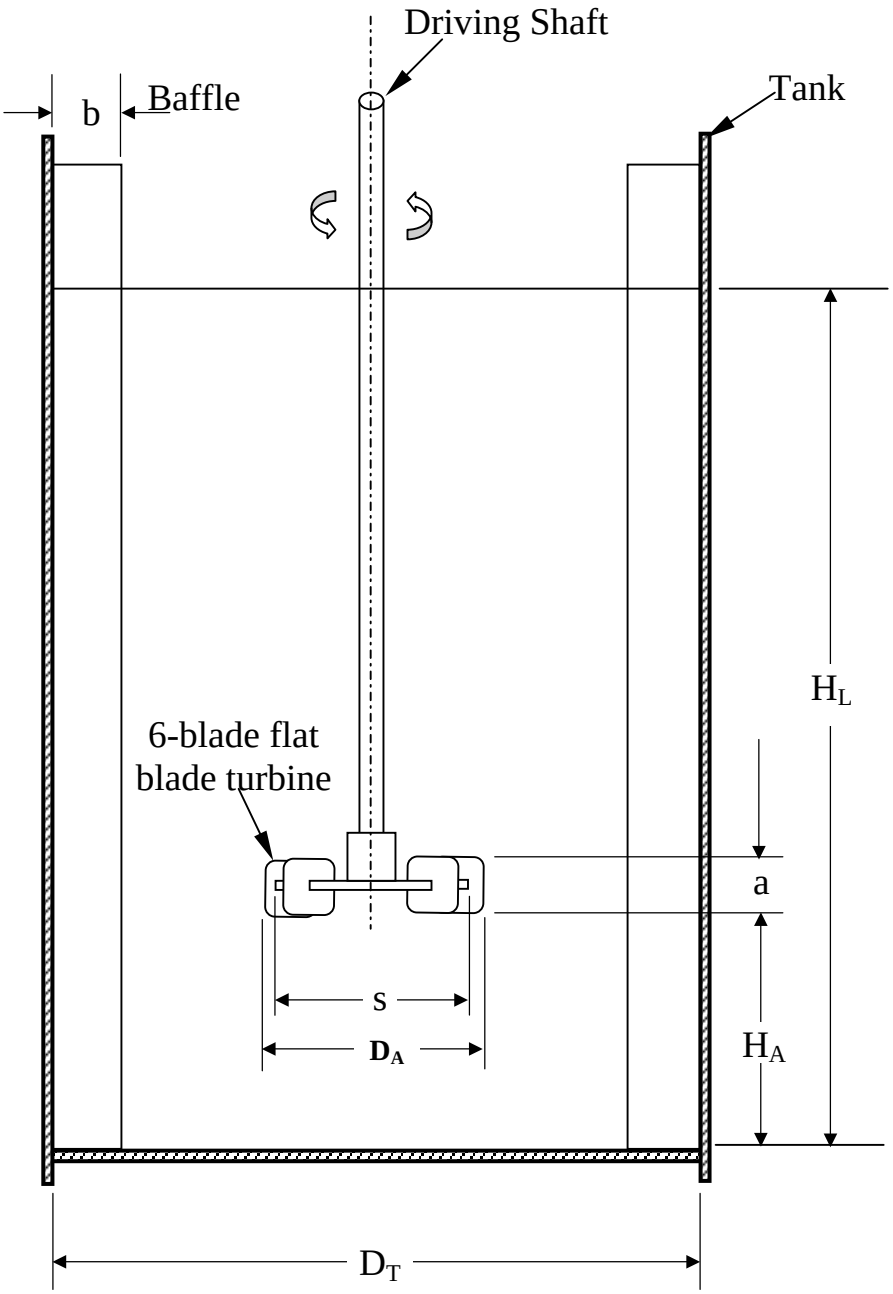



Figure of Standard Tank Configuration

Processing considerations sometimes necessitate deviations from the standard configuration.

## Marine Type Propeller

It can be considered as a case-less pump. In this case its volumetric circulating capacity ($Q_A$) is related to volumetric displacement per revolution ($V_D$) by the equation;

$Q_A = \eta V_D N$

where, $\eta$: is a dimensionless efficiency factor which is approximately (0.6).

