



## **The Quality of Reverse Osmosis Water in Storage Tanks In Basrah city – Iraq.**

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### **Abstract**

For studying the quality of Reverse Osmosis drinking water in storage tanks an investigation covering 21 selected locations in Basrah City Centre conducted to take the samples from them, Reverse Osmosis storage water samples were tested for their chemical constituents. Ca, Mg, Na, K, Cl, HCO<sub>3</sub>, and total hardness (T.H.), total dissolved solids (T.D.S.), and pH values. Comparing the levels of that chemical constituents with the Global levels and with regional water standard levels and with local water standard levels also with three kinds of bottled drinking water products, shows that studied parameters of storage Reverse Osmosis drinking water are acceptable with the mentioned standards. The storage Reverse Osmosis drinking water was potable because there was no great change in the quality.

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Key Words: Water, Tanks, Drinking water, water quality.

### **1- Introduction**

The water quality has developed with increasing demand for water, which is suitable for specific uses and conformed to desired quality. The most fundamental need for suitable drinking water and food

preparation and that poses no risk to human health; good quality drinking water may be consumed in any desired amount without adverse effects on health (Haman & Botcher, 1986). The high density of population in Basrah city, in addition to the

decreasing in water resources, required additional resources for drinking water. For that many projects established to produce R.O. water. Water storage tanks are widely used in Basrah for keeping the Reverse Osmosis water that use for drinking, they are in many shapes and some of them are fabricated from metal others plastic, a functional water tank, should do no harm to the storage water.

Water intended for human consumption must be free from organisms that are the causative agents of disease, and must not contain chemical substances at concentrations that may be hazardous to human health. In addition, drinking water should be acceptable free from unpleasant or objectionable taste, odor, color and turbidity (Gower, 1980; Biswas, 1990). However no studies available concerning the quality of Reverse Osmosis drinking water in Basrah City. This study was conducted the main parameters in Reverse Osmosis stored drinking waters in an attempt to evaluate the quality of Reverse Osmosis drinking water characteristics from the chemical and physical point views.

## 2-Material and Methods

The samples of Reverse Osmosis water storage in tanks which used for drinking were collected from 21 selected stations in Basrah City by plastic sampling bottles,

transfer to the labs in cool box and keep them under 4°C till used for test.

The water samples were analyzed to obtain the concentration of Ca, Mg, Na, K, Cl, and  $\text{HCO}_3$  in addition to the measurement of total hardness (T.H.), total dissolved solids (T.D.S.), and (pH). Calcium and Magnesium were determined by titration with 0.01N EDTA, Bicarbonate was determined by titration with 0.01N  $\text{H}_2\text{SO}_4$ , Chloride was determined by titration with 0.01N  $\text{AgNO}_3$ , T.H. was determined by titration with 0.01N EDTA according to the procedure of (APHA, 1975). Sodium and Potassium were determined by using flame photometer model JENWAY PFP7, pH and T.D.S. were measured by multi parameter model Cond 3401 WTW, after it calibrated by using standard solutions.

## 3-Results

The concentration of main parameter of Reverse Osmosis water samples from the study area was shown in table (1).

There was no significant difference between the pH values for the Reverse Osmosis water tanks the range was acidic. The values of T.D.S. showed no significant differences between some Reverse Osmosis water tanks and a high values in others like Al Khandak 585 mg/l and Al Basrah 164 mg/l and Al Jzaaer 199mg/l. T.H. has no significant difference values in the Reverse Osmosis water tanks

accept Al- Tahsenia recorded the highly value 240mg/l, for Potassium concentration their was no significant deference in the Reverse Osmosis water tanks the rang was 0.09-0.5 mg/l. The highest concentration of Sodium recorded in Al-Tahsenia 40.8 mg/l and lowest concentration in Al-Ashar 7.9 mg/l. Calcium concentration recorded no significant difference among locations the range was 16-48 mg/l and no detection in 5-mil and Al-Junina. Magnesium concentration recorded no significant difference values for the Reverse Osmosis water tanks the range was 14.5-58.3 mg/l. The highest Chloride concentration was 248.5mg/l in Al-Junina and Al-Abella and the lowest concentration recorded in most of the other Reverse Osmosis water tanks 71mg/l. Bicarbonate concentration was recorded no significant difference between the Reverse Osmosis water tanks and the range was 36-72 mg/l.

