Effeciency of the Designe of waste water treatment unit of Babil Batteries factory in Baghdad (state Battery manufacturing company)

*** Kawakib Jaber AL-Hashimi ,** Aid Khalaf Thamer**

Collage of pharmacy, university of AL-Mustansriya
Ministry of industry and minerals (Babil Batteries factory in Baghdad)

الخلاصة:

تتخلف من العمليات الانتاجية للمعامل الصناعية مياه ملوثه لايمكن تصريفها مباشرة للانهار او المجاري العامة قبل معالجتها وتخفيض نسب الملوثات فيها الى الحدود البيئية المسموح بها في نظام صيانة الانهار العراقية من التلوث بحيث لايؤثر على مواصفات مياه الانهار والمجاري العامة.

ان المياه المصرفة من وحدتي اللبخ والشحن في معمل البطاريات السائلة تكون مياه غير متعادلة وتحتوي على نسبة عالية من الرصاص والعوالق الاخرى لذا فان عملية المعالجة هنا اعتمدت على فصل العوالق والاطيان بعمليتي الترسيب والترويق وذلك بعد معالجة الاس الهيدروجيني لها ثم لعملية الترشيح.

تم تقييم كفاءة وحدة المعالجة المدرجة في البحث لمدة ثلاث سنوات من عملها وكانت نتائج جيدة جداً ويمكن اعتمادها في معامل اخرى مماثلة.

Abstract:

Industrial waste water is discharged from various processes in factories using water. Further, the contaminants and Pollutants separated from the water, must be treated and disposed of so that they cannot cause environmental pollution of other obstructions.

The flow diagram of waste water treatment of babil Battries factory is shown.

This was the most suitable treatment methods involving equipments and chemicals. Physical and chemical. Treatment (included PH adjustment) were the methods used, to remove the Pollutants present in the waste water of Bettries factory in Baghdad Determination of chemical properties of final disposal water has been done, estimation tests show good results for many years.

Introduction:

Domestic and industrial usage of water commonly contributes chemicals to the water discharge.

The substances which are obstacles in the protection of the natural environment and maintenance of human health become the objects of treatment.

Industrial waste water is discharged from various Processes in factories using water. The sources and types of waste water vary with the industrial classification, and also the quality of waste water is some time different. Even in the same type of industry [1].

Removal of Pollutant.

The contaminants and Pollutants separated from the water must be treated and disposed of so that they can not cause environmental pollution or other obstruction.

The process of waste water treatment is divided into the following three classes [2,3]:-

1. Physical treatment. (4)
2. Chemical treatment. (5)
3. Biological treatment. (6)

Planning waste water treatment: outlined below [4,5]:

a. fixing treatment target.
b. choice of treatment methods.
c. Determination of final disposal.

Removal of lead from waste water of Batteries factory. in Baghdad

It is an example of waste water treatment Processes. designed and instructed in Iraq.(*)
And measured its efficiency for many years.

Lead:

Lead (Pb) is a soft, naturally occurring metal used in wide verity of industries including electroplating, metallurgy Plastics,
Batteries, Electronic equipment and Pigments.

Lead can be found in an inorganic form as an oxide (Lead dioxide, $Pb O_2$) or as a salt (Lead chloride $Pb Cl_2$) or in organic forms as alkylated lead .

The central and peripheral nervous system, and the blood forming hematopoetic system can be adversely affected by lead. Several studies suggest that lead is embryo toxic, and may be have caused miscarriages in woman working with it. Lead is the most common cause of human metal poisonings and the most intensively studied. The literature on lead toxicity is enormous.

