Examination and Analysis of Water from Household Water Filter System (Kifflow)

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Abstract

Public water system must produce pure water strictly meet standards to be sure it is safe for drinking. However, that does not mean it is void of all contaminants. Tap water may contain pollutants effect on the *taste, color and smell* of water. Water filter systems, like *Reverse Osmosis filter*, will remove pollutants from the water. These systems, also known as *faucet water filters*, in this study the activity of water filter (kifflow) which widely used in Iraqi houses was tested through compared the tap water quality before and after entrance to this filter this drinking water systems filter contain six different stages. Each stage or filter gives results different from the others.

Keywords: Reverse Osmosis Filter; Examination; Water Quality; Tap water

فحص وتحليل مياه الفلاتر المنزلية (كفلوو)

الخلاصة

المياه التي تأتي من شبكة المياه العامة يجب أن تستوفي للشروط الصارمة لضمان أنها آمنة للشرب. ومع ذلك، فإن هذا لا يعني أنها خالية من كل الملوثات. قد تحتوي مياه الصنبور على الشوائب التي تؤثر ليس فقط على الصحة ولكن على الطعم واللون ورائحة المياه. ونظم تصفية المياه، مثل مصفاة التناضح العكسي واحدة من الوسائل المعتمدة لازالة الملوثات من المياه. هذه النظم تدعى أيضا بالمرشحات. في هذه الدراسة تم اختبار كفاءة تلك الفلاتر (كفللو) والتي تستخدم على نطاق واسع في المنازل العراقية من خلال مقارنة نوعية المياه قبل وبعد عملية الفلترة، هذا النوع من الفلاتريربط على شبكات مياه الشرب ويحتوي على ستة مراحل مختلفة من حيث التركيب والوظيفة.

الكلمات المرشدة: مصفاة التناضح العكسي، فحص، نوعية المياه، مياه الصنبور

INTRODUCTION

Process of clearing unwanted biological pollutants, chemicals, gases and suspended solids from polluted water defined as water purification. The target is to make water suitable for a specific purpose. Generally, water is sterilized for human uses (*drinking water*). Along with the 2007 WHO report,

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(*1.1 billion* people couldn't have purification water suppliers, 88 percent of the *4 billion* diarrheal disease cases annually causes to risky water and inadequate sanitation and hygiene, whereas, each year died *1.8 million* people from diarrheal diseases). The WHO estimates that (94 %of these diarrheal cases are preventable through modifications to the environment, including access to safe water) [1-3].

A huge number of lives each year could save when using an easy way for purification water in the home, for example (*filters*, *chlorination*, and *solar disinfection* and keeping it in the containers) [4].

One of the purification stages is filtration, solids separation from fluids (liquids or gases) by using physical or mechanical technique to interpolating a medium through which only the fluid can pass. Filtrate is the fluid that passes through. [1] *Pore size* and *filter thickness* affected on filtrate contains of particles size as well as the filtration activity. Some biological processes can also described as a Filtration, specifically in the water and sewage treatment in which unwanted constituents are removed by absorption into a biological film grown on or in the filter medium as in sand filtration [1].

Filtration has three kinds of processing, Rapid sand filters, slow sand filters, and Membrane filtration, sewage and drinking water filtered by filtering both using Membrane filters. Membrane filters for can remove technically all subjects more than (0.2 *um—Membrane*) with (*Giardia* and *Cryptosporidium).* Filters are one of *tertiary treatment* when it is worked for reuse the water from the industries, for limited local uses, or pretreatments for drainage the water into the rivers that is used by municipalities to the downstream. Industry used these treatments widely, especially for drinkable preparation including (bottled water). So there is no filtration can avoid off substances which are dissolved in the water such as nitrates, phosphorus and heavy metal ions. To get full water purification it must be *sterilized* to settle any harmful organisms and pathogenic. There are many kinds of Disinfected processing such us Chlorine disinfection, Ozone disinfection, Ultraviolet disinfection, Solar water disinfection [5-11]. Actually there are an additional techniques to purifying the water like Boiling, Granular Activated Carbon filtering, Distillation, Desalination, In Situ Chemical Oxidation [12-16].

