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Research Article

Managing water wastage, wasting time and increasing the efficiency of the filters using tube settlers

Mohsen Memarzadeh[1], Mozhgan Ahmadi Nadoushan[2*], Payam Najafi [3], Mehran Hoodaji [4]

[1] Ph.D. Student of Environmental Pollution, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran.

[2] Department of Environment, Waste and Wastewater Research Center, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran.

[3] Department of Water Engineering, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran.

[4] Department of Soil Science, Faculty of Agriculture, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran.

**Corresponding Author email:* m.ahmadi1984@gmail.com

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Extended Abstract

Introduction

The Isfahan Water Treatment Plant, with a final capacity of 12.5 cubic meters per second, is one of the largest water treatment facilities in the Middle East. It features 10 sedimentation basins with retention times ranging from 1.91 to 2.75 hours, each with a volume of 9,172 cubic meters and surface loading rates between 2.14 and 2.85 cubic meters per square meter per hour. This study aimed to evaluate the efficiency of combining sedimentation basins equipped with tube settlers in full-scale field applications to enhance water quality, reduce water loss, minimize backwashing time, and decrease maintenance requirements. The study compared two streams: Stream 1, equipped with tube settlers, and Stream 2, operating without them. The results demonstrated significant improvements in operational efficiency and resource conservation.

Materials and Method

The study was conducted at the Isfahan Water Treatment Plant, focusing on two streams within the first phase of the plant. Stream 1 was equipped with hexagonal polypropylene tube settlers with a hydraulic diameter of 50-80 mm, installed at a 60-degree angle and 90 cm in length. Stream 2 operated without tube settlers. Key parameters such as the number of backwashing cycles, water loss, and the operational hours of mechanical and electrical equipment were compared between the two streams. Data were collected over six months, and the efficiency of the tube settlers was evaluated based on water quality, backwashing frequency, and energy consumption.

Results and Discussion

The results indicated that the use of tube settlers in Stream 1 reduced the number of backwashing cycles by an average of 25% compared to Stream 2. This reduction also led to a decrease in water consumption for backwashing and a reduction in the operational hours of mechanical and electrical equipment. Specifically, the water loss in Stream 1 was 166,082 cubic meters over six months, compared to 220,185 cubic meters in

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Stream 2. The energy consumption for backwashing pumps and blowers was also significantly lower in Stream 1, with 263,424 pump operations and 35,328 blower operations annually, compared to 504,896 and 41,664, respectively, in Stream 2. These findings highlight the effectiveness of tube settlers in improving operational efficiency and reducing resource consumption.

Conclusion

The study concludes that the integration of tube settlers in sedimentation basins significantly enhances the performance of water treatment plants. By reducing the number of backwashing cycles, water loss, and energy consumption, tube settlers offer a cost-effective solution for improving water quality and operational efficiency. The findings suggest that the combined use of sedimentation basins and tube settlers should be considered in the design and operation of water treatment facilities. This approach not only improves water quality but also contributes to sustainable water management by conserving resources and reducing operational costs. Future research should explore the long-term impacts of tube settlers on water treatment processes and their applicability in different treatment plant configurations.

Keywords*:* Backwashing, Electromechanical equipment, Time wastage, Tube settlers, Water wastage