During operation of most water treatment plants, spent filter backwash water (SFBW) is generated, which accounts about 2–10% of the total plant production. By increasing world population and water shortage in many countries, SFBW can be used as a permanent water source until the water treatment plant is working. This data article reports the practical method being used for water reuse from SFBW through different method including pre-sedimentation, coagulation and flocculation, second clarification, ultra filtration (UF) and returned settled SFBW to the beginning of water treatment plant (WTP). Also, two coagulants of polyaluminum ferric chloride (PAFCl) and ferric chloride (FeCl₃) were investigated with respect to their performance on treated SFBW quality. Samples were collected from Isfahan’s WTP in Iran during spring and...
summer season. The acquired data indicated that drinkable water can be produced from SFBW by applying hybrid coagulation-UF process (especially when PAFCl used as coagulant).

© 2017 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

Specifications Table

| Subject area                           | Environmental Engineering
| More specific subject area             | Water treatment, water reuse
| Type of data                           | Table and figure
| How data was acquired                  | Raw SFBW was treated with a pilot plant that includes primary sedimentation, coagulation & flocculation and ultra-filter. The quality of raw water in Isfahan’s WTP, produced and treated SFBW was determined according to the standard method for the examination of water and wastewater.
| Data format                            | Raw and analysed
| Experimental factors                   | - The data related to sedimentation, coagulation (with PAFCl and FeCl₃) and UF was presented
|                                       | - The data related to quality of raw and treated SFBW including biological, chemical and physical properties was presented.
| Experimental features                  | SFBW treatment by primary sedimentation, coagulation and flocculation and ultra-filter
| Data source location                   | Isfahan’s WTP in Iran
| Data accessibility                     | The data are available with this article and it is not published anywhere

Value of the data

- The data presents the quality of raw water and produced spent filter backwash water in Isfahan-Iran water treatment plant.
- This data show the ability of two coagulant as traditional and pre polymerized for SFBW treatment.
- The data present the quality of treated SFBW with coagulation - UF process and returned the settled SFBW to the WTP entrance.

1. Data

Presented data in this article deal with the quality of raw water entered to Isfahan’s WTP, raw produced SFBW and treated SFBW by primary sedimentation, coagulation (PAFCI and FeCl₃ used as coagulants), Hybrid coagulation-UF processes and recirculation of primary settled SFBW to WTP entrance. Data including parameters like turbidity, color, electrical conductivity (EC), total dissolved solid (TDS), pH, alkalinity, Sludge volume, Iron (Fe), Aluminium (Al), Arsenic (As), Lead (Pb), Cadmium (Cd), ultra violet adsorption at 254 nm wave length (UVA₂₅₄), specific ultra violet (SUVA), dissolved organic carbon (DOC), total organic carbon (TOC), total coliform (TC), fecal coliform (FC) and heterotrophic plate count (HPC). These data presented in Tables 1–3 and Figs. 1–3.
Table 1
The quality of raw water entered to WTP, produced water in WTP and SFBW that produced during filters backwash.

| Parameter                  | Raw water in WTP | Produced water in WTP | Raw SFBW       |
|----------------------------|------------------|-----------------------|----------------|
| Turbidity (NTU)            | 7 (± 0.7)        | 0.25 (± 0.01)         | 275.5 (± 2.1)  |
| Color (Pt. Co. units)      | 11 (± 1.4)       | 0                     | 35 (± 2.8)     |
| EC (µS/cm)                 | 333 (± 2.8)      | 334 (± 1.4)           | 335 (± 1.4)    |
| TDS (mg/L)                 | 165 (± 2.8)      | 166 (± 1.4)           | 167 (± 1.4)    |
| pH                         | 8.22 (± 0.02)    | 8.2 (± 0.02)          | 8.4 (± 0.1)    |
| Alkalinity (mg/L CaCO₃)    | 132 (± 1.4)      | 126 (± 1.4)           | 150 (± 2.8)    |
| Sludge volume (ml/L)       | Negligible       | Negligible            | 12 (± 1.4)     |
| Iron (mg/L)                | 0.1 (± 0.01)     | 0.02 (± 0.002)        | 0.7 (± 0.002)  |
| Aluminium (mg/L)           | 0.035 (± 0.01)   | 0.049 (± 0.002)       | 0.31 (± 0.002) |
| Arsenic (µL)               | 0                | 0                     | 0              |
| Lead (µL)                  | 2 (± 0.28)       | 0.5 (± 0.002)         | 16 (± 0.002)   |
| Cadmium (µL)               | 0.43 (± 0.028)   | 0.38 (± 0.002)        | 0.7 (± 0.02)   |
| UVA₂⁵⁴nm (cm⁻¹)            | 0.052 (± 0.03)   | 0.034 (± 0.001)       | 0.18 (± 0.01)  |
| SUVA (L/mg m)              | 2.6              | 3                     | 3              |
| DOC (mg/L)                 | 2 (± 0.28)       | 1.1 (± 0.14)          | 10 (± 2.8)     |
| TOC (mg/L)                 | 2.2 (± 0.14)     | 1.2 (± 0.14)          | 0              |
| Total Coliform (MPN/100 ml)| 5300 (± 1120)    | Lower than 1          | 9500 (± 1625)  |
| Fecal Coliform (MPN/100 ml)| 1600 (± 256)     | Lower than 1          | 2900 (± 414)   |
| HPC (CFU/ml)               | 2550 (± 346)     | 50 (± 6)              | 4500 (± 525)   |

