

TREATMENT AND RE-USING OF BOILER BLOWDOWN IN THERMAL ELECTRIC POWER PLANTS

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ABSTRACT:- This work studied the utilization of a pilot plant of ion exchange as a treatment method and re-use for blowdown water in South-Baghdad electric power plant. The pilot plant consisted of two columns of QVF (4.75 cm internal diameter & 90 cm long); cation and anion exchangers' together form the demineralization process. The study is divided into two parts; the first part is to study the effect of flow rate, bed depth, silica concentration on breakthrough time and adsorption capacity for ion exchange pilot plant. The second part is to study the effect of pH with the range of 4.5 to 10 on breakthrough time and adsorption capacity by using two kinds of cation (strong and weak cation resins

The experimental data collected were represented by two dimensional figures and fitted to a second order polynomial mathematical model, with correlation coefficient about 0.98.

The best operating condition attaining maximum breakthrough time and higher adsorption capacity at flow rate (12.46 L/hr) and maximum bed depth (50 cm) with minimum silica concentration (0.1ppm) .The system of WAC resin and SBA resin was more effective than a system of SAC&SBA resin in treating boiler blowdown water.

The cost estimation is saving 274560 \$ by treating boiler blowdown water due to elimination of some processes such as coagulation, filtration and R.O processes, and also reduction in chemicals consumption.

Keywords:- Re-using wastewater, Boiler blowdown .

INTRODUCTION

Industrial wastewater presents a complex and challenging problem to the community welfare; because of this it is important to find a solution to this problem, such as: re use of

waste water by using closed system, control of pollution, and if feasible, recovery of by-product to less expense of treatment and to keep pollution at minimum levels.(Rao, 1994)⁽¹³⁾.

The raw water used to feed these boilers containing varying levels of impurities that are treated in water treatment plant to remove impurities by processes such as filtration, softening and demineralization. Internal boiler water treatment (such as volatile treatment, Alkaline treatment, polyamine treatment, coordinated phosphate treatment) chemicals are added to boiler water, which will increase the level of solids in the boiler water. (Nalco, 1988)⁽¹¹⁾. Even with the best pretreatment program, boiler feed water often contains some degree of impurities, such as suspended and dissolved solids. These impurities can remain and accumulate inside the boiler as the boiler operation continues. The increasing concentration of dissolved solids may lead to carry over of boiler water into the steam, causing damage to piping, steam traps and even process equipment.

To avoid boiler problems, water must be periodically or "blowdown" from the boiler to control the concentrations of suspended and total dissolved solids within the acceptable levels in the boiler. Surface water blowdown (skimming) is often done continuously to reduce the level of dissolved solids, and bottom (mud) blowdown is performed periodically to remove sludge from the bottom of the boiler. (Ncdenr, 2004)⁽¹²⁾.

The study is concerned with the application of ion exchange because ion exchange is becoming more and more important in the treatment of water and waste water. Ion-exchange process removes unwanted ions from raw water by transferring them to a solid material, called an ion-exchanger, which accepts them while giving back an equivalent number of a desirable species stored on the ion-exchanger skeleton. (ABB, 2005)⁽¹⁾.

The ion exchange has a limited capacity for storage of ion on its skeleton, called its exchange capacity; because of this, the ion exchange eventually becomes depleted of its desirable ions and saturated with unwanted ions. It is then washed with a strong regenerating solution containing the desirable species of ions, and these then replace the accumulated undesirable ions, returning the exchange material to a usable condition. (Metcalf, 2003)⁽¹⁰⁾.

There are many types of resins as follows :- (Desilva, 1999⁽⁵⁾; Betz, 1980⁽³⁾; Remco, 2005⁽¹⁴⁾). Strong acid cation resin (SAC); Weak acids cation resin (WAC); Strong base anion resin (SBA); Weak base anion resin (WBA); Heavy metal selective chelating resins.

The ion exchange process has many applications such as water softening; demineralization (deionization); industrial waste water^(7,9).

Boilers may be classified on the basis of the following characteristics depend on pressure (30-225 bar), capacity (20×10^5 - 10^5) Kg/hr, type of fuel, water circulation, material construction and firing configuration (Carld and Shields, 1961⁽⁴⁾; Harry, 1983⁽⁸⁾).

The aim of the present work is to utilize waste water from boilers department of South-Baghdad power plant (which discharge to river currently) by re-using it inside water treatment department depending on the principle of closed system, and so, reducing water consumption and water pollution. The treating method proposed is by ion exchange. Different parameters (flow rate, bed depth, silica content, and pH) were studied effect on breakthrough time and adsorption capacity, also studied the possibility of HCl and NaOH regenerants re-use, as chemical materials in regeneration system. The case study was selected in South-Baghdad Power plant which discharge as a total quantity of liquid to blow-off tank $30.38\text{m}^3/\text{hr}$ was drawn from two groups of boiler (1st group consist of four boilers and 2nd group consist of two boilers) operate at 62 and 98 bar as respectively.

