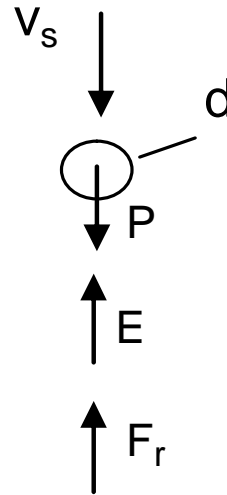


## CAIDA DE UNA ESFERA

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$$v_s = \sqrt{\frac{4}{3} \frac{g(\gamma_s/\gamma - 1)d}{C_d}}$$



## SEDIMENTACION

$$v_s = \sqrt{\frac{4}{3} \frac{g(\gamma_s/\gamma - 1)d}{C_d}}$$

$v_s$  = velocidad de sedimentación

$C_d$  = coeficiente de arrastre

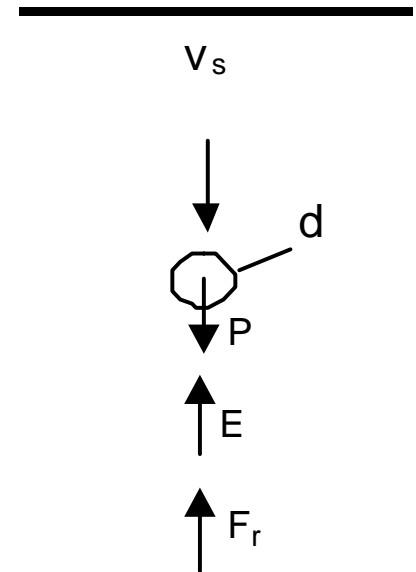
$d$  = diámetro de la partícula

$P$  = peso de la partícula

$E$  = empuje del agua sobre la partícula

$R_e$  = número de Reynolds

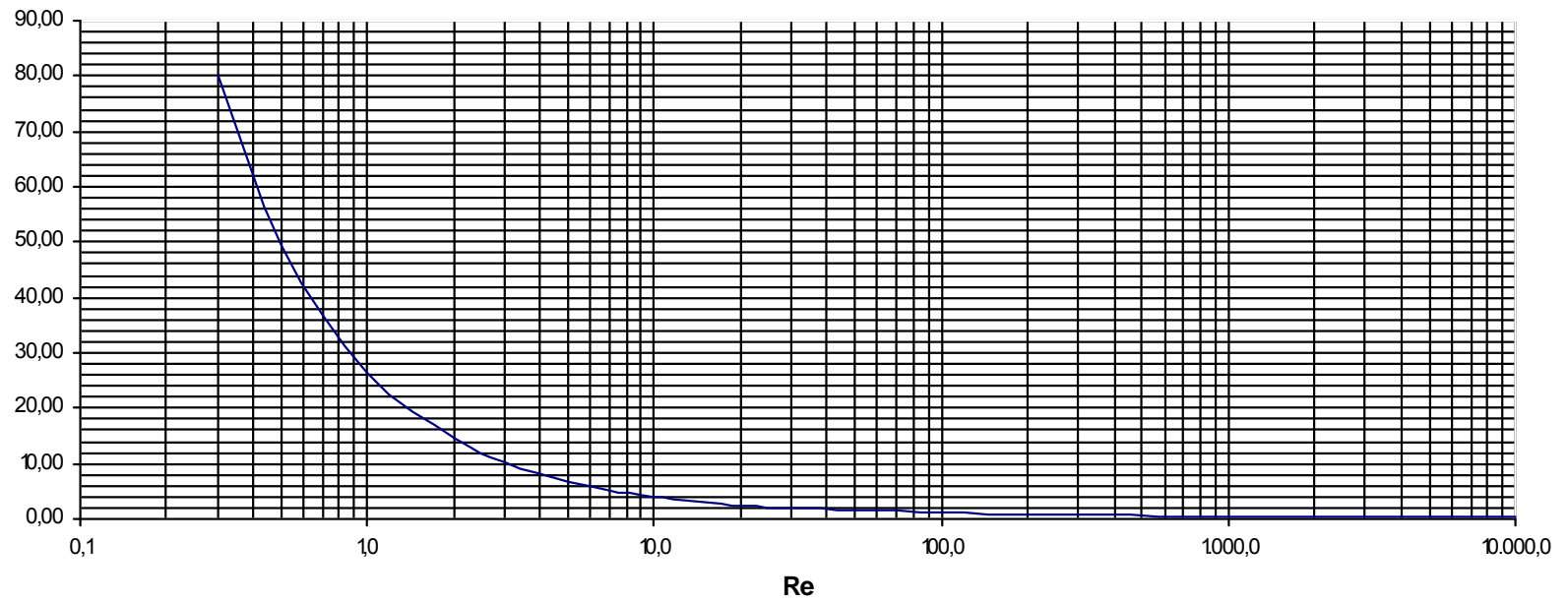
$$R_e = \frac{v_s d}{\nu}$$



| $R_e$  | $C_d$ |
|--------|-------|
| 0.3    | 80.00 |
| 0.5    | 49.50 |
| 1      | 26.50 |
| 2      | 14.60 |
| 3      | 10.40 |
| 5      | 6.90  |
| 7      | 5.30  |
| 10     | 4.10  |
| 20     | 2.55  |
| 30     | 2.00  |
| 50     | 1.50  |
| 100    | 1.07  |
| 200    | 0.77  |
| 300    | 0.65  |
| 700    | 0.55  |
| 1,000  | 0.46  |
| 2,000  | 0.42  |
| 3,000  | 0.40  |
| 10,000 | 0.39  |

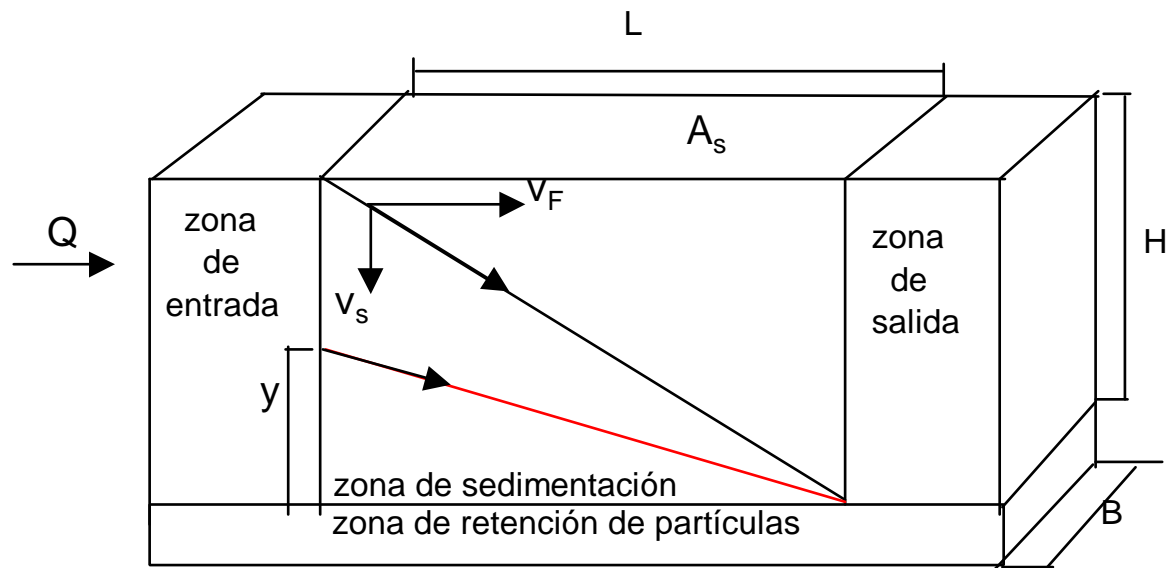
| viscosidad cinemática<br>del agua |                                   |
|-----------------------------------|-----------------------------------|
| t<br>° C                          | $\nu * 10^6$<br>m <sup>2</sup> /s |
| 0                                 | 1.790                             |
| 5                                 | 1.517                             |
| 10                                | 1.310                             |
| 15                                | 1.140                             |
| 20                                | 1.004                             |
| 25                                | 0.884                             |
| 30                                | 0.805                             |
| 40                                | 0.652                             |
| 50                                | 0.556                             |
| 70                                | 0.423                             |
| 80                                | 0.369                             |
| 100                               | 0.296                             |