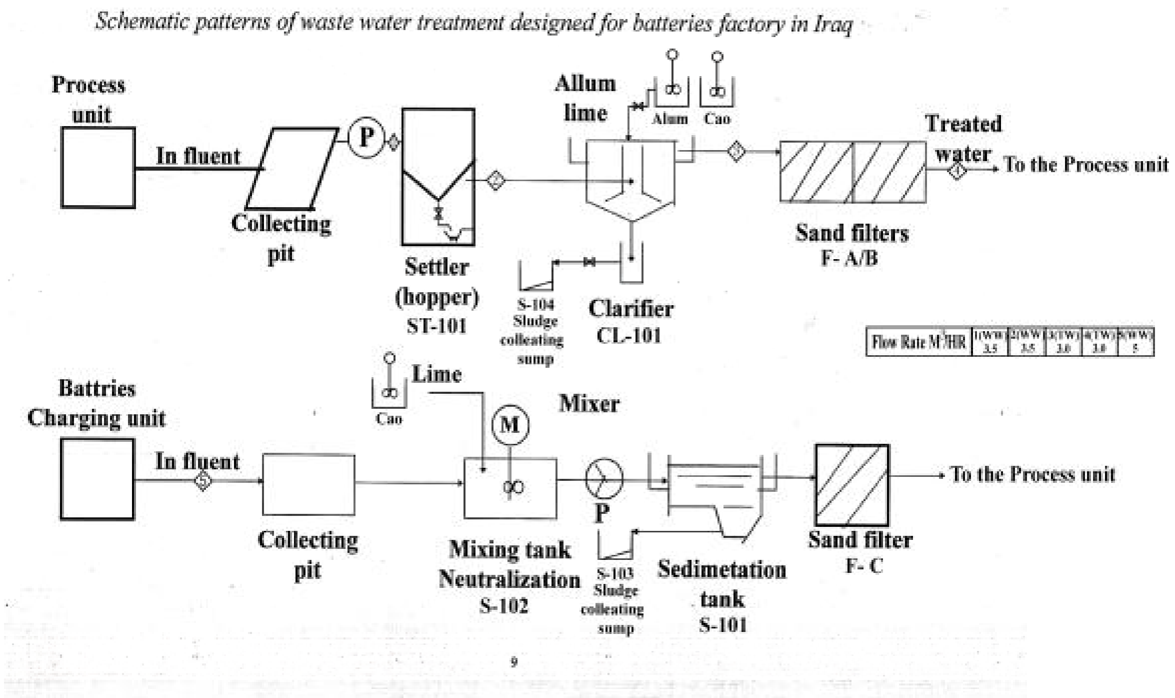
The pure metallic element is usually insoluble in water and so unreactive as to resist incorporation .However, inorganic, ionic forms of the metal, as found in salts, will enter into biologic processes if they are sufficiently water soluble. Organ metallic compounds such as tetraethyl lead are particularly dangerous because of their enhanced ability to cross biologic membranes including the skin and the so called blood- brain barrier. The blood – brain barrier is thought to exist at the level of the endothelial cells, which line the blood vessels in the brain.

After absorption, lead is distributed with in the body in complex patterns. Some lead can be found in the liver, kidneys, and red blood cells, but more than 90% is rapidly incorporated into bone.

Measurement of blood lead levels is an index of exposure to lead, but not index of the total body burden, which is largely stored in bone.[4,8]

	Charging Batteries Unit	Process Unit	Limits for the treated water
PH	Min 1.5 Max 3.9 Ave. 2	6.9 10.8 9.2	6 9.5
T.D.S	Ave.17754 PPM	Min 243 PPM Max 2100 PPM Ave. 581 PPM	
$So_4^=$	Ave. 14160 PPM	Min 96 PPM Max 1368 PPM Ave. 210 PPM	200 PPM
Pb	Ave . 1.2 PPM	Min 0.2 PPM Max 30 PPM Ave. 2.4 PPM	0.05 PPM

Table-1: Data from the analysis of waste water depends for the unit designee.



Flow diagram (1)

Settler:

Gravitational sedimentation:

Sedimentation is used for the treatment of suspended solids which have larger densities than that of water.

An important factor affecting the efficiency of sedimentation treatment is the settling velocities of particles. The faster the settling velocity, the higher the efficiency, this enables the equipment to be small-sized. Factors which determine settling velocities are mainly the diameter and density of particles and the viscosity of solution.

These relations may be expressed in Allen's equation, Newton's equation, Stock's equation, stock's equation, etc. However, stock equation in generally used in the case of water and waste water treatment [2,4,7]

$$V = \frac{g.Dp^2 (P_p - P)}{18m}$$

V=settling velocity

D p=diameter of particles

P_p-p)= difference of density between the particles and water

m = Viscosity of water

Clarifier:

In the case of removing soluble substances, it is necessary to convert them into insoluble (easy to be separated from water) substances by means of chemical reaction or decomposition. Moreover, it is necessary to enlarge apparent Particle sizes in order to increase the efficiency of separation.