Reverse Osmosis, is a simple and easy water purification process, it is a technology must found anywhere pure water is needed, it, also proven to be the most efficient and cost effective process to mutate seawater, well water or brackish water to pure drinking water. It has been successfully used for Residential, Commercial, and Industrial Applications. In this study one of the household *Reverse Osmosis filter* widely used in Iraq was studied and investigated the purification activity for this system.

Materials and Methods

Materials

Reverse Osmosis System (Kifllow) was studied to investigated the purification activity for it, It‘s one of the household system used in Iraq. This filter contains five stages as follow:

1. PP sediment filter, which can remove floater such as sand, Iron rust, Copper rust and Phosphor.
2. GAC granular Carbon filter, which can absorb the unusual smell, Chlorine, Chlorine by- product and so on.
3. CTO Carbon block filter, which can remove Chlorine, Organic, color, odor and floating particles.
4. TFC RO membrane, which can remove Bacteria, Virus, Chemical Material, and heavy material.
5. Post Carbone filter, which can improve the taste.
   Figure 1 shows the five filter stages and the other contents.

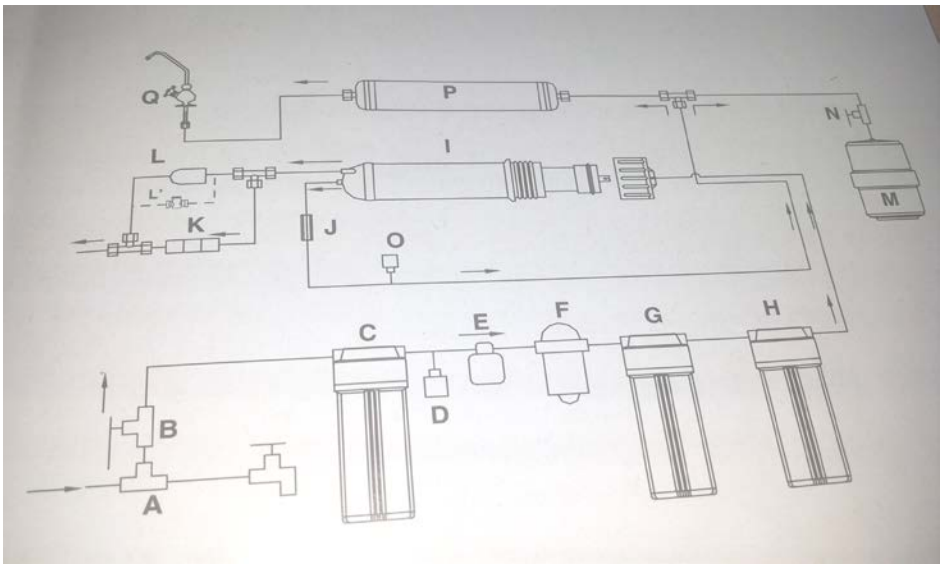

Figure (1). Working Flow Chart

A. Feed water connector B. Brass Valve C. Pre PP Sediment Cartridge
D. Low Pressure Switch E. Solenoid Valve F. Booster Pump
G. Pre Granular Carbon Cartridge H. Pre Carbon Block Cartridge
I. Membrane housing J. Check valve k. Flow Restrictor
L. Auto- Flush Solenoid Valve (Optional) L’ Manual flushing valve
M. Water storage tank N. Tank ball Valve O. High Pressure Switch
P. Post Carbon Filter Q. Faucet

Methods
Samples

Three kind of water samples was tested which are (the tap water before inter the filter system (original water), the filtered water and the drain water which go out from filter system).The samples was collected in the same time, I Litter for each sample, the number of samples was 9. All samples had triplicates for each analysis.