EXPERIMENTAL WORK

The experimental runs studied the treatment of blowdown from boilers in South Baghdad power plant by small-scale ion exchange and it re-use as feed water to boilers. Different variables (flow rate, bed depth, and silica concentration) were selected to study the effect on breakthrough time and adsorption capacity.

Experiments runs also studied the effect of pH value with the range (4.5-10) on demineralization process with two kinds of cation resins and one kind of anion resin.

To minimize the economic cost, a few experiments were carried out to show the possibility of re-using the regenerate from cation & anion exchangers in the next regeneration.

All the samples of blowdown were taken from the boilers blowdown sample in South Baghdad Power Plant. The properties of these different samples are indicated in the analysis listed in table (1). These analyses of properties were carried out at the laboratory in South-Baghdad electric power plant. All experiments were conducted at room temperature.

The materials of resins consisted of three types, these were used in all general demineralization systems as following: -

- Strong Acid Cation resin (SAC) type Amberjet 1200H
- Strong Base Anion resin (SBA) type Amberjet 4200 Cl

-Weak Acid Cation resin (WAC) type Amberlite IRC-50

Schematic representation of the experimental equipment is shown in Figure (1), which consists of the following parts: A glass Q.V.F column was used (4.75 cm internal diameter) and (90 cm long). The resin beds in both columns (cation exchanger resin and anion exchanger resin) were confined in the columns by two fine center disks (filter).

The laboratory experimental work used the blowdown water after collected it from different units (boilers) in a container and mixed with $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$ to increase its silica concentration or mixed with deionized water to decrease its silica concentration. After preparing the feed solution with the desired concentration of silica the experiment would be started. Every 10 minutes, 10 ml of a sample was taken out periodically from the outlet of the anion exchanger for analysis until break point that already was reached that is equal to (0.02ppm) silica conc. (allowable value for boilers water in South- Baghdad power plant).

Regeneration solutions of 6% HCl, 4% NaOH and 3% HCl for the strongly acidic cation exchanger, strongly base anion exchanger and weak acidic cation exchanger respectively. The procedure to prepare these solutions shown in reference (Usama, 2006)⁽¹⁶⁾.

EXPERIMENTAL PROCEDURE

Soaking the resin before adding it to the column to allow it to reach its hydrated volume. The two columns were soaked with deionized water, and then are backed with strong acidic cation resin (SAC) and strong base anion resin (SBA) respectively. The cation exchanger was washed in an upward direction (counter –current) with the flow rate of 8 BV/hr (Rohm and Haas, 1998)⁽¹⁵⁾, at bed expansion 60% & temperature 25 C for 15 minutes using tap water pumped by centrifugal (service) pump.

Regeneration of (SAC) & (WAC) exchangers were carried out by injecting the acid solution of 6% & 3% HCl respectively. The acid solution flowed upward (counter-current) by dosing pump from regenerant tank to cation exchanger. This regenerated the resin at a rate of 4 BV/hr, for at least 45 minutes contact time. Regeneration of the (SBA) was carried out by base solution of 4% caustic soda (NaOH).

The base solution (after heated it to 40 C°) flowed upward (counter-current) by dosing pump from regenerant container to anion exchanger at flow rate of 4 BV/hr for at least 45 minutes contact time. The detail procedure was presented in reference (Usama, 2006)⁽¹⁶⁾.

RESULTS AND DISCUSSION

The effect of studied variables on breakthrough time is shown in figures (2) to (5).

Figure (2) illustrates the interaction effect between bed depth and silica concentration. It seems that increasing the bed depth with decreasing silica concentration will increase the breakthrough time. This because of that; the longer the column, the deeper is the reaction zone, and the greater is the operating capacity of the resin and consequently lately breakthrough time, the deeper reaction zone and the greater breakthrough time. With higher silica concentration of feed, the mass transfer rate through the film until it exceeds the diffusion rate through the resin beads. Then diffusion through the resin becomes the controlling factor and the system is said to exhibit particle controlled kinetics, which is slower process. This condition means that the leakage curve is spread out over deeper reaction zone. If this condition is happened it leads to shorter exhaustion time and lower adsorption capacity.

Figure (3) shows the interaction between flow rate and silica concentration. The effect of both variables had come in accordance with each other in the direction of decreasing breakthrough time with increasing flow rate and silica concentration.

Figure (4) shows the interaction effect between flow rate and bed depth. Both variables tend to affect the breakthrough time in opposite direction. If the flow rate is low enough, equilibrium is established as the solution reaches a new layer of the resin, that's means the wave front is only slightly diffuses as a result of each successive layer of resin being almost completely exhausted before leakage occurs. As flow rate increases, equilibrium is no longer reached and the exhaustion curve is spread out over deeper reaction zone that has a smaller adsorption capacity and earlier breakthrough point.

