# Monitoring of the Main Operational Parameters of Aposelemis Water Treatment Plant (WTP)

**Gyparakis S.[1,*], Diamadopoulos E.[2]**

[1] Corresponding Author, Technical University of Crete

[2] Technical University of Crete

*corresponding author: e-mail: gyparis@yahoo.com

**Abstract**

The purpose of this study is to present the annual monitoring data of the main water quality operational parameters of Aposelemis Water Treatment Plant (WTP). The main quality parameters studied are: turbidity, pH, suspended solids, conductivity, manganese (Mn), coliform bacteria, Escherichia Coli and Clostridium Perfringens of the untreated and treated surface water of the Aposelemis reservoir. There is a seasonal variation in the turbidity and in the microbiological parameters of WTP incoming water. The Suspended Solids fluctuation follows the entry water turbidity fluctuation. There is no significant difference between the water entry and exit conductivity. The produced water by Aposelemis WTP is of high quality and fulfills all the legislation requirements for water intended for human consumption.

**Keywords:** turbidity, pH, suspended solids, conductivity, manganese, coliforms

## 1. Introduction

Rising population, increased industrial and agricultural water usage as well as climate changes have brought great challenges to water supply of adequate quality and quantity. Thus, nowadays the water treatment industry has placed a greater emphasis on the optimization of water treatment plants to improve capacity, quality, operational costs and capital expenditure. The monitoring of the main water quality parameters is of great importance to the Water Treatment Plants' (WTP) operators. Operation has gradually become more complex over the past few decades as new technologies have been developed and regulations have been tightened.

## 2. Methodology and Equipment

The Aposelemis WTP is located on the island of Crete and has a maximum capacity of 110,600 $m^3$/d. Its main water treatment processes are: ozonation, flocculation, sedimentation, sand filtration and chlorination. The study period covered 12 months (Jan to Dec 2017), while the water samples were analyzed in the Water Quality Control Laboratory of Aposelemis WTP according to Standard Methods for the Examination of Water and Wastewater (22nd edition, 2012).

## 3. Results

### *3.1. Physico-chemical parameters*

The average, minimum and maximum values of studied physico-chemical parameters at the entry and at the exit of the Aposelemis WTP are shown in Table 1.

**Table 1.** Physico-chemical parameters

| Parameter | AVERAGE | MIN | MAX |
|---|---|---|---|
| **Turbidity (NTU) Entry** | 5,227 | 0,625 | 16,800 |
| **Turbidity (NTU) Exit** | 0,121 | 0,014 | 0,336 |
| **pH Entry** | 7,67 | 7,06 | 8,31 |
| **pH WTP Exit** | 7,23 | 6,28 | 7,74 |
| **Suspended Solids (mg/L) Entry** | 4,32 | 0,21 | 27,22 |
| **Conductivity 20°C (μS/cm) Entry** | 387,09 | 296,00 | 443,00 |
| **Conductivity 20°C (μS/cm) Exit** | 393,21 | 330,00 | 454,00 |
| **Mn (mg/L) Entry** | 0,380 | 0,021 | 2,682 |

The water turbidity at the WTP exit is far below than the by legislation accepted limit for human consumption water (*Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption*). The Aposelemis WTP's treated water is of exceptional clarity.

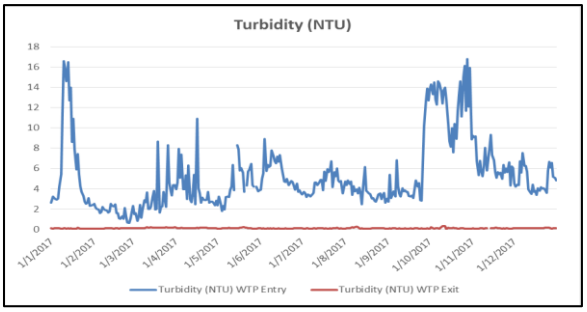


**Figure 1.** Water Turbidity at the WTP entry and exit

Water pH at the WTP exit was lower than the pH at the plant input due to the addition of the coagulant $Al_2(SO_4)_3$ (Figure 2).

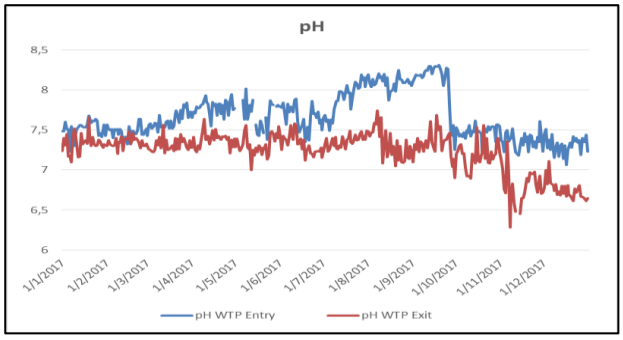


**Figure 2.** Water pH at the WTP entry and exit

The Suspended Solids fluctuation (Figure 3) follows the entry water turbidity fluctuation.

