**CHLORINATION—CHLORINE DEMAND TEST**

***What is the “chlorine demand test” used for?***

* To have an effective disinfection and avoid the contamination during subsequent transport and distribution, we need to add chlorine until we have a free residual chlorine of about 0.5 mg/l (after 30 min of contact period)
* The chlorine that we add to the water is consumed by organic and inorganic compounds. It is impossible to know in advance how much chlorine we should add to have free residual chlorine after treatment.
* The chlorine demand test allows finding out how much chlorine we should add to clear water to have an effective disinfection.

**PRACTICAL EXAMPLE OF CHLORINE DEMAND TEST**

**Material:**

* 6 buckets with 10 litres of the water to be treated each. For an effective disinfection, water subject to chlorination must be clear and with a pH value within the suitable range (< 5 NTU, pH 6.5-8.5)
* Stock chlorine solution (MS) 1%
* Pool tester, Chlorine test kit (to check final chlorine ≈ 0.5 mg/l)
* Syringe to measure volumes
* Watch
* Wand to stir

**Preparing 1% Stock Chlorine Solution (Mother Solution)**

$\frac{Volume \left(MS\right) × \%(MS)}{\% Chlorine} =Weight of Chlorine Powder $

**Analysis检测:**

* Add MS (0.5 ml, 1 ml, 1.5 m, 2 ml, 4 ml, 6 ml) in the water buckets
* Stir for about 10 min. and leave the chlorine to react for 30 min.
* Measure the chlorine concentration of the buckets

*Chlorine after 30 min*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bucket 6 ml | Bucket 4 ml  | **Bucket** **2 ml**  | Bucket 15 1.5 ml | Bucket 1 ml | Bucket 10 0.5 ml |
| > 3 mg/l  | 2.5 mg/l  | **0.6 mg/l**  | 0.2 mg/l  | 0.0 mg/l  | 0 mg/l  |

Choose the right bucket (the one with a final chlorine concentration of about 0.5 mg/l, in the example Bucket 2 ml)

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| --- |
| **Chlorine Mother Solution of 1%** |
| **Tank Volume (Ltr)** | **70% Chlorine Powder** | **Tank Volume (Ltr)** | **50% Chlorine Powder** | **Tank Volume (Ltr)** | **30% Chlorine Powder** |
| **1 litre = 14 gm** | **1 litre = 20 gm** | **1 litre = 33 gm** |
| ***Tank*** | ***Weight*** | ***Spoons*** | ***Tank*** | ***Weight*** | ***Spoons*** | ***Tank*** | ***Weight*** | ***Spoons*** |
| *1 ltr* | 14 gm  | 1 | *1 ltr* |  20 gm  | 1.5 | *1 ltr* |  33 gm  | 2.4 |
| *2 ltr* |  28 gm  | 2 | *2 ltr* | 40 gm  | 3 | *2 ltr* | 66 gm  | 4.8 |
| *5 ltr* |  70 gm  | 5 | *5 ltr* |  100 gm  | 7 | *5 ltr* | 166 gm  | 12 |
| *10 ltr* |  143 gm  | 10 | *10 ltr* |  200 gm  | 14 | *10 ltr* | 333 gm  | 24 |
| *20 ltr* |  283 gm  | 20 | *20 ltr* |  400 gm  | 29 | *20 ltr* | 667 gm  | 48 |
| *30 ltr* |  428gm  | 30 | *30 ltr* |  600 gm  | 43 | *30 ltr* | 1000 gm  | 72 |
| *40 ltr* |  571gm  | 40 | *40 ltr* |  800 gm  | 58 | *40 ltr* | 1333 gm  | 95 |
| *50 ltr* |  714 gm  | 50 | *50 ltr* |  1000 gm  | 71 | *50 ltr* | 1667 gm  | 120 |
| *60 ltr* |  857 gm  | 60 | *60 ltr* |  1200 gm  | 86 | *60 ltr* | 2000 gm  | 143 |
| *70 ltr* |  1000 gm  | 70 | *70 ltr* |  1400 gm  | 100 | *70 ltr* | 2333 gm  | 167 |
| *80 ltr* |  1142 gm  | 80 | *80 ltr* |  1600 gm  | 114 | *80 ltr* | 2667 gm  | 191 |
| *90 ltr* |  1285 gm  | 90 | *90 ltr* |  1800 gm  | 129 | *90 ltr* | 3000 gm  | 215 |
| *100 ltr* |  1428 gm  | 100 | *100 ltr* |  2000 gm  | 143 | *100 ltr* | 3333 gm  | 239 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Chlorine Mother Solution of 0.25%** |
| **Tank Volume (Ltr)** | **70% Chlorine Powder** | **Tank Volume (Ltr)** | **50% Chlorine Powder** | **Tank Volume (Ltr)** | **30% Chlorine Powder** |
| **1 litre = 3.6 gm** | **1 litre = 5 gm** | **1 litre = 8 gm** |
| ***Tank*** | ***Weight*** | ***Spoons*** | ***Tank*** | ***Weight*** | ***Spoons*** | ***Tank*** | ***Weight*** | ***Spoons*** |
| *1 ltr* | 3.6 gm  | 0.25 | *1 ltr* |  5 gm  | 0.36 | *1 ltr* |  8 gm  | 0.6 |
| *2 ltr* |  7 gm  | 0.5 | *2 ltr* |  10 gm  | 0.75 | *2 ltr* | 16 gm  | 1.2 |
| *5 ltr* |  18 gm  | 1.25 | *5 ltr* | 25 gm  | 1.75 | *5 ltr* | 42 gm  | 3 |
| *10 ltr* | 36 gm  | 2.5 | *10 ltr* | 50 gm  | 3.5 | *10 ltr* | 83 gm  | 6 |
| *20 ltr* | 72 gm  | 5 | *20 ltr* | 100 gm  | 7 | *20 ltr* | 165 gm  | 12 |
| *30 ltr* |  108 gm  | 7.5 | *30 ltr* |  150 gm  | 11 | *30 ltr* |  250 gm  | 18 |
| *40 ltr* |  144 gm  | 10 | *40 ltr* |  200 gm  | 15 | *40 ltr* |  333 gm  | 24 |
| *50 ltr* |  180 gm  | 12.5 | *50 ltr* | 250 gm  | 18 | *50 ltr* | 416 gm  | 30 |
| *60 ltr* |  216 gm  | 15 | *60 ltr* |  300 gm  | 22 | *60 ltr* |  500 gm  | 36 |
| *70 ltr* |  252 gm  | 17.5 | *70 ltr* |  350 gm  | 25 | *70 ltr* | 580 gm  | 42 |
| *80 ltr* |  286 gm  | 20 | *80 ltr* | 400 gm  | 29 | *80 ltr* |  667 gm  | 48 |
| *90 ltr* |  321 gm  | 22.5 | *90 ltr* | 450 gm  | 32 | *90 ltr* | 750 gm  | 54 |
| *100 ltr* | 360 gm  | 25 | *100 ltr* | 500 gm  | 36 | *100 ltr* | 830 gm  | 60 |