Figure (5) illustrates the effect of different pH (4.5, 6.5, 7.5, 8.5, 10) on the breakthrough time of the deionized process for system (1) consist of strong acid cation resin (SAC) and strong base anion resin (SBA) with best operating conditions, flow rate (12.46l/hr), bed depth (0.5m), silica conc.(0.1ppm). This figure shows that the breakthrough time decreases with increasing pH, and this may be explained as follows: - any ion exchange resin is a type of synthetic resin manufactured by introducing functional group into a three dimensional cross linked polymer matrix. On this system, the (SAC) resin was manufactured by introducing a sulfonic acid group ($-\text{SO}_3\text{H}^+$) into a polymer matrix, and this process (sulfonation process) make a resin very strongly acidic cation exchange resins and ionized it

throughout the pH range (1-14). Therefore, because this resin is ionized throughout the pH range and have a limiting exchange capacity (typically 1.8 eq/l), when we increase pH (i.e. increase OH⁻ ions), these OH⁻ ions combined with H⁺ ions released from active sites of resin to form water molecules (H₂O) and at a certain time the resin is exhausted (the active sites on resin surface completely exhausted). As pH increases further, more hydroxide (OH⁻) ions will present in feed solution, therefore, immediately resin's active sites exhaust at a shorter breakthrough time than previous pH (i.e. the same limiting capacity, but more OH⁻ ions).

Four experiments were carried out at different pH (6.5, 7.5, 8.5, and 10) with optimum flow rate (12.46 l/hr), bed depth (0.5m), and silica conc. (0.1ppm) for a system (2) consist of weak acid cation resin (WAC) and strong base anion resin (SBA). Figure (6) shows that the breakthrough time increases with increasing pH. This relation is explained as follows: - The functional (active) group of (WAC) resin typically is carboxylate (pK_a=4.8), and this active group will be more ionized as pH increases towards alkaline conditions. (AWWA, 1995⁽²⁾; Diaion, 1995⁽⁶⁾). Weak acid cation resin has a total capacity equal to 3 eq/l or 150000 g salt/m³ resin, at low pH this capacity is not completely used, because only a few active sites on resin surface will ionize, therefore, a little feed water is treated and the resin will exhaust at a certain time. As pH increases, more active group on resin surface will be ionized, this means more capacity and more feed water will be treated, and the resin will exhaust at a longer breakthrough time than previous pH.

EFFECT OF STUDIED VARIABLES ON ADSORPTION CAPACITY

The effect of studied variables on adsorption capacity is shown in figures (7) to (10).

Fig. (7) Shows the interaction effect between flow rate and bed depth. The adsorption capacity increases with decreasing flow rate and increasing bed depth. As flow rate increases, equilibrium is no longer reached and the exhaustion curve is spread out over deeper reaction zone that shows lower adsorption capacity. As bed depth increases, adsorption capacity increases because sufficient intimate contact time of each particle with the feed water, and consequently additional space available for ion exchange.

Figure (8) shows the interaction effect between bed depth and silica conc. At low silica conc., higher adsorption capacity was noticed and the adsorption capacity was increased with longer bed depth.

Figure (9) shows the interaction effect between flow rate and silica conc. at optimum bed depth (0.5m). As flow rate and silica conc. decreases, adsorption capacity increases.

Adsorption capacity was plotted against different pH (4.5, 6.5, 7.5, 8.5, and 10) at best operating other conditions, flow rate (12.46 l/hr), bed depth (0.5m), silica conc. (0.1ppm) in Fig. (10). this figure shows that the adsorption capacity of system (1) (SAC & SBA) is slightly constant with increasing pH. This relation is attributed as previously outlined in discuss the relation between breakthrough time and pH for system (1). In other words the resin will treat the same amount of feed solution throughout the pH range under study, but in shorter time in alkaline solutions.

Figure (11) illustrated the relation of pH with adsorption capacity of system (2) (WAC &SBA) at different pH (6.5, 7.5, 8.5, and 10) for best operating conditions, flow rate (12.46 l/hr), bed depth (0.5m), and silica conc. (0.1ppm). This figure shows that the adsorption capacity increases as pH increases, this is because as pH increases (i.e. OH⁻ ions increases) in feed solution, these ions will combine with H⁺ ions which are released from active sites on resin surface to form water molecules (H₂O), and at a certain time, the resin will exhaust. As pH increases more, more OH⁻ ions present in feed solution, and at the same time more active sites will ionize and be ready to exchange with feed ions, this means more feed water will be processed.

REGENERANT RE-USE

The last third part of injection step (acid injection and base injection) &the first third part of displacement step were collected; the collected amounts from two steps approximately equal to about 1L of acidic solution, and 1L of base solution. The specifications of two solutions are illustrated in table (2).

Therefore, in order to profit from these solutions, we re-use it as follows:

A- System (1) (SAC&SBA resins): - The collected acid &base solutions were used in strong acid cation resin and strong base anion resin as a pre-injection acid & base step before fresh regenerant injection step. This process makes the breakthrough time become longer than fresh regenerant injection step only, because the contact time between regenerant solution and resin becomes longer. The results of this process are listed in table (3).