Comparative the pH value with the range value of Global standard WHO and with Iraqi standard value also with Local Kurdistan Region standard value and with regional Jordanian standard value also with three kinds of bottled drinking water Aqua Gulf (Kuwait), Salsal (Basrah), Maeen (Sudia Arabia), their was no significant differences between the values. The value of T.D.S it was less than the WHO

standard value, Iraqi standard value, Local Kurdistan Region value, and Jordanian standard value, also from Salsal, and Maeen, and more than the Kuwaiti product Aqua Gulf.

The values of total hardness T.H. were agree with WHO standard and with the Iraqi standard, its less from the local Kurdistan region standard also less from the Jordanian standard range; it's so higher than the three kinds of bottled drinking water products. Potassium shows a very low value from the Iraqi standard and from the locally Kurdistan region value also less than the three kinds of bottled drinking water products. Sodium concentration agree with the global WHO standard, also with the locally Kurdistan region value and also with the value of three kinds of bottled drinking water products, but it's so less than the value of the Iraqi standard, and the Jordanian standard value. Calcium concentration was less from the global WHO standard and the mean of Kurdistan locally region standard and the Iraqi standard, but higher than the three kinds of bottled drinking water products. Magnesium value agree with the global WHO standard value, and with the locally Kurdistan region standard value, but it was less than the Iraqi standard value but higher than the three kinds of bottled drinking water products. Chloride value

also agree with the Iraqi standard value, and with the Jordanian standard value, but higher than the locally Kurdistan region value, and also from the three kinds of bottled drinking water products, Bicarbonate value was less than the Iraqi

standard value, but higher than the locally Kurdistan region value, as its all showed in table (2).

**Table -1- The measurement values of the parameters that had been recorded for Reverse Osmosis storage drinking water.**

stations	pH	T.D.S. mg/l	T.H. mg/l	K mg/l	Na mg/l	Ca mg/l	Mg mg/l	Cl mg/l	HCO <sub>3</sub> mg/l
Al-Ashar	6.1	55	100	0.2	7.9	48	24.3	71	72
Al-Khandak	6.2	585	100	0.4	17.0	32	24.3	76	72
Al-Twessa	6.8	66	140	0.5	13.5	40	43.0	71	57.6
Al-Khora	6.6	60	120	0.3	7.1	40	29.1	71	57.6
Al-Basrah	6.6	164	100	0.5	17.0	40	24.3	71	72
Al-Hayania	6.8	80	100	0.2	15.6	16	24.3	71	57.6
5-mil	6.3	70	100	0.2	14.6	-	24.3	85	36
Al-Gziyza	6.8	86	80	0.3	12.2	40	19.4	71	72
Al-Maaqil	6.8	92	60	0.3	20.9	32	14.5	106	36
Al_Jmhuria	6.7	84	120	0.4	17.4	32	29.1	71	36
Amendakhly	6.1	80	140	0.3	15.7	40	43.0	71	72
Keblla	6.1	68	100	0.3	9.8	40	24.3	71	72
Jameyat	6.2	77	60	0.2	16.0	40	14.5	71	36
Jameyat Al- Eskan	6.4	50	80	0.1	8.4	16	19.4	71	36
Al-Methaq	6.2	54	60	0.1	6.2	16	14.5	71	36
Al-Junina	6.4	52	60	0.1	9.2	-	14.5	248	36
Al-Abella	6.5	50	100	0.09	8.3	32	24.3	248	36
Al-Meshraq	6.0	96	100	0.6	15.2	16	24.3	71	36
Al-Tahsenia	6.3	59	240	0.1	12.6	40	58.3	156	36
Al-Jzaaer	6.0	199	100	1.4	40.8	40	24.3	71	36
Al-Jubella	6.4	73	60	0.1	16.5	16	14.5	71	57.6

**Table -2- Comparative values of parameters tested for the Reverse Osmosis storage drinking water with other standards values.**