* Because of very high turbidity and particulate matter this parameter was not analysed.

Table 2
Quality of treated SFBW with primary sedimentation, coagulation and hybrid coagulation-UF process.

| Parameter                  | Settled SFBW | Treated SFBW with PAFCl | Treated SFBW with FeCl₃ | PAFCl-UF output | FeCl₃-UF output |
|----------------------------|--------------|-------------------------|------------------------|-----------------|----------------|
| Turbidity (NTU)            | 130 (± 1.6)  | 2.2 (± 0.28)            | 3.2 (± 0.3)            | 0.1 ≤           | 0.1 ≤          |
| Color (Pt. Co. units)      | 30 (± 1.4)   | 3 (± 1.4)               | 4 (± 1.4)              | 0               | 0              |
| EC (µS/cm)                 | 330 (± 2.1)  | 339 (± 1.41)            | 352 (± 1.6)            | 339 (± 1.4)     | 352 (± 1.6)    |
| TDS (mg/L)                 | 165 (± 2.12) | 167.3 (± 0.4)           | 175 (± 1.2)            | 167 (± 1.6)     | 175 (± 1.2)    |
| pH                         | 8.3 (± 0.08) | 8.2 (± 0.2)             | 7.3 (± 0.3)            | 8.1 (± 0.1)     | 7.1 (± 0.14)   |
| Alkalinity (mg/L CaCO₃)    | 145 (± 2.1)  | 140 (± 1.4)             | 126 (± 2.1)            | 138 (± 1.2)     | 125 (± 1.6)    |
| Sludge volume (ml/L)       | 3 (± 1.4)    | 5.1 (± 0.32)            | 7.2 (± 0.28)           | Negligible      | Negligible     |
| Iron (mg/L)                | 0.35 (± 0.06) | 0.09 (± 0.002)          | 0.16 (± 0.01)          | Negligible      | Negligible     |
| Aluminium (mg/L)           | 0.25 (± 0.04) | 0.04 (± 0.003)          | 0.045 (± 0.002)        | 0.035 (± 0.028) | 0.027 (± 0.03) |
| Arsenic (µL)               | 0            | 0                      | 0                      | 0               | 0              |
| Lead (µL)                  | 14 (± 1)     | 8 (± 0.8)               | 11 (± 0.92)            | 3 (± 0.2)       | 6 (± 0.5)      |
| Cadmium (µL)               | 0.61 (± 0.08) | 0.3 (± 0.06)            | 0.27 (± 0.05)          | 0.19 (± 0.04)   | 0.21 (± 0.03)  |
| UVA₂⁵⁴nm (cm⁻¹)            | 0.12 (± 0.02) | 0.05 (± 0.01)           | 0.052 (± 0.014)        | 0.032 (± 0.01)  | 0.035 (± 0.01) |
| SUVA (L/mg m)              | 2.7          | 2.5                     | 2.4                    | 2.28            | 2.18           |
| DOC (mg/L)                 | 4.4 (± 0.28) | 2 (± 0.28)              | 2.1 (± 0.3)            | 1.4 (± 0.1)     | 1.5 (± 0.11)   |
| TOC (mg/L)                 | 2.3 (± 0.28) | 2.47 (± 0.3)            | 1.7 (± 0.14)           | 1.8 (± 0.14)    |                |
| Total Coliform (MPN/100 ml)| 8500 (± 1414) | 695 (± 77)              | 1075 (± 76)            | Negative        | Negative       |
| Fecal Coliform (MPN/100 ml)| 3050 (± 495) | 585 (± 77)              | 920 (± 395)            | Negative        | Negative       |
| HPC (CFU/ml)               | 3600 (± 565) | 556 (± 62)              | 832 (± 181)            | 265 (± 35)      | 350 (± 42)     |

* Because of very high turbidity and particulate matter this parameter was not analysed.