Water Quality Analysis

Water quality indicates to the *physical, chemical, biological*, characteristics of water [17]. It is a measure of the stipulation of water according to the purpose we need for it [18]. It is most considerably used by reference to a set of levels with which compliance can be assessed. Water quality should be estimate to the world standards for each part of ecosystem. The *water quality* was observed like (Smell, Color, Electrical conductivity E.C, and pH).

Chemical water analysis

Total Hardness in the water, Calcium ions, Magnesium ions, sodium ions and Chloride concentration in the water were done for the water, according to the *American public health methods* [19].

Bacteriological water analysis

In the same time, the analysis of Bacteria availability in the water is a tested method to investigate the present bacteria .

The plate count method depend on a bacteria colony were growing on a nutrient medium, colonies can observed and counted by naked eye. To be effective, the dilution of the unique sample must be adjusted, the average of the purpose bacterium is grown between *30 and 300 colonies* [20].

The laboratory procedure enclose making a number of dilutions for the sample (1:10, 1:100, 1:1000, etc.) in antiseptic, the mixture was cultivated on nutrient agar and incubated at *22°C for 24 hours* and *37°C for 24 hours* respectively. The colonies are counted by eye at the end of the incubation period, no needs for a microscope due to the colonies are a few millimeters across, and this procedure takes a few moments to conduct [20].

Results and Discussion

In this study the tap water, filtered water, and the drained water from the filter were examined for chemical analysis, these results were summarized in Table 1.

We can describe the difference in water values between before and after filtration, the widely difference explained the capability of water filter for decreasing the pollutants were very good, so the removal percentage for Total Hardness was 17%, while for Ca, Mg, and Na were 5%, 31% and 23% respectively, the removal percentage depend on the material of filter, size of pores, number of stages, and disinfected kind, these agreement with [5-6].

In the same time the drained water had the highest values due to accumulate the pollutants during the filter operation.

Tap water was Bacteriological tested for the probable number of growth; Coliform and E. coli it was found three growths in The plate, while for filtered water and drained water were empty from any growth, this is a proof on filter activated for water purification due to disinfected stage in the filter it was TFC RO membrane, which can remove Bacteria, Virus, Chemical Material, and heavy material.

Filtered water results were compared with world standards, the results were summarized on Table 2.

In Tap water the Ca value aced the Iraqi standard for Drinking water quality, while for filtered and drained water within ranged of world standard. These results explained the rezone behind the white layer formed after using the water directly without filtration.

Table (1). Physical and chemical analysis for tap water, filtered water, and the drained water from the filter

Parameters	Tap water	Filtered water	Drained water
	None	None	None
	None	None	None
	740	10	910
	6.3	7.2	6.9
	352.8	58.8	411.6
	78.6	3.93	94.3
	38.3	11.8	42.8
	0	0	0
	17.3	4	20

Table (2). Filtered water results in comparison with world standards

Parameters	Filtered water	WHO (2004)	CCME (2007)	Iraq Quality for drinking water (2001)
Smell	None	None	None	None
Colure	None	None	None	None
E.C (µmoh/cm)	10	-	-	-
pH	7.5	-	6.5-8.5	6.5-8.5
Total Hardness (mg/l)	58.8	-	0-75	500
Calcium (mg/l)	3.93	-	200	50
Magnesium (mg/l)	11.8	-	50	50
Chloride (mg/l)	0	0.7	-	250
Sodium (mg/l)	4	50	200	200

Conclusion

The purification activity for Reverse Osmosis filter (Kifllow), was examined through Chemical and Biological analysis for water. Found the difference between

the original and filtered water due to the filter stages, so the removal percentage for Total Hardness was 17% wile for Ca, Mg, and Na were 5%, 31% and 23% respectively, the filtered water was free from any bacterial growth in comparison to that water before inter the filter. The drained water which goes out filter after the purification operation had the highest values due to accumulation of pollutants during filtration process to through it out of the filter. This study proved Reverse Osmosis filter (Kifllow) was active for removing the pollutant from water and the filtered water good for drinking.

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