B- System (2) (WAC & SBA resins): - The acid solution was used in regeneration process for weak acid cation resin (injection acid step) without using fresh HCl, and base solution as a pre-injection step before fresh NaOH injection step. This process gives a good result as in table (4) in comparison with fresh acid & base solutions that are used in normal regeneration process.

ESTIMATION COST OF SUGGESTED PROCESS

In this section a suggested flow diagram is presented for re-using the blowdown water leaving the boilers situation, and then the estimation cost of this process with comparison with the production cost of cubic meter of demineralized water that is usually produced in electric power plant for steam generation. The suggested diagram for blowdown water treatment is shown in Fig. (12).

The final conclusion from suggested process is:

The total dissolved ions reduced from (120 ppm as CaCO₃) for R.O. product only to (78 ppm as CaCO₃) for suggested blending mixture, that leads to reducing in bed volume and in regenerant amounts (HCl and NaOH) for cation and anion resins in about 65% vol. as shown in table (5).

From table (5), it was found that the total saving money for the suggested work is about (8081\$), and this amount of money is a final result from saving the amounts of resin and regenerants. In addition to these, the re-used blowdown water savings is (266466 \$), therefore, the total savings (re-used blowdown+savings in regenerants & resins amounts) are equal to (274560 \$).

EMPIRICAL CORRELATIONS

The responses (breakthrough time and adsorption capacity) of the experiments conducted according to Box-Wilson method and are fitted to second order polynomial correlations as shown in Eqs. (2)& (3) With the correlations coefficients 0.983 & 0.988 respectively. The maximum and minimum of variables is X₁=20.8, 12.46 L/hr, X₂=0.5, 0.3m, X₃=5.0, 0.1ppm as respectively.

$$Y_{\text{Breakthrough time}} = 11.24016 - 6.84367X_1 + 6.291747X_2 - 4.40896X_3 + 3.20002X_1X_2 + 2.189389X_1^2 \quad \dots\dots (1)$$

$$Y_{\text{Adsorption capacity}} = 80.07513 - 14.146 X_1 + 7.409052 X_2 - 19.8373X_3 - 1.75125 X_1X_2 + 2.856239X_2X_3 \quad \dots\dots (2)$$

CONCLUSIONS

The following conclusions can be drawn from the present work as following: -

- 1- Ion exchange is an effective method for treating blowdown water, and there are some interactions between parameters such as: bed depth and silica concentration, flow rate and silica concentration, flow rate and bed depth, etc.
- 2- The pH value (with the range of 4.5 to 10) affected on the breakthrough time and adsorption capacity for two kinds of cation resin (strong & weak) with one kind of anion resin (strong base anion) at the best operating conditions (flow rate=12.46 L/hr, bed depth =0.5 m, and silica concentration =0.1 ppm).
- 3- The exhaust regenerant solutions (after regeneration process of cation and anion) were re- used for type of resins (SAC, SBA, and WAC) which it improve breakthrough time and adsorption capacity.
- 4- The blowdown water was blended with R.O product and this mixture was fed to the demineralization process. This process improved the breakthrough time and adsorption capacity.
- 5- The cost of production one cubic meter of demineralized water for the present system in South Baghdad power plant was 12.5 \$, but the cost of production one cubic meter of blowdown water by suggested method reduced to 0.163 \$.

NOMENCLATURE

X_1, X_2, X_3	coded variables for makeup experimental investigation represent Flow rate, bed depth, silica concentration respectively.
Y	observed value of response (dependent variables) for experiment
B.D	blowdown
BV	bed volume
EC	electrical conductivity
RO	reverse osmosis
R	resin matrix

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Table (1): The Characteristics of Boiler Blowdown at normal operation in South-Baghdad Power plant.

	Min.	Average	Max.
pH	9.00	9.6	9.8
E.C (μ S / cm)	8	20	40
TDS(ppm)	5	18	30
T.H (ppm)	Trace	Trace	Trace
Na ⁺ (ppm as CaCO ₃)	6.0	20	39.80
Ca ⁺² (ppm as CaCO ₃)	Trace	0.003	0.007
Mg ⁺² (ppm as CaCO ₃)	Trace	0.005	0.018
Cl ⁻ (ppm as CaCO ₃)	Trace	Trace	0.02
SO ₄ ⁻² (ppm as CaCO ₃)	Trace	0.002	0.004
OH (ppm as CaCO ₃)	12	20	40
SiO ₂ (ppm)	Trace	0.2	1.2
Phosphate (ppm as P ₂ O ₅)	3	7	10

Table (2): The Specifications of Re-used Acidic and Base solutions.

Specifications	Acid Solution	Base Solution
pH	1.5-2.5	10-12
HCl%	2.5-3.5	-
NaOH%	-	1.5-2
SiO ₂ (ppm)	-	0.1-0.2

Table (3): The re-using regenerates for System (1).