2. Experimental design, materials and methods

2.1. Quality, quantity and characteristics of raw SFBW

Isfahan water treatment plant treats 12 m³/s of water by coagulation, flocculation, sedimentation and rapid sand filtration processes. Produced backwash water from 48 filter units in the plant considered as a waste. Generated SFBW was about 24,000 m³/d.
2.1.1. Experiment protocol

In this study SFBW was treated by continues processes including primary sedimentation, coagulation, flocculation, secondary sedimentation and UF process. Entrance flow for all sections of the pilot, except UF membrane was 10 l/h. Also, hydraulic retention time (HRT) was 60, 6, 48 and 192 minu, respectively (Fig. 1). According to our previous study, coagulation with PAFCl and FeCl₃ was conducted at pH 8.3 [1]. Both PAFCl and FeCl₃ used as coagulants (Figs. 2 and 3). A pre-determined dosage of PAFCl (10 mg/L) and FeCl₃ (30 mg/L) was continuously and individually added into the rapid mixer basin (mixing speed: 80 rpm, HRT: 6 min). Then coagulated water passed through two-floc-culation tanks with a mixing intensity of 40 rpm. After that, the effluent was introduced to a sec-ondary sedimentation basin, and then directed to a UF membrane module. The UF module filtration was 8 L m⁻² h⁻¹ at a trans-membrane pressure of 300 Pa. It was operated in a cycle of 60 min filtration and 1 min backwashing [2–5]. The importance of such treatment processes for SFBW is that in case there are some concentrations of pollutants being accumulated in the SFBW they will be

Table 3
Mixing of settled SFBW with raw water that entered to Isfahan’s WTP.

| Parameter                        | Mixing settled SFBW with raw water entered to WTP |
|----------------------------------|---------------------------------------------------|
| Turbidity (NTU)                  | 9.8                                               |
| Color (Pt. Co. units)            | 11.4                                              |
| EC(μS/cm)                        | 332                                               |
| TDS (mg/L)                       | 165                                               |
| pH                               | 8.22                                              |
| Alkalinity (mg/L CaCO₃)          | 132.3                                             |
| Sludge volume (ml/L)             | 0.07                                              |
| Iron (mg/L)                      | 0.105                                             |
| Aluminium (mg/L)                 | 0.04                                              |
| Arsenic (μ/L)                    | 0                                                 |
| Lead (μ/L)                       | 2.28                                              |
| Cadmium (μ/L)                    | 0.43                                              |
| UVA₂₅₄₅nm (cm⁻¹)                 | 0.053                                             |
| DOC (mg/L)                       | 2.05                                              |
| TOC (mg/L)                       | --*                                               |
| Total Coliform (MPN/100 ml)      | 6986                                              |
| Fecal Coliform (MPN/100 ml)      | 2512                                              |
| HPC (CFU/ml)                     | 885                                               |

* Because of very high turbidity and particulate matter this parameter was not analysed.

![Fig. 1. A schematic of the experimental set-up. 1: a reservoir tank for raw SFBW, 2: pump, 3: primary sedimentation, 4: coagulation, 5: flocculation, 6: secondary sedimentation, 7: UF module [6]].

