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SUSTAINABLE WATER USE IN BULENT ECEVIT UNIVERSITY FACULTY OF ENGINEERING

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Abstract

Water is a vital compound to sustain our lives. On the other hand, it is a scarce resource. The consumption of water has increased over recent decades. Therefore, sustainable water consumption becomes a key concern. Turkey is a water deficit country and prevention of excessive water usage is quite important. In this study, we focused on the water consumption prevention methods in Bülent Ecevit University. Three years water consumption values have been analysed in Faculty of Engineering. The effect of installing "Pedal Controlled Lavatory Faucets" on water saving were investigated. This water saving equipment was in use between May 2016 and September 2017. Water consumption valueswere calculates as 2.61, 3.47 and 2.01 m3/capita/year for 2015, 2016 and 2017 respectively. Results showed that Pedal Controlled Lavatory Faucets decreased the amount of water used in the faculty buildings.

Key words*: Bülent Ecevit University Engineering Faculty, sustainability, water consumption,water saving.*

INTRODUCTION

Water is a vital compound for humans and all living creatures. We use water to sustain our daily life such as for drinking, cleaning and cooking etc. Also, water is used in industry, in agriculture and in dairy farms (Robinson et al., 2016; Maryam and Büyükgüngör, 2017). Unfortunately, water is a scarce compound and only a few percent of global water is available as freshwater (Amr et al., 2016; Distefano and Kelly, 2017). Over the recent decades, there has been an increasing trend in water consumption as a result of many factors like increasing population of cities, effects of climate change, growing demand of water in industries, economic development and especially wrong water politics. High water consumption brings about dried lakes or rives and lowering of water table in aquifers (Udimal et al., 2017). All these results will create water scarcity; affect food security and economic development (Distefano and Kelly, 2017). Therefore, sustainable water usage becomes a key concern. The term "sustainable water use" includes security of water resources, water conservation, water reuse, water harvesting, efficient and sustainable use of water and even making purchase decisions for buying a product with a low water foot-print (Amr et al., 2016; Arfanuzzaman and Rahman, 2017; Kang et al., 2017; Maryam and Büyükgüngör, 2017).
Water-deficit country can be defined as if per capita water use is between 1000 and 3000 m3 annually (Yüksel, 2015). Today, Turkey is a water-deficit country with 1519 m3/person/year water consumption (Maryam and Büyükgüngör, 2017). In the near future (2030), depending on the population growth, water availability will drop to 1120 m3/person/year. So, it is important to use water resources efficiently and prevent excess water demands.
Universities are one of the biggest institutions with large water consumption rates. In this paper, we focused on water conservation at Engineering Faculty of Bülent Ecevit University campus. In materials and methods part, information about study area is given and pedal controlled sinks are briefly described. The volumes of water consumption before and after installation of pedal controls are given in results and discussion section. Finally, in conclusion part, this paper finishes with a few suggestions for further water conservation methods.

MATERIALS AND METHODS

Study Area

Bülent Ecevit University is in the city of Zonguldak, Turkey. Main campus is located at the latitude of 41.450829 and the longitude of 31.762459 (Figure 1). The history of university reaches till 1924, when the university was founded as the Vocational School of Mining and Mine Foremen. The former name of the university was "Zonguldak Karaelmas University" during the period of 1992 and April 2012. Today, it is a state university, which consists of 14 faculties, 3 graduate schools, 9 vocational high schools and 1 conservatory.

The Engineering Faculty is in Farabi Campus (main campus) of Bülent Ecevit University. Engineering Faculty has a building of 31316 m2 interior area. The Faculty has been offering education and training services in 30 classes, 7 computer laboratories and 38 education & research laboratories. Faculty is composed of 12 departments, which are Computer, Biomedical, Environmental, Electrical-Electronics, Geomatics, Food, Civil, Geological, Mining, Mechanical, Mechatronics and Metallurgical Engineering. There exists 160 academic and 44 administrative staff in the faculty.

Figure 1. Bülent Ecevit University Google Earth satellite image (2018)

The number of students shows an increasing trend among the years. There were 3962 student in 2015-2016 academic year and 4463 students in 2016-2017. In 2017-2018 academic year, there are 4732 students in engineering faculty.

