

WATER CONSERVATION AT SPORTING CLUBS

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ABSTRACT

Water is scarcity around the world especially at the Arab world countries. Sport is also important for Human Life. So it is very important to conserve water at each activity of the man life. In this paper we should consume every point of water in sporting club to use it in the write way. We shall focus at the water uses in the sporting club for swimming, irrigation, wash, drink and domestic uses.

STUDY STEPS

- 1- The uses Activities in the Cairo Sporting Club as the following:
Swimming Pools water, Wash water, Irrigation water, and Domestic water.
- 2- Water efficient uses for the different activities in the club.
- 3- Scientific methods for solving the problem.

Estimation of the monthly water uses in the swimming pools

Swimming Pools are reuse it's water one or two times in the year to make the annual maintenance and that with the daily chloride injections with sodium sulfate to purity the water from infections and from stagnation state at the swimming pole.

We can measure the amount of water use at the swimming pools:

$$50*25*1.25 + 20*15*5 + 5*15*1.8 = 1562.5 + 1500 + 135 = 3197.5 \text{ m}^3/\text{year}$$

This annual amount of waters is serving about 40,000 family with average family number about 4 persons = 160000 persons.

So the average water consume per person = $3197.5/160000 = 0.019 \text{ m}^3$.

This rate of uses is absolutely low rate is about from 19 to 36 Liter of water per person if the swimming pools one or two time per year reuses .

Annual water uses from water counters at the period from 1/7/2003 to 30/ 6 / 2004:

$$5286 + 13338 + 6976 + 28893 + 20347 + 6976 + 6976 + 24975 + 5736 + 20516 + 5636 + 20516 = 166171 \text{ m}^3.$$

Second Step to calculate the consume waters by different uses (Land irrigation and Domestic uses) at the club.

- The area of the club is about 10 Fed. So the irrigation water is about $10 * 4000 = 40000 \text{ m}^3$.
- Domestic uses about 30 liters for average 1000 visitor person daily at the club = $30 * 1/1000 * 1000 * 365 = 10950 \text{ m}^3/\text{years}$.

The Total Consumed Water Uses per Year = Swimming Pools uses + Irrigation uses + Domestic uses = $2 * 3197.5 + 40000 + 10950 = 57345 \text{ m}^3/\text{year}$

Calculation of the annual water losses

Total Annual water losses = $166171 - 57345 = 108826 \text{ m}^3/\text{year}$

This a large amount of water losses about 108826 m^3 is consider water evaporation from the swimming pools and water losses from the manhole and from the sides of swimming pools

1. Water Evaporation from Swimming Pools calculated by Meed Pond Method:

$$E = 0.0331 * V * (e_s - e_a) * (1 - 0.03 * (T_a - T_w))$$

where T_a = average air temperature in C

T_w = average water surface temperature in C

The amount of evaporation water in the large swimming pool = $2802.27 \text{ m}^3/\text{year}$

The amount of evaporation water in the small swimming pool = $840.83 \text{ m}^3/\text{year}$

The amount of evaporation water in the swimming pools = $3643.6 \text{ m}^3/\text{year}$

2. Water Losses from the swimming Pool sides and Manholes

The amount of water losses from the swimming Pool Sides with thickness is 0.1 cm around the Pool with an average width 1 m in a time 30 seconds. By considering the working time of the swimming pools = 10 hours/day

$$= ((0.1/100) * (52+52+25+25) * 1 * 30 * 60 * 10 * 300) * 0.1 = 83160 \text{ m}^3.$$

The average water losses from Manhole = $108826 - 83160 - 3643.6 = 22022.4 \text{ m}^3$.

So the Total losses which could be reuse = $83160 + 22022.4 = 105182.4 \text{ m}^3$. Figure 1 shows the monthly water uses, monthly evaporation and other activities uses, and monthly water losses in Cairo Sporting Club.

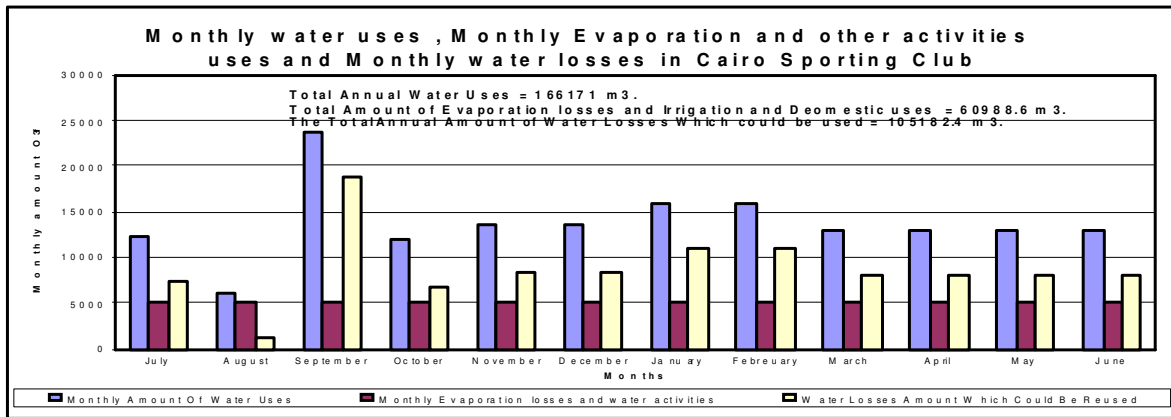


Figure 1. Monthly water uses, monthly evaporation and other activities uses, and monthly water losses in Cairo Sporting Club