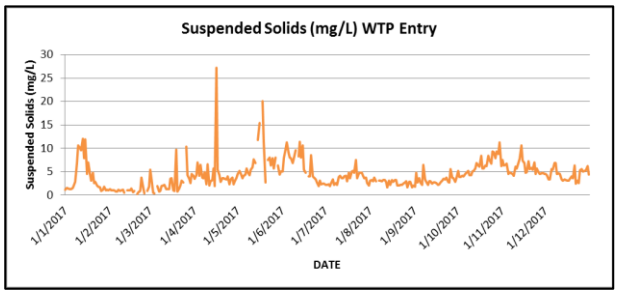


**Figure 3.** Suspended Solids at the WTP entry

There is no significant difference between the water entry and exit conductivity, as depicted in Figure 4.

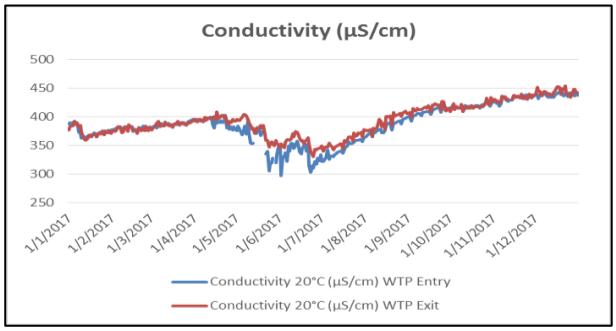


**Figure 4.** Water Conductivity at the WTP entry and exit

*3.2. Microbiological parameters*

The average, minimum and maximum values of studied microbiological parameters at the entry of the Aposelemis WTP are shown in Table 2.

**Table 2.** Microbiological parameters

| Parameter | AVERAGE | MIN | MAX |
|---|---|---|---|
| **Coliform bacteria (colonies /100 mL)** | 2566 | 5 | 37800 |
| **Escherichia coli (colonies /100 mL)** | 13 | 0 | 194 |
| **Clostridium perfringens (colonies /100 mL)** | 4 | 0 | 70 |

The fluctuation of Coliform bacteria, Escherichia Coli, Clostridium Perfringens concentration are shown in Figures 5 and 6. The concentration is zero colonies/100 mL at the exit.

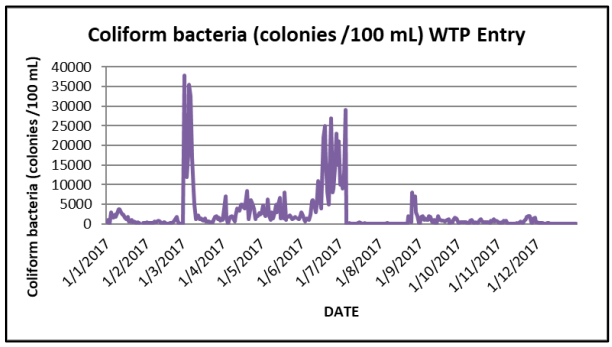


**Figure 5.** Coliform bacteria concentration at the WTP entry

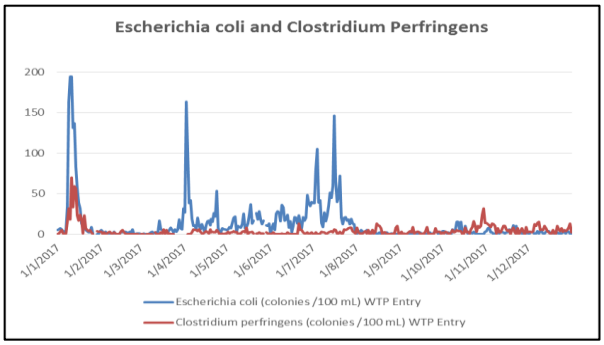


**Figure 6.** Escherichia coli and Clostridium Perfrigens at the WTP entry

## 4. Conclusions

Aposelemis WTP treated water is of exceptional clarity. There is a seasonal variation in the turbidity and in the microbiological parameters of WTP incoming water. Water pH at the WTP exit is reduced due to the addition of the coagulant $Al_2(SO_4)_3$. The Suspended Solids fluctuation follows the entry water turbidity fluctuation. There is no significant difference between the water entry and exit conductivity. The process of ozonation and chlorination manage to completely disinfect the water. The produced water by Aposelemis WTP is of high quality and fulfills all the requirements (physico-chemical and microbiological parameters) in accordance with the provisions of the Drinking Water Directive.

**References**

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