

## Recycle of Soft Water Discharged from Dialysis Room Capital Medical University Beijing Ditan Hospital, China

### GGHH Agenda Goals

- Water

### Hospital Goal

- Recycle and reuse the soft water discharged from dialysis room.
- Save water and at the same time reduce the cost of the boilers.

### Progress Achieved

- On Monday, Wednesday and Friday, the hospital saves 10.5 tons water per day, on Tuesday and Thursday, the hospital saves 5.25 tons water per day. The amount of water saved per week is 42 tons and 2,184 tons per year.
- The hospital's effective reuse of the soft water has avoided waste, and at the same time reduced the cost of the boilers.

### The Issue

The Dialysis room of Beijing Ditan Hospital covers an area of 472.06m<sup>2</sup> with 18 beds. Its maximum amount of treated patients in a month is 490, and by average 450 per month. Large quantity of reverse osmosis water is needed when conducting dialysis. The water is produced by the water treatment system of the dialysis room. The reverse osmosis water obtained through the treatment is about 25-30% of the original raw water, and the other 70-75% soft water was normally discharged into sewer.

Dialysis room working hours <sup>o</sup>		
Date <sup>o</sup>	Working hours <sup>o</sup>	Number of patients <sup>o</sup>
Monday <sup>o</sup>	All day <sup>o</sup>	28 <sup>o</sup>
Tuesday <sup>o</sup>	Half day <sup>o</sup>	14 <sup>o</sup>
Wednesday <sup>o</sup>	All day <sup>o</sup>	28 <sup>o</sup>
Thursday <sup>o</sup>	Half day <sup>o</sup>	14 <sup>o</sup>
Friday <sup>o</sup>	All day <sup>o</sup>	28 <sup>o</sup>
Saturday <sup>o</sup>	Off <sup>o</sup>	0 <sup>o</sup>
Sunday <sup>o</sup>	Off <sup>o</sup>	0 <sup>o</sup>
Weekly total <sup>o</sup>		112 <sup>o</sup>
Monthly total <sup>o</sup>		448 <sup>o</sup>

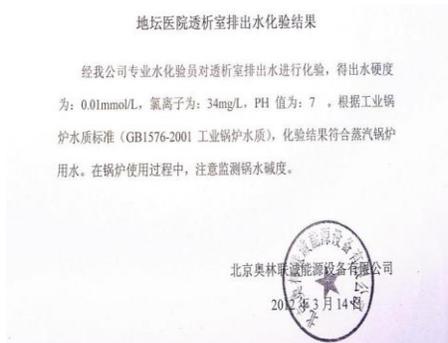
Table 1 Dialysis room working hours and number of patients



Picture 1 Water treatment system

On average, there are 15 dialysis treatments per day, and the maximum amount in one day is 28. The dialysis room is open all day on Monday, Wednesday and Friday, half day on Tuesday and Thursday, and closed on Saturday and Sunday. The consumption rate of purified water in dialysis is about 0.5L/minute and one dialysis operation lasts for 4 hours, so one operation uses about 120L purified water in total. For the all-day working day which has 28 patients, the total purified water consumed is about 3,360L (3.36

tons). For the half-day working day, the number is 1,680L (1.68 tons). The purified water used for dialysis is about 25%-30% of the raw water, so the total amount of water treated is 6.72-13.44 tons, and the amount of discharged soft water is about 5-10 tons. To avoid wasting water, the hospital leaders required to look for ways to recycle and reuse the soft water.



Picture 2: Result of the water test

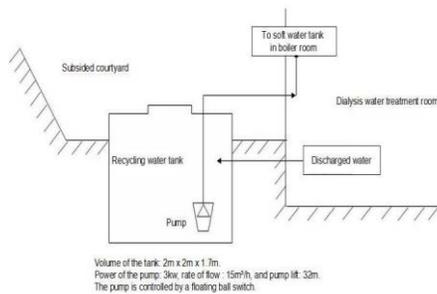


Figure 1 Diagrammatic drawing of the retrofitting plan



Picture 3 Soft water transfers to the water tank in boiler room

### Implementation Process

After discussion and examination, the hospital made the preliminary decision to use the discharged water from the dialysis room's water treatment system to the boilers, but the discharged water need to be able to meet the standards of boiler water, so water sample was collected and sent to Beijing Aolinliancheng Energy Equipment Co. Ltd. for testing. The result showed that the soft water met the industrial boiler

water standard (GB 1576-2001, testing result: hardness: 0.01mmol/L, chloridion: 34mg/L, PH value: 7). A 2m x 2m x 1.7m recycling water tank was installed outside of the dialysis room's water treatment plant, in a subsided courtyard on the north of outpatient building. In the water tank, a diving pump was installed. The pump pumped the recycled water to the boiler room's soft water tank which was 3.8m x 2.8m x 1.6m. The pump's power is 3kw, rate of flow is 15m<sup>3</sup>/h, and pump lift is 32m. The pump is controlled by a floating ball switch.

### Tracking Progress

There are four 8-tons team boilers in the hospital's boiler room. Two of them in use and the other two for backup. The boilers provide the entire hospital's heating and hot water. The heating season of the hospital is from Oct. 15 to the next year's Apr. 15. Water consumption of the boilers is 30 tons/day and the amount of crude salt used for water demineralization is 100kg. In non-heating seasons, the boilers consume 8 tons/day water for hot water and the crude salt used for water treatment is 26kg. The price of crude salt is USD \$0.1 (0.65 Yuan)/kg. The expense for treating 1 ton water is the sum of 1 ton raw water's price and 3.3kg crude salt's cost, which is: 5.8+2.15=7.95 Yuan/ USD \$1.28 USD.



Picture 4: Recycling water tank

The water recycling system was put into use on August 13, 2012. The monitoring data showed that the pump started for 5-6 times on Monday, Wednesday and Friday, and each time lasted for 7 minutes. According to the pump's rate of flow, the pump delivers 1.75m<sup>3</sup>(1.75 tons) water each time and 10.5m<sup>3</sup>(10.5 tons) each day when the dialysis room is in all-day operation, which provides enough water for the boilers in non-heating seasons, but additional soft water is needed on Tuesday, Thursday, Saturday and Sunday.

According to the above description and analysis, it is concluded that on Monday, Wednesday and Friday, the hospital saves 10.5 tons water per day. On Tuesday and Thursday, the hospital saves 5.25 tons water per day. The amount of water saved per week is 42 tons and 2,184 tons per year.

It is indicated from the above mentioned data that the project has a tangible result. The hospital's effective reuse of the soft water has avoided waste, and at the same time reduced the cost of the boilers.

### Challenges and lessons learned

Ditan hospital has ever planned to reuse the discharged soft water for irrigation or fire-fighting. However, the fire-fighting water tank is far away from the dialysis room, which makes it difficult to construct the project. Since the soft water lacks of mineral matters and trace elements, it is not suitable for irrigation neither. Finally, the hospital decided to use the soft water for boilers, which not only save water but also reduce the cost of softening water for the boilers. In addition, the soft water tank of the boilers is close to the dialysis room, which made it convenient for the construction work.

**Demographic information**

Capital Medical University Beijing Ditan Hospital is a class 3A hospital (high) under Beijing Health Bureau. It covers an area of 75000 m<sup>2</sup>, with 600 beds. There are 955 staffs in the hospital. Beijing Ditan Hospital specializes in the treatment of infectious disease. It is superior in hepatopathy treatment, infectious disease treatment, intensive care and combination of Chinese traditional and western treatment. The hospital also makes its remarkable progress in scientific research.

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