Feed solution Specifications			Breakthrough Time (hr)*	Breakthrough Time (hr)**
Flow rate (l/hr)	Bed depth (m)	Silica conc.(ppm)		
14.224	0.457	3.964	20.5	21.10
16.63	0.5	2.55	22.3	23.10
12.46	0.5	0.1	10.25	10.55

Table (4): The Re-using Regenerates for System (2).

Feed specifications				Breakthrough time(hr)*	Breakthrough time(hr)**
pH	Flow rate(L/hr)	Bed depth(m)	SiO ₂ (ppm)		
9.5	12.46	0.5	0.1	10.2	10.55
7.5	12.46	0.5	0.1	2.5	3.30

Note: *= Fresh HCl & NaOH solutions

**= Re-use acid solution only & (re-use + fresh) base solutions.

Table (5): the Savings in Resin & Regenerants for Suggested process.

	R.O.product only	(R.O. +B.D.) blended	Savings	Price	Total savings (\$)/month
SAC resin	4.103 m ³	2.66 m ³	1.443 m ³	1.5 \$/liter	2164.5
SBA resin	6.113 m ³	3.972 m ³	2.141 m ³	2 \$/liter	4282
HCl for cation regeneration	524.88 kg/day	341.16 kg/day	183.72 kg/day	266.66\$/ton	980
NaOH for anion regeneration	400.7 kg/day	260.45 kg/day	140.25 kg/day	233.33 \$/ton	654.5
				Σ =	8081

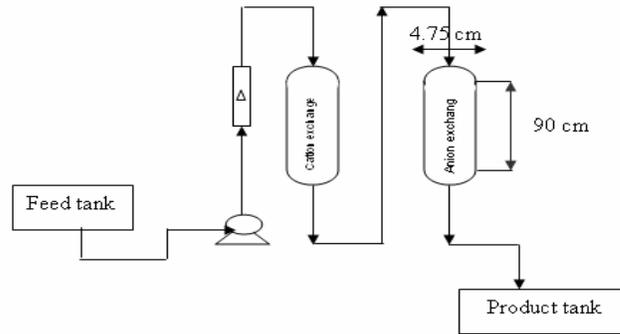


Fig. (1): Schematic Diagram of Demineralization Pilot Plant

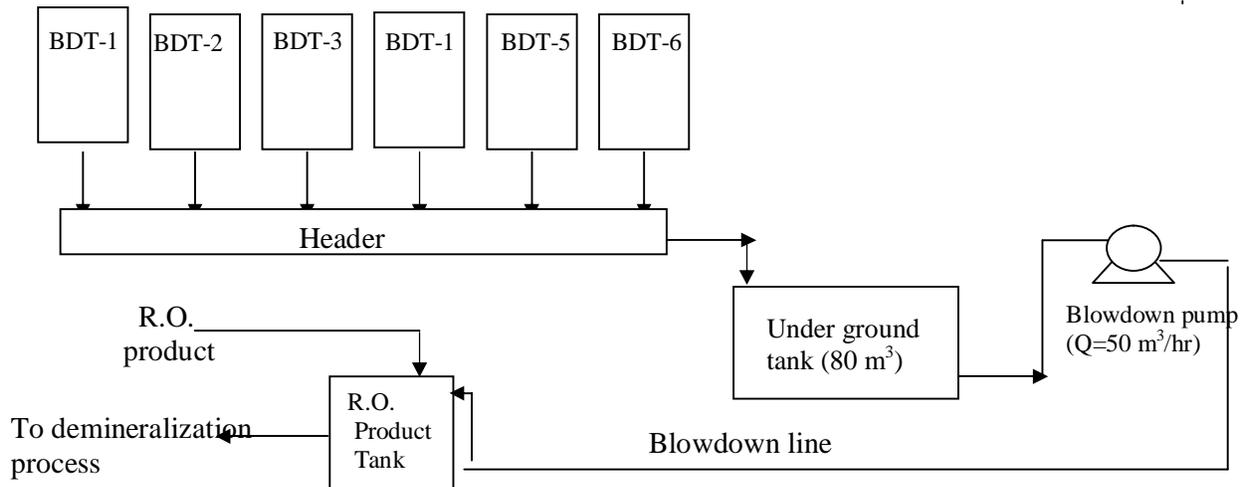


Fig. (2): Shows the Suggested Treatment for Blowdown Water.

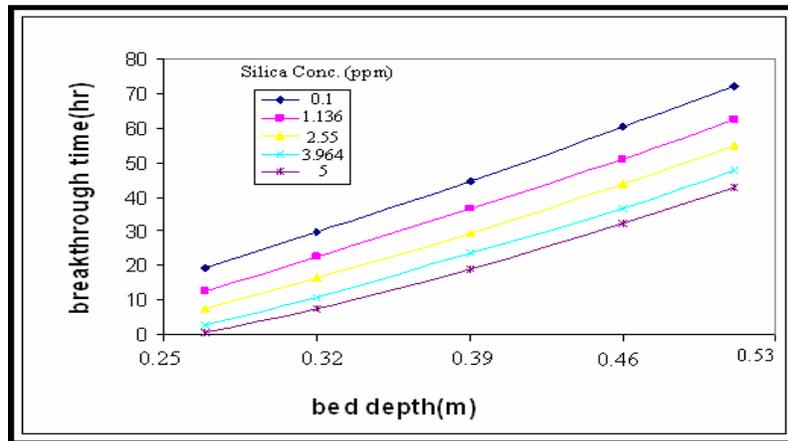


Fig (3): Effect of Bed Depth and Silica Concentration on Breakthrough time at Optimum Flow rate of (12.46 l/h).