2.1.1. Experiment protocol

In this study SFBW was treated by continues processes including primary sedimentation, coagulation, flocculation, secondary sedimentation and UF process. Entrance flow for all sections of the pilot, except UF membrane was 10 l/h. Also, hydraulic retention time (HRT) was 60, 6, 48 and 192 minu, respectively (Fig. 1). According to our previous study, coagulation with PAFCl and FeCl₃ was conducted at pH 8.3 [1]. Both PAFCl and FeCl₃ used as coagulants (Figs. 2 and 3). A pre-determined dosage of PAFCl (10 mg/L) and FeCl₃ (30 mg/L) was continuously and individually added into the rapid mixer basin (mixing speed: 80 rpm, HRT: 6 min). Then coagulated water passed through two-flocculation tanks with a mixing intensity of 40 rpm. After that, the effluent was introduced to a secondary sedimentation basin, and then directed to a UF membrane module. The UF module filtration was 8 L m⁻² h⁻¹ at a trans-membrane pressure of 300 Pa. It was operated in a cycle of 60 min filtration and 1 min backwashing [2–5]. The importance of such treatment processes for SFBW is that in case there are some concentrations of pollutants being accumulated in the SFBW they will be
removed to much lower concentrations [7–9]. Data of this article attained from experimental work and all experiments were conducted according to the standard method for the examination of water and wastewater. Total organic carbon (TOC) was analyzed by Phoenix 8000 system. Turbidity, UV$_{254}$, true color, Total dissolved solid (TDS), Electrical Conductivity, and pH were measured by TN-100 (EUTECH) Turbidimeter, DR 5000-HACH LANGE, EC meter SENSIONS (HACH-LANGE, Germany), and pH-meter model CG 824, respectively. Dissolved organic carbon (DOC), UV254, and the true color were analyzed after filtration through a 0.45 μm membrane. Fe, Pb, As, and Cd were analyzed by inductively coupled plasma (ICP).

Acknowledgements

Authors are grateful to the school of health, Isfahan University of Medical Sciences, Isfahan-Iran and Environmental Health Engineering Department of Saveh University of Medical Sciences, Saveh-Iran for their help to conduct this work. Also, thank for National Water & Wastewater Engineering Company of Iran for all cooperation.

Transparency document. Supplementary material

Transparency document associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2017.10.062.
References

[1] A. Ebrahimi, M.M. Amin, Y. Hajizadeh, H. Pourzamani, M. Memarzadeh, A.H. Mahvi, M. Mahdavi, Filter backwash water treatment by coagulation: a comparison study by polyaluminium ferric chloride and ferric chloride, Desalin. Water Treat. 66 (2017) 320–329.

[2] M. Mahdavi, M.M. Amin, A.H. Mahvi, H. Pourzamani, A. Ebrahimi, Metals, heavy metals and microorganism removal from spent filter backwash water by hybrid coagulation-UF processes, J. Water Reuse Desalin. (2017) (jwrd2017148).

[3] M. Mahdavi, M.M. Amin, Y. Hajizadeh, H. Farrokhzadeh, A. Ebrahimi, Removal of different NOM fractions from spent filter backwash water by polyaluminium ferric chloride and ferric chloride, Arab. J. Sci. Eng. 42 (2017) 1497–1504.

[4] J. Nouri, A.H. Mahvi, R. saeedi, K. Dindarloo, M. Raflee, S. Dobaradaran, Purification and removal of ascaris and fasciola hepatica eggs from drinking water using roughing filters, Korean J. Chem. Eng. 25 (2008) 501–504.

[5] A.H. Mahvi, M. Ahmadi Moghaddam, S. Nasseri, K. Naddafi, Performance of a direct horizontal roughing filtration (DHRF) system in treatment of highly turbid water, J. Environ. Health Sci. Eng. 1 (2004) 1–4.

[6] A. Ebrahimi, M.M. Amin, H. Pourzamani, Y. Hajizadeh, A.H. Mahvi, M. Mahdavi, M.H.R. Rad, Hybrid coagulation-UF processes for spent filter backwash water treatment: a comparison studies for PAFCl and FeCl3 as a pre-treatment, Environ. Monit. Assess. 189 (2017) 387.

[7] A.H. Mahvi, E. Bazrafshan, H. Biglari, Humic acid removal from aqueous environments by electrocoagulation process using iron electrodes, E-J. Chem. 9 (2012) 2453–2461.

[8] E. Bazrafshan, A.H. Mahvi, S. Nasseri, M. Shaieghi, Performance evaluation of electrocoagulation process for diazinon removal from aqueous environments by using iron electrodes, Iran. J. Environ. Health Sci. Eng. 4 (2007) 127–132.

[9] E. Bazrafshan, H. Biglari, A.H. Mahvi, Phenol removal by electrocoagulation process from aqueous solutions, Fresenius Environ. Bull. 21 (2012) 364–371.