RESULTS AND PROPOSED SOLUTIONS

We can use an amount of 105180 m³ per year, which is the water losses in different ways. In this work, we use the two scientific methods of solution:

First Method

To lift the amount of side swimming Pool water about 30cm by using Sakya method without energy. The Sakya could be moved by using the water kinetic energy which is flows outside the swimming pools. After this method of lifting, we could make a first treatment of water by adding chloride and then flow the water again into the swimming pole as shown in Figure 2. This method is considered as the low cost of maintenance and operation method.

Second Method

In this method, we could reserve the amount of water losses which is about 105180 m³/year at an underground reinforced concrete reservoir and reused this amount of water after treatment with chloride. This amount of water could enough for water demand in the club about 8 months.

This reservoir could be design with volume 13147 m³ and with size as follows: 55*55*4.5 = 13612 m³. With average reinforced concrete volume about 3770 m³, which cost about 1.320 million Egyptian pounds.

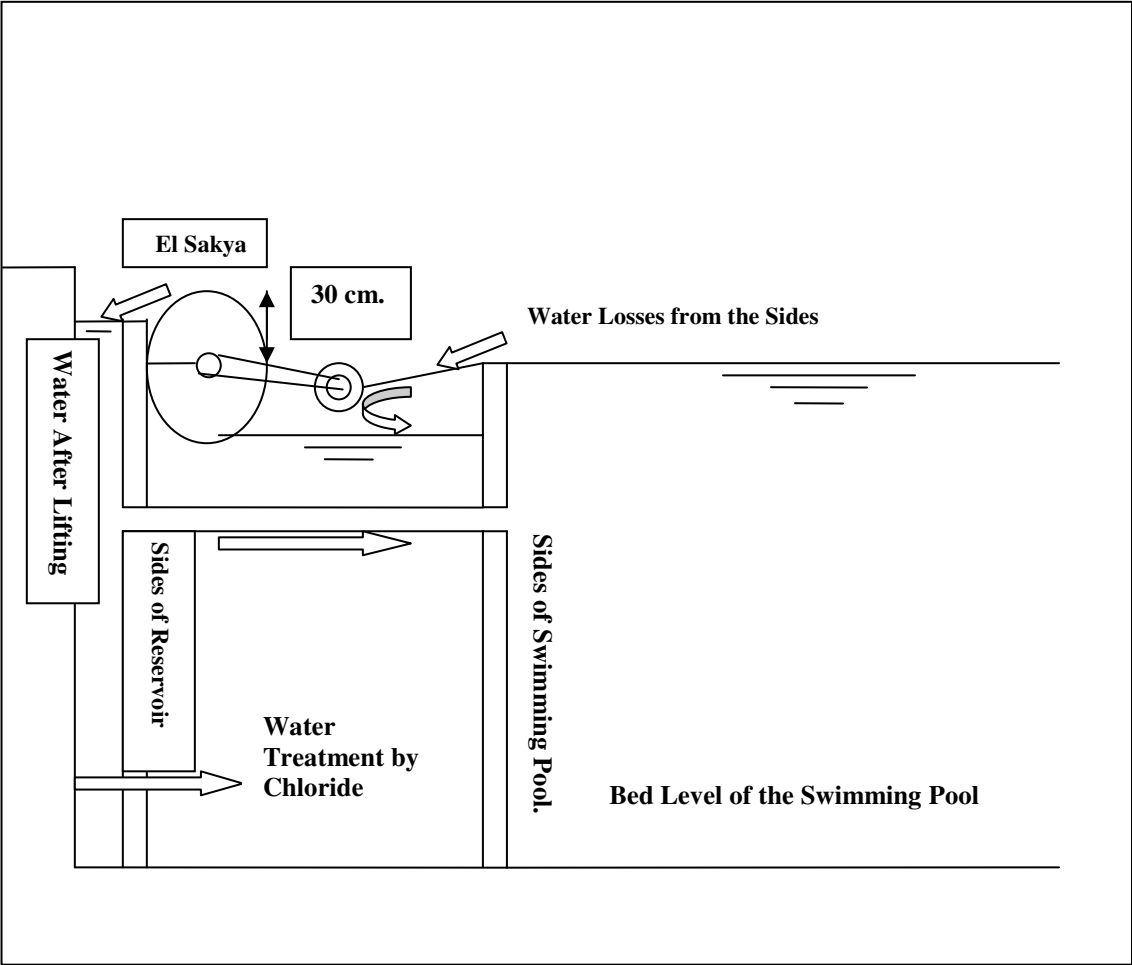


Figure 2. Lifting Process of Water Side Losses with Sakya and Reusing it in the Swimming Pool after first treatment