Coagulation, Flocculation and sedimentation is generally applied for the purpose.

In this case, coagulation and flocculation chemicals are utilized to raise the efficiency of separation. It is the way to agglomerate fine particles and colloids dispersal stably in water by means of coagulant and flocculants chemicals, and to separate them as large floc.

Since the fine Particles and colloids in water have electric charges on their surfaces, or are covered with hydrophilic substances, they are dispersed stably due to repulsion of particles and Brownian movement.

Coagulants have the function to neutralize charges on Particle, and to weaken the repulsion of Particles.

This Function is called charge neutralization or coagulation. Further more, flocculants have the function to combine (agglomerate) Particles and to form a flocky mass (floc).

These two functions change fine particles and colloids into coarse particles which are easy to separate. In this case we use alum as a coagulant.

General considerations for use of inorganic coagulant are shown as follows:

a- PH control:
Each of the inorganic coagulants has a proper PH range which usually coincides with the PH range to produce hydroxides.
In this case the most suitable PH for alum is the range of 5 to 7.5, and primary floc is easily formed within this range.

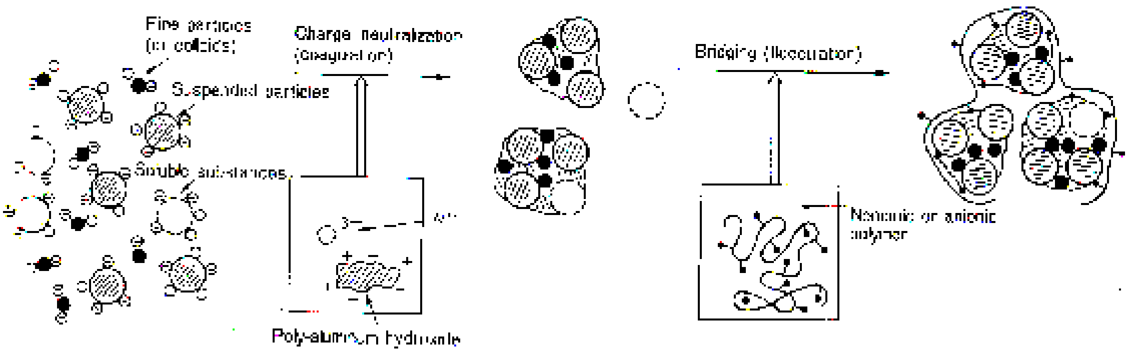
b- Mixing for coagulation:
Strong mixing is needed to bring about frequent contact among suspended solids and coagulants for sufficient charge neutralization and reaction.
Mixing time become important for removal of emulsion substances.

c- Order of chemicals addition: It is general practice to add inorganic coagulants first and then adjust PH .Sometimes added simultaneously

Clarification is performed in rectangular or circular basin where the waste water is held quiescent to permit particulate solids to settle out of suspension. To prevent short- circuiting and hychraulic disturbances in the basin, flow enters behind a baffle to dissipate inlet velocity.

Over flow weirs, Placed near the effluent channel, are arranged to provide a uniform effluent flow. Floating materials are prevented from discharge with the liquid over flow by placing a baffle in front of the weir. A mechanical skimmer collects and deposits the scum in a pit outside of the basin.

Settled sludge is slowly moved toward a hopper in the tank bottom by a collector arm.



Schematic model of coagulation and flocculation process

Sedimentation:

Criteria for sizing sedimentation tank are over flow rate (surface setting rate), tank depth at the side wall, and detention time. Surface settling rate is defined as the average daily over flow divided by the surface area of the tank, expressed in terms of cubic meters per square meter per day.
Area is calculated by using inside tank dimensions, Disregarding the central stilling well of in board weir troughs. (eq.).

The quantity of over flow from a Primary clarifier is equal to waste water in fluent, since the volume of sludge withdrawn from the tank bottom is negligible.

$$V \circ \frac{Q}{A}$$

V =over flow rate (surface settling rate), cubic meters per square meter per day.
Q = average daily flow, cubic meters per day.
A= total surface area of tank, square meters.
Detention time is computed by dividing tank volume by influent flow expressed in hours (eq.).

$$t = 24\frac{V}{Q}$$

Where t= detention time, hours
V=tank volume, cubic meters
Q= average daily flow, cubic meters per day
24= number of hours per day

Raw waste water enters through a series of parts near the surface along one end of the tank. A short baffle dissipates the influent velocity directing the flow down ward. Water moves through at a very slow rate and discharges from the opposite end and by flowing over multiple effluent weirs. [2,7]

Settled solids are scraped to a sludge hopper at the inlet end. Sludge is with drawn periodically from the sludge hopper for to disposal (or reused).