### CAIDA DE UNA ESFERA

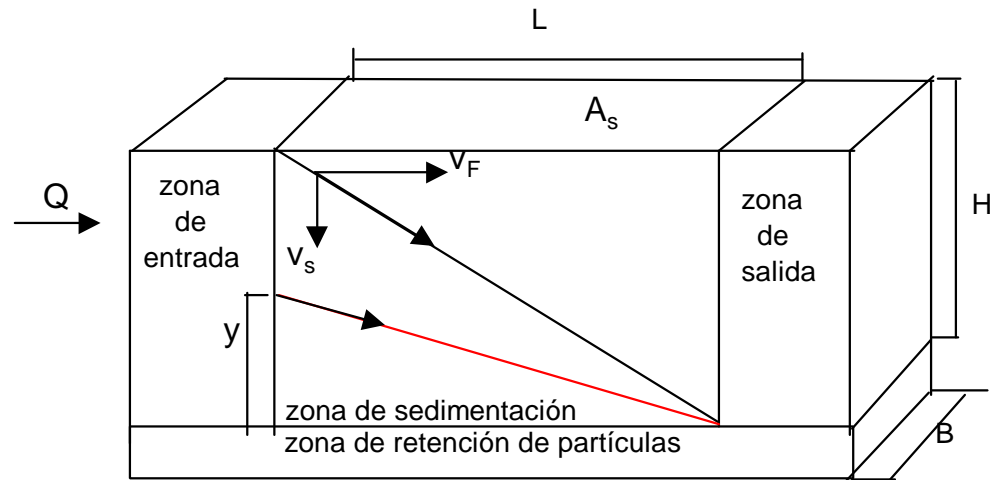




# DESARENADOR IDEAL - MODELO DE HAZEN Y CAMP



## CALCULO DE LA LONGITUD DE UN DESARENADOR



$$\frac{v_s}{v_F} = \frac{H}{L} \quad \longrightarrow \quad v_s = \frac{H}{L} v_F$$

$$v_F = \frac{Q}{HB} \quad \longrightarrow \quad v_s = \frac{Q}{L B} \quad \longrightarrow \quad L = \frac{Q}{v_s B}$$



$$C_d Re^2 = \frac{4}{3} \frac{g(\gamma_s/\gamma - 1) d^3}{\nu^2}$$

$$\frac{C_d}{Re} = \frac{4}{3} \frac{g(\gamma_s/\gamma - 1) \nu}{v_s^3}$$

$$Re = \frac{v_s d}{\nu}$$

| $C_d / R_e$ | $R_e$  | $C_d$ | $C_d R_e^2$ |
|-------------|--------|-------|-------------|
| 266,67      | 0,3    | 80,00 | 7,2         |
| 99,00       | 0,5    | 49,50 | 12,4        |
| 26,50       | 1      | 26,50 | 26,5        |
| 7,30        | 2      | 14,60 | 58,4        |
| 3,47        | 3      | 10,40 | 93,6        |
| 1,38        | 5      | 6,90  | 172,5       |
| 0,76        | 7      | 5,30  | 259,7       |
| 0,41        | 10     | 4,10  | 410         |
| 0,13        | 20     | 2,55  | 1.020       |
| 0,07        | 30     | 2,00  | 1.800       |
| 0,03        | 50     | 1,50  | 3.750       |
| 0,0107      | 100    | 1,07  | 10.700      |
| 0,00385     | 200    | 0,77  | 30.800      |
| 0,00217     | 300    | 0,65  | 58.500      |
| 0,00079     | 700    | 0,55  | 269.500     |
| 0,000460    | 1.000  | 0,46  | 460.000     |
| 0,000210    | 2.000  | 0,42  | 1.680.000   |
| 0,000133    | 3.000  | 0,40  | 3.600.000   |
| 0,000039    | 10.000 | 0,39  | 39.000.000  |



# ESQUEMA DE UN DESARENADOR COMERCIAL

