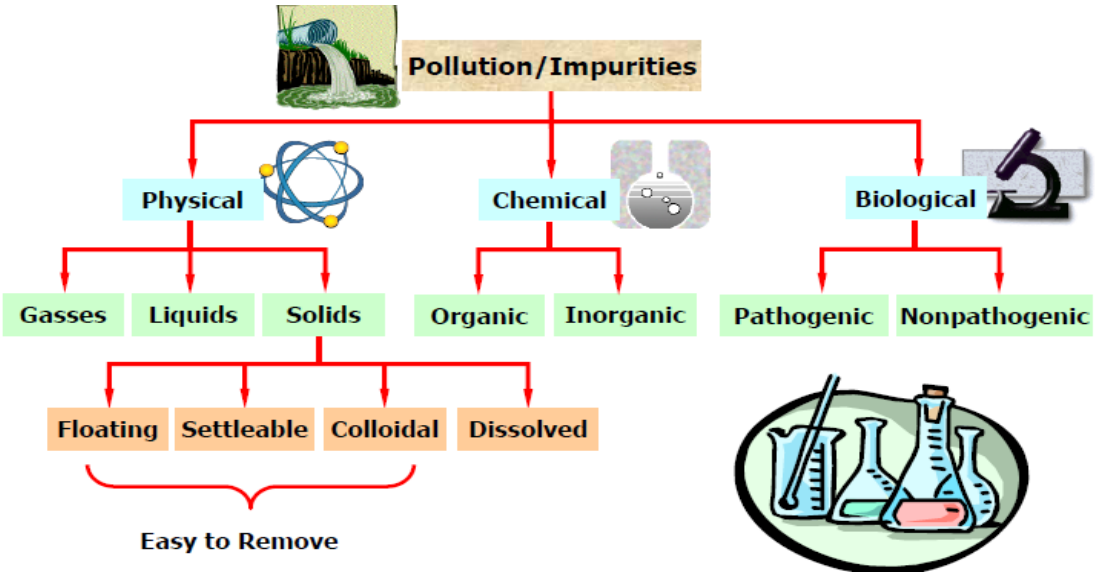
1. Introduction



pH, Temperature, TSS, TDS, Turbidity, Alkalinity, Hardness, Chloride, BOD, COD, Microbiology

اهم الملوثات التي تتعلق بمحطات معالجة مياه الشرب هي:

A) pH and Temperature

Common water pH levels

Type of water	pH level
Tap water	Varies; typically about 7.5
Distilled reverse osmosis water	5 to 7
Common bottled waters	6.5 to 7.5
Bottled waters labeled as alkaline	8 to 9
Ocean water	About 8
Acid rain	5 to 5.5

B) Total suspended Solid (mg/L)

Total suspended solids (TSS) include all particles suspended in water which will not pass through a filter.

C) Total Dissolved Solids (mg/L)

The material remaining in the water after removal suspended-solids by filtration is called total dissolved solids. This material is left as a solid residue upon evaporation of the water. Dissolved material results from the solvent action of water on solids, liquids, and gases.

D) Turbidity (NTU)

Turbidity is a measure of the degree to which the water loses its transparency due to the presence of suspended particulates. Suspended matter in water scatters or absorbs light and does not allow free passage, the visual depth of such water samples are restricted.

Turbidity meters

E) Biological Water Quality Parameters (number/ml)

The Biological water quality parameters include the pathogens like bacteria, virus, protozoa and helminths.

امثلة: عن الفايروسات والبكتريا المرضية في المياه:

الجدول ادناه مهم في عمليات المعالجة:

Relationship between Particle Size and Settling Time

Particle diameter mm	Particle Type	Settling Time (through 1 m)
10 mm	Gravel	1 second
1.0 mm	Sand	10 seconds
0.1 (100 µm)	Fine Sand	2 minutes
0.01 (10 µm)	Clay	2 hours
0.001 (1 µm)	Bacteria	8 days
0.0001 (0.1 µm)	Colloidal Particles	2 years
0.00001 (0.01 µm)	Colloidal Particles	20 years

Can't remove only by Gravity

2. Estimation of water consumption

The demand of water can be divided into the following:

a) Domestic water demand: drinking, cooking, washing, bathing, sanitary purposes…etc.

حسب عدد السكان والمحددات الدولية للاستهلاك الفردي (المناخ والعادات تؤثر بصورة كبيرة على قيمة الاستهلاك) مثلا العراق 200-250 L/c.d . يصل من 50 الى 60 % من الاستهلاك الكلي.

b) Industrial water demand: factories, offices, hotels, hospitals…etc.

حسب نوع المصنع والطاقة الانتاجية ويشكل تقريباً من 20 الى 25 %.

c) Public use: parks, gardens, roads, losses…..etc.

ملاحظة: قبل البدء بعملية التصميم لمحطة مياه الشرب، يجب في البداية تحديد كمية الاستهلاك الحالية وكذلك عمر مشروع محطة مياه الشرب لذا يجب في البداية تحديد النمو السكاني للمدينة المخدومة بمحطة مياه الشرب.

3. Population Estimation

Arithmetic method

This method of forecasting is based upon the hypothesis that the rate of increase is constant. If may be expressed as follows:

$\frac{dp}{dt} = k_a$

$$\boldsymbol{p_1 = p_0 + k_a t}$$

Where p_1 = population at future time

p_0 =Present population, usually use p_0 value of latest census.

2.2 Geometric growth rate method

The hypothesis of growth rate method is assumed that the rate increase is proportional. It can be written as

$\frac{dp}{dt} = k_p . P$

$$\boldsymbol{\ln p1 = \ln p0 + k_p(t1 - t0)}$$

Example 1: A city recorded population of 113000 and 129000 in the 1980 and 1990 census, respectively. Estimate the population in 1999 by using Arithmetic method?

Solution: At first we should find k_a value from previous population data

$k_a = \frac{129000-113000}{10} = 1600$ capita/year

p_t for 1999 is:

$p_{1999}=p_o+k_a$ t= 129000 capita+1600 capita/year *9 year

Q water=?

Example 2: Solve Example 1 using geometric rate method?

Solution: At first we should find k_a value from previous population data

$$k_p = \frac{ln\ 129000 - ln\ 113000}{10} = 0.01324$$

p_t for 1999 is:

$\ln p_t = \ln p_o + k_p\ (t - t_o) = \ln(129000) + 0.01324 * (1999 - 1990)$

p_{1999} =145 325 capita

Q water=?