Length to width ratio of rectangular tanks varies from about 3:1 to 5:1 with liquid depths of 2 to 2.5m.The bottom has a gentle slope toward the sludge hopper.

Filtration:

Sand filters:

Is the method of catching and separating suspend solids in water on the surface of filter media or inside filter beds.

The granular – media gravity filter is the most common type used to remove non settleable floc remaining after chemical coagulation and sedimentation.

A typical filter bed is pleased in a concrete box with a depth of about 2.7 m. the granular media about 0.6 m deep.

During filtration, water passes down ward through the filter bed from coarse to fine media by gravity.

(1)TDS (PPm) After treat	PH After treat ment	P H Before treatment	(Pb) PPm After treat	(Pb) PPm Before treat ment	Average for one year
497.7	8	10	〉0.01	1	After 1 years
761.	7.5	9	〉0.01	1	After two Years
754	7.9	10	〉0.01	1	After three years
1496	8.3	10	〉0.01	1	After four years
1500-1000 PPm	9.5-6		〉0.01		Ira of limits (standard limits)

Table-2: Batteries factory (1), Process unit.

(1)TDS (PPm) After treat	PH After treat ment	P H Before treatment	(Pb) PPm After treat	(Pb) PPm Before treat ment	Average for one year
23.3	8.6	3	〉0.01	1	After1 year
234	8.5	1	〉0.01	5	After2 years
741	8.08	1	〉0.01	5	After 3 years

Table-3: Charging unit.

TDS PPm	PH After treat ment	P H Before treatment	(Pb) PPm After treat	(Pb) PPm Before treat ment	Average for one year
448	8.2	9	〉0.01	2.4	After 1 year
761	8	9	〉0.01	1	After2 year
722	8.07	10	〉0.01	1	After3 year
1500-1000 ppm	6 - 9.5		〉0.01		limits

Table-4: Batteries factory (2), Process unit (2).

TDS PPm	PH After treat ment	P H Before treatment	(Pb) PPm After treat	(Pb) PPm Before treat ment	Average for one year
3.6	7.4	2.5	〉0.01	2.5	Ave After(1) year
	7.9	2	〉0.01	4	After (2) year
	8.1	2	〉0.01	4	After (3) years

Table-5: Charging unit (2).

Conclusion:

The flow diagram for waste water treatment as shown in (fig-1) was the most suitable treatment method. The estimation for the results for many years shows very good results.

References:

1- Industrial waste water treatment Technology (1985). (second addition). Patterson, j. W. Jan. ol.

2- Minora okazaki Dr.Eng(1958). Chemical for water and waste water treatment. Chairman Editorial committee Tokyo. Kurita Water Industries Ltd.

3- Belhateche, D.H. (1995). Choose appropriate waste water treatment technologies. Chemical Engineering Progress. Vol.91, no .8,PP.32-51-.

4- Anton, F.; Minton; Chairman; Francis, V. Fissure. (1977). Vice Chairman in Charge of Review Coordination..Waste water Treatment Plant Design. By A joint committee of the water Pollution Control Federation and the American Society of Civil Engineers.

5- Schroeder, E.D. (1977). Water and waste water treatment. Mc Graw – Hill, New York.

6- Belkin, S.; Brenner, A. and Abeliovich, A. (1993). Biological treatment of a high Salinity Chemical industrial wastewater. Environmental quality and ecosystem stability. Vol.27, no. 7-8,pp.105 – 112. 1993.

7- Hammer, D.A. and Bastian, R.K. (1989). Constructer wetlands for waste water treatment. Municipal, industrial and agricultural. Jan. ol.

8- LEAD. Division of Toxicology and Environmental Medicine Tox. FAQs TM.U.S. Department of health and human services, Public Health Service. (ATSDR) Agency for Toxic Substances and Disease Registry. CAS# 7439-92-1. August 2007.