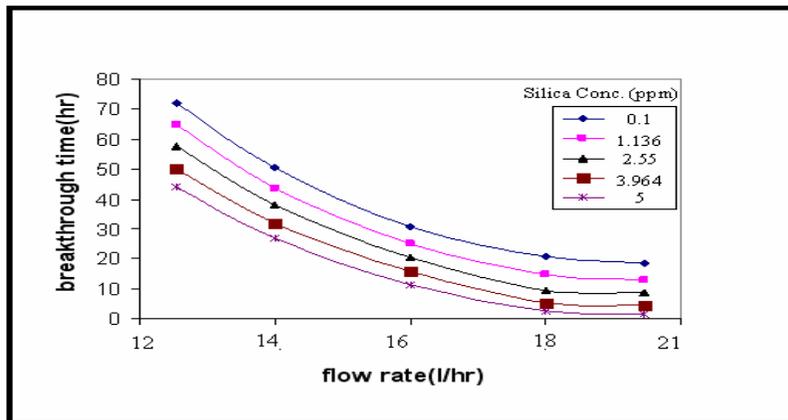


Fig (4): Effect of Flow rate and Silica concentration on Breakthrough Time at Optimum Bed Depth (50cm).

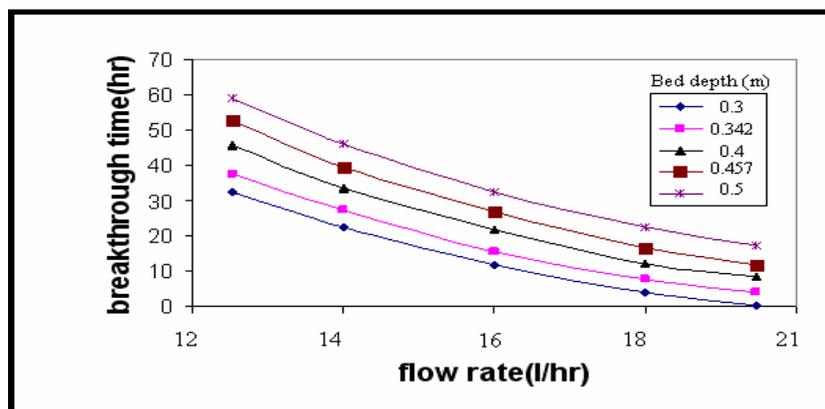


Fig. (5): Effect of Flow rate and Bed depth on Breakthrough Time at Optimum Silica Concentration (0.1ppm).

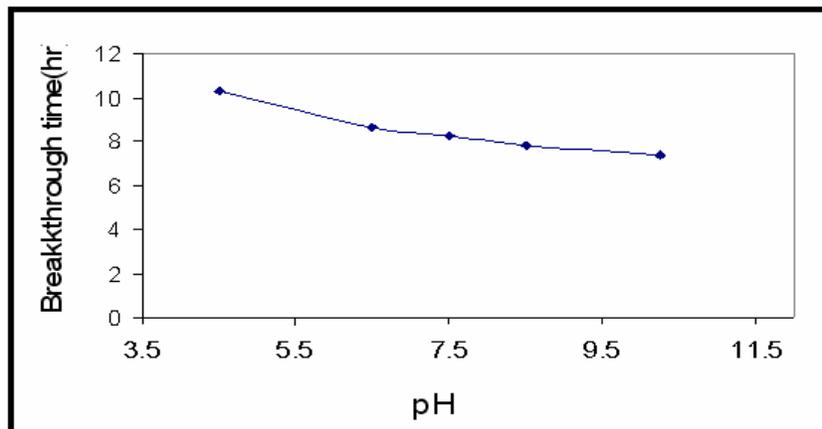


Fig. (6): Effect of pH on Breakthrough time for System (1).