Parameters	Range	Mean	Global WHO standard	Iraqi standard No. 47/1974	Kurdistan Region standard	Jordanian standard	Bottled Drinking Water		
							(Aqua Gulf Kuwait)	(Salsal Basrah Iraq.)	(Maeen Sudia Arabia)
pH	6.1-6.8	6.3	6.5 - 8.5	6.5 – 8.2	7.6	6.5 – 8.5	7.0	7.2	7.2
TDS	mg/l 50-585	104.7	500-1500	500 -1500	908	500-1500	95	120<	135
T.H.	mg/l 60-240	100.9	100 -500	100 -500	288.41	300-500	7	-	40
K	mg/l 0.09-1.4	0.31	-	250	2.3	-	2.3	1.2	1.25
Na	mg/l 6.2-40.8	14.37	20	200	15.4	200-400	22	10	18.5
Ca	mg/l 16 - 48	32.42	75	75 - 200	72.9	-	5.0	21	25
Mg	mg/l 14.5-58.3	25.35	30	50 - 150	30.2	-	1.7	8	15
Cl	mg/l 71-248.5	94.60	-	200 - 250	15	200 - 500	9	30	20
TCO <sub>3</sub>	mg/l 36 - 72	51.25	-	125 - 200	19.95	-	55	-	37

Global WHO standards (Bart ram and Balance, 1998)

Iraqi standard No.417/1974

Local Kurdistan Region standard (Aziz, 2008)

Jordanian Miyahuna Company test report for drinking water, 2007

Aqua Gulf, Salsal, Maeen three kinds of bottled drinking water productions.

#### 4- Discussion

All the results of the recorded concentrations of that main parameters comparing with that WHO global standard values and with the Jordanian standard values and with Iraqi standard value also with locally Kurdistan region values and with three kinds of bottled drinking water shows that there was no significant differences between the values measured in this study agree with the study of (Jawad

*et-al*, 1988) the effect of domestic storage tanks on the quality of drinking waters in Baghdad city. Its also agree with the study of (Al-Omari *et al*, 2008), drinking water quality in roof storage tanks in the city of Amman, Jordan. The most suitable tanks that used for storage Reverse Osmosis drinking water should be a plastic because the metal storage tanks contain variable levels of minerals contents would affect the stored waters, such metals are probably

one of the most harmful and insidious pollutants (Pier&Bang,1980), so It preferred to be that storage tanks from plastic to not cause any leaching of metals to the drinking water that caused health problems occurring due to chemical contamination of drinking water shows a relation between a water hardness and heart disease, cardiovascular disease, also mutagenic-carcinogenic effects of in organics metals (Graun & Mc Cabe,1975), also preferred to be this storage drinking water tanks in a cool temperature places even the temperature is not too critical but, for drinking a cool temperature is generally preferred(Gower,1980).Its preferred to be far from the direct sun light because the higher temperature caused a changed in the odor and the color of drinking water because of the reduction in pathogens through the action of sun light that also associated with the production of algae,its preferred to be well closed to not be polluted by birds and other animals (WHO,1997). The highest values of parameters in study stations may be affected by the time that the Reverse Osmosis drinking water stay in the storage tanks, density of population, and with the unsuitable storage conditions. The results of this study are acceptable according to the mentioned standards and the storage Reverse Osmosis drinking water is potable

because there is no great change in their quality.

## 5-References

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## نوعية مياه التنافذ العكسي داخل الخزانات في مدينة البصرة - العراق

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### الخلاصة

لدراسة نوعية مياه الشرب التنافذ العكسي داخل الخزانات في مركز مدينة البصرة تم اختيار 21 منطقة في مركز مدينة البصرة لجمع عينات مياه الشرب التنافذ العكسي. تم إجراء الاختبارات لقياس الخصائص الكيميائية المنتخبة ومنها الكالسيوم والمغنسيوم والصوديوم والبوتاسيوم والكلور والبيكربونات وكذلك اختبار العسرة الكلية والاملاح الكلية الذائبة والذالة الحامضية . بأجراء المقارنة للقيم التي سجلت مع قيم لمعايير عالمية وأقليمية ومحلية وكذلك مع ثلاثة انواع من منتجات المياه المعدنية من مناشئ مختلفة تعتبر القيم ضمن تلك القياسية وكل القيم المسجلة ضمن الحدود المقبولة لمياه التنافذ العكسي المخزونة في الخزانات صالحه للشرب وذلك بسبب عدم وجود تغيير كبير في نوعيتها.

كلمات المفتاح: مياه، خزانات، مياه الشرب، نوعية المياه