Pedal Controlled Lavatory Faucets

At May 2016, in our university, ordinary lavatory faucets of wash basins at Electrical-Electronics, Mechanical, Mining and Civil Engineering departments were changed with pedal controlled lavatory faucets in order to save water. Water flow is controlled by pressing the pedal. When person removes his foot from pedal water flow is cut off (Figure 2). With pedal controlled system, one can use water without wasting it. The unit price of pedal was 178 Turkish Liras (TL) and 10 pedals were installed.

Figure 2. Pedal controlled lavatory faucets

RESULTS AND DISCUSSIONS

Based on the last three years, the amounts of water used are shown in Table 1. Grey shaded cells in the table indicate the period, when pedal controlled lavatory faucets were used. Faculty of Engineering used 10873, 16177 and 9921 m3 of water yearly in 2015, 2016 and 2017 respectively. As discussed in previous section, the number students at the faculty were rising. On the other hand, with the installation of these water saving devices the rate of water

usage was decreased. There was a sudden climb in water consumption at July-August period of 2016. During these months, there were a summer school at the university and a lot of students came from other universities to take summer courses. Also, during summer season, the temperature was very hot that results in more water consumption. Moreover, water used for cleaning during these months should also be taken into account. That is why; water usage had reached the highest among the last three years. Starting from September of 2016, the amount of water used had decreased despite the increasing number of students till September of 2017. At this time, the construction of new faculty building was finished and all departments except from Mining Engineering moved to the new building. New faculty building unfortunately does not have pedal controlled lavatory faucets to save water. Also, lots of water was used for cleaning of new building just before the new academic year. These explain 3092 m^3 water consumption during September-October period of 2017.

According to our data, the amount of water usage per capita shows a decreasing trend. In order to calculate per capita water consumption values, total yearly consumption is divided by total number of people (students + academic staff + administrative staff).

2015: (10873 m^3/year) / (3962+160+44) = 2.61m^3/capita/year

2016: (16177 m^3/year) / (4463+160+44) = 3.47 m^3/capita/year

2017: (9921 m^3/year) / (4732+160+44) = 2.01 m^3/capita/year

As it is seen from these values; despite the increasing number of students, there is a large decline in the amount of water consumed. Decreasing water consumption proves the success of the pedal system in terms of water saving.

Table 1. Water Consumption Values

	Water consumption (m^3)		
Bill Period	2015	2016	2017
January-February	1,390	4,032	1,203
March-April	1,683	2,745	1,572
May-June	1,552	2,840	1,562
July-August	2,533	4,125	1,037
September-October	2,374	1,425	3,092
November-December	1,341	1,010	1,455
TOTAL	10,873	16,177	9,921

CONCLUSIONS

Recently, the lack of sufficient resources, increasing water demand and rapid population growth has increased the importance of water management. Water resources management should be performed with in the effective and sustainable framework. Water saving is an integral part of this framework. This requires education starting from early ages. Water saving consciousness should be given to children from a young age and children should grow up by adopting this consciousness.

The aim of this study is calling attention to water saving by producing new projects and enhancements. As a result; by the aid of Pedal System, serious reduction is observed at usage of water. Because this system is used for trial scale, new faculty building does not have pedal controlled lavatory faucets. Installing this system in the new building in the light of examined results will be an important method to save water. Water saving equipments should be installed all of the buildings in university so that our university will be a good example for society in terms of sustainable water usage.

For sustainable water use in university campuses, rainwater harvesting on top of the buildings is another opportunity. The average annual amount of rain in Zonguldak is 1219 mm. There is a quite potential to save water in rain harvesting. Taken into consideration of the climatic conditions of Zonguldak Province, rainwater can be stored with simple arrangements which are made at the buildings. It is a great advantage for the user that the rainwater is clean, the water is not paid for, and the system recovers its own cost in a few years. The use of rainwater in toilet flushes and garden irrigation by establishing harvesting system will further reduce the amount of water used.

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SECTION 02
SUSTAINABLE DEVELOPMENT OF RURAL AREA