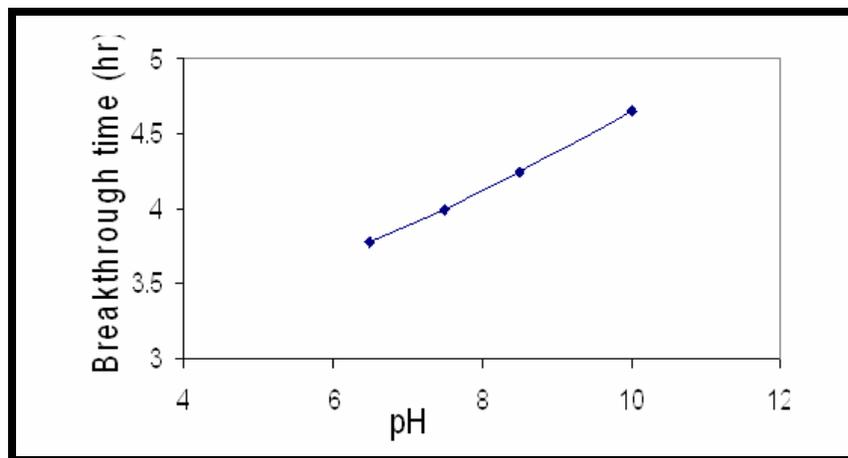


Fig. (7): Effect of pH on Breakthrough Time for System (2).

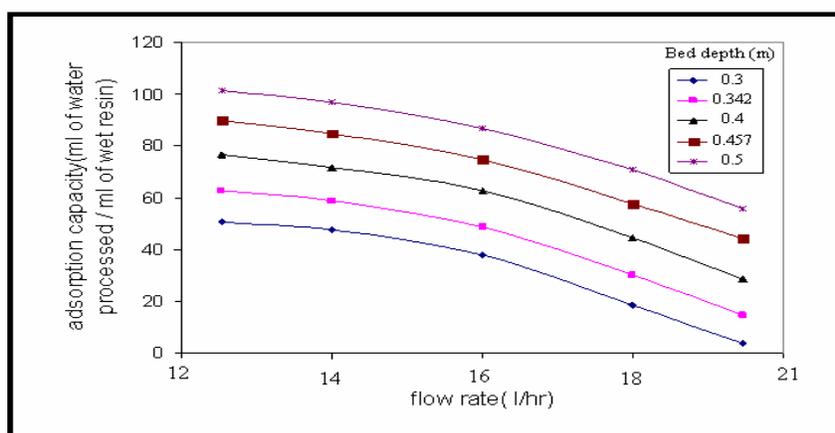


Fig. (8): Effect of flow rate on adsorption capacity at different bed depth at opt. silica conc. (0.1 ppm).

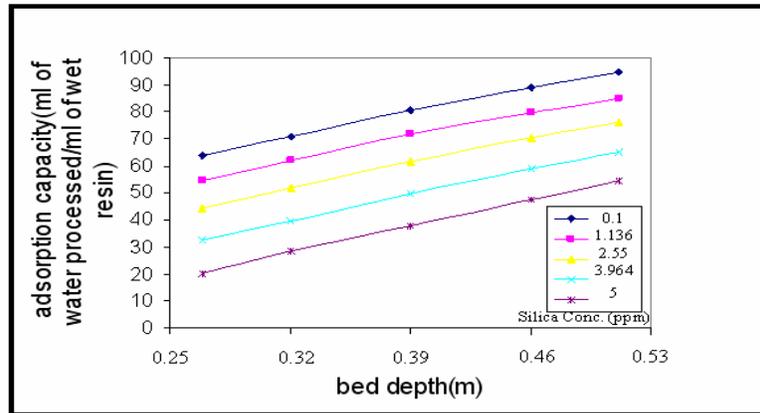


Fig. (9): Effect of Bed Depth on Adsorption Capacity at different Silica Conc. and opt. Flow rate (12.46L/hr).

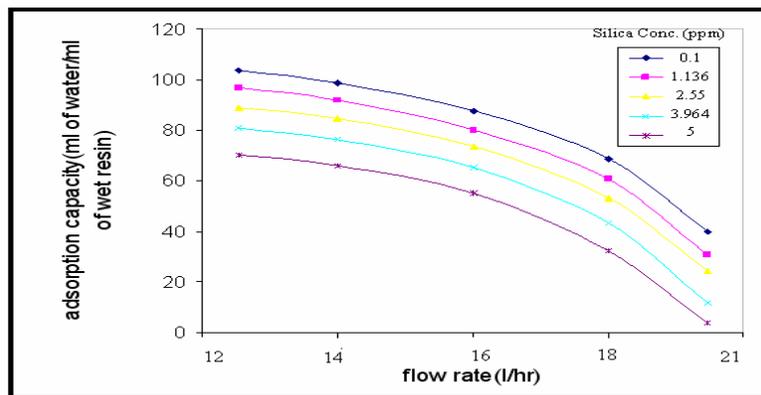


Fig. (10): Effect of Flow rate on Adsorption Capacity at different Silica Conc. and opt. Bed depth (0.5m).