$V_D$ is related to the propeller pitch (P) and the propeller diameter ($D_A$) by the equation;

$$V_D = \frac{\pi D_A^2 P}{4}$$

Most propellers are square pitch propellers where ($P = D_A$) so that the last equation becomes;

$$V_D = \frac{\pi D_A^3}{4} \qquad \Rightarrow \quad Q_A = \frac{\eta \pi D_A^3 N}{4}$$

A tank turnover rate ($I_T$) is defined by the equation;

$$I_T = Q_A / V$$

where, V: is the tank volume and $I_T$: is the number of turnovers per unit time.

To get the best mixing $I_T$ should be at a maximum for a given tank volume (V), this means that the circulating capacity $Q_A$ should have the highest possible value for the minimum consumption of power.

The head developed by the rotating agitator ($h_A$) can be written as;

$h_A = C_1 N^2 D_A^2$ where, $C_1$ is a constant.

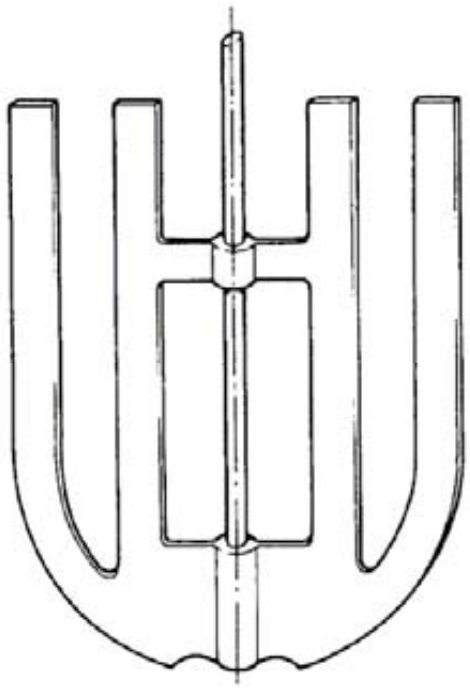
$Q_A/h_A = C D_A/N$ where, $C = \eta\pi/(4C_1)$

but $\dot{\gamma}_m = KN$

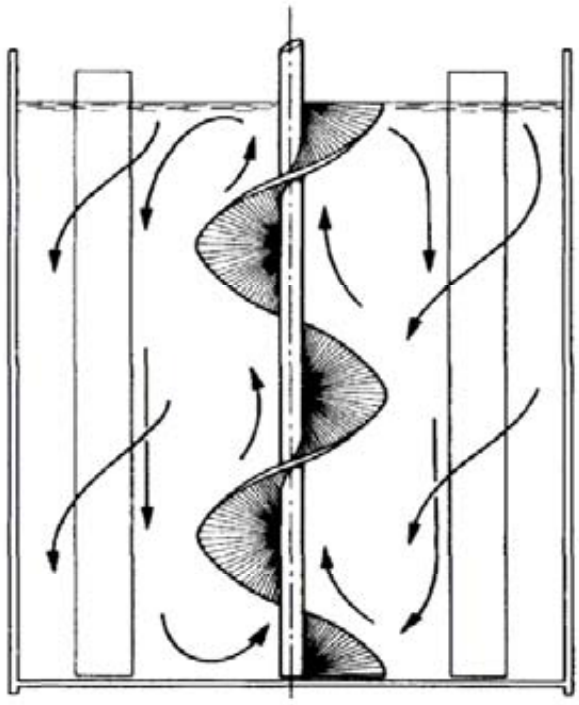
$$\frac{Q_A}{h_A} = C' \frac{D_A}{\dot{\gamma}_m}$$ where, C´ = C.K = constant

### 9.2.2 Small Blade, High Speed Agitators

This type of agitators includes **anchors, gates, paddles, helical ribbons, and helical screws**. They are used to mix *relatively high viscosity liquids* and depend on a large blade area to produce liquid movement throughout a tank. Since they are low shear agitators.



***Gate type anchor agitator***



***Flow pattern in a baffled helical screw system***