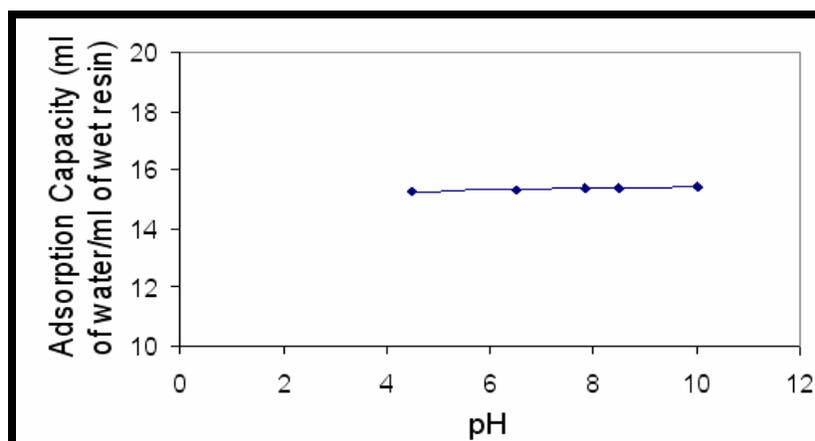


Fig. (11): Effect of pH on Adsorption Capacity for System (1).

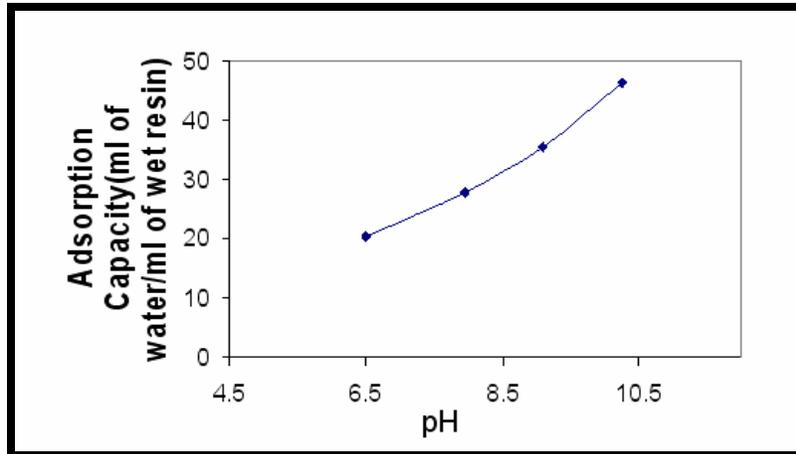


Fig. (12): Effect of pH on Adsorption Capacity for System (2).

معالجة وإعادة استخدام ماء التصريف المستمر للمراجل البخارية لمحطات الطاقة الكهربائية

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قسم الهندسة الكيمياءوية-الجامعة التكنولوجية

الخلاصة

يتضمن البحث دراسة منظومة ريادية متكونة من مبادلات ايونية كطريقة معالجة ماء التصريف المستمر لمراجل محطة كهرباء جنوب بغداد وإعادة استخدامها مره أخرى كماء مغذي للمراجل. المنظومة الريادية عبارة عن عمودين زجاجيين كل عمود بقطر (4.75 سم) وارتفاع (90 سم) , العمود الأول هو المبادل الأيوني الموجب والعمود الثاني هو المبادل الأيوني السالب والذين بمجموعهما يكونان عملية إزالة الأملاح. تم تقسيم الدراسة إلى قسمين : القسم الأول دراسة تأثير ثلاثة متغيرات مختلفة وهي معدل الجريان المغذي , ارتفاع الطبقة للمبادل الأيوني السالب , وتركيز السليكا على خاصيتين للمبادلات الايونات هما زمن الاستنفاد وقابلية الامتصاص والقسم الثاني تضمن دراسة تأثير الدالة الحامضية (0-4.5) على زمن الاستنفاد وقابلية الامتصاص لنوعين من الراتنج هما (الراتنج الحامضي الموجب القوي والضعيف). تم تمثيل النتائج العملية بعلاقات بيانية ذات بعدين وإيجاد علاقات تجريبية بين المتغيرات بمعادله متعددة الحدود من الدرجة الثانية بمعامل ارتباط (0.98) وباستخدام برنامج في الحاسبة الالكترونية. تم إيجاد الظروف المثلى التي تعطي أطول زمن أستنفاد وأعلى قابلية امتصاص وهي: معدل جريان المغذي (12.46 لتر/ ساعة) , ارتفاع الراتنج السالب (0.5متر) , وتركيز السليكا (0.1 جزء بالمليون). وتبين من خلال النتائج انه باستخدام نظام مبادل ايوني موجب ضعيف مع مبادل قاعدي سالب قوي هو أكثر كفاءة في معالجة ماء التصريف المستمر مع نظام مبادل حامضي موجب قوي ومع مبادل سالب قوي. وتم تحليل الكلف الاقتصادية باستخدام الطريقة المقترحة في البحث, إمكانية الوفير شهريا من إعادة استخدام التصريف المستمر بالطريقة المقترحة هو 27456 دولار وهذا ناتج من اختزال عدة عمليات مستخدم حاليا في إنتاج الماء من وحدة معالجة المياه كعملية التنافذ العكسي وعملية الترشيح والتركيد وأيضا عدم الحاجة لإضافة مواد كيمياءويه.