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Study of the Physicochemical Properties of the Boukerdane Dam Water in Algeria

Soumya Saidi^{1,2*}, Nour El Houda Malki^{1,2}, Sihem Arab³, Somia Hamil¹

¹Laboratory of Animal Eco-Biology, Ecole Normale Supérieure, Kouba, Algiers, Algeria

²Faculty of Biological Sciences, USTHB, Bab Ezzouar, Algiers, Algeria

³Faculty of Earth Sciences, Geography and Land Planning, USTHB, Bab Ezzouar, Algiers, Algeria

*Corresponding author's email: ssaidi@usthb.dz

ABSTRACT

In this study, we examined the relationships between key physicochemical parameters in water samples collected from the Boukerdane dam in Tipasa, Algeria. Our analysis focused on variables such as water temperature, conductivity, salinity, pH, dissolved oxygen, and total dissolved solids (TDS). Notable findings include correlations between temperature and conductivity, salinity and pH, and conductivity and TDS. These insights provide valuable guidance for optimizing energy systems and industrial processes.

Keywords: Water, physicochemical parameters, boukerdane dam, Algeria.

1 Introduction

Energy and industrial process engineering plays a crucial role in the management of natural resources and sustainable energy production. In this study, we examined the relationships between different environmental variables such as water temperature, conductivity, salinity, pH, dissolved oxygen, and total dissolved solids (TDS). The objective was to better understand these relationships in order to optimize industrial processes related to energy.

2 Experimental

The data used in this study was collected from measurements taken on water samples taken at the Boukerdane dam in Tipasa, during a period of 9 months (April - December 2023). The studied variables were quantified and measured using a multiparameter. The correlation coefficients were then calculated to evaluate the linear relationships between the different variables such as water temperature, conductivity, pH, salinity and dissolved oxygen.

3 Results and Discussion

The correlation results obtained revealed significant relationships between the studied variables. A moderate negative correlation was observed between water temperature and conductivity ($r = -0.69$), suggesting that variations in temperature may influence conductivity in the industrial context under study. Furthermore, a strong positive correlation was observed between salinity and conductivity ($r = 0.79$), emphasizing the importance of salinity in the measurement of conductivity. Furthermore, a significant positive correlation was found between water temperature and pH ($r = 0.54$). This suggests that temperature can influence the acid-base balance of water used in industrial processes, which can have consequences on the overall performance of these processes.



Table 1: Correlation table between different physicochemical parameters)

	Water Temperature	Conductivity	Salinity	pH	Dissolved Oxygen.	TDS
Water temperature	1	-0.69	-0.28	0.54	-0.11	-0.46
Conductivity	-0.69	1	0.79	-0.67	-0.57	0.87
Salinity	-0.28	0.79	1	-0.47	-0.79	0.86
pH	0.54	-0.67	-0.47	1	0.28	-0.42
Dissolved Oxygen.	-0.11	-0.57	-0.79	0.28	1	-0.71
TDS	-0.46	0.87	0.86	-0.42	-0.71	1

Moreover, a notable negative correlation was observed between salinity and pH ($r = -0.79$), suggesting that salinity can influence the pH of water used in industrial processes. This is particularly relevant in cases where controlled pH is essential for chemical reactions and treatment processes. Regarding dissolved oxygen, a significant negative correlation was observed with salinity ($r = -0.71$). This highlights the effect of salinity on the solubility of oxygen in water, which can be a critical factor for industrial processes requiring an adequate supply of oxygen. Finally, a strong positive correlation was found between conductivity and the total dissolved solids (TDS) concentration ($r = 0.87$), suggesting that conductivity can serve as a reliable indicator to estimate the concentration of dissolved solids in water within the studied context.

5 Conclusions

Overall, our findings highlight significant relationships between the environmental variables studied within the context of energy engineering and industrial processes. These results provide valuable insights for optimizing the design and management of energy systems and industrial processes. They underscore the importance of considering these relationships when planning and operating industrial facilities to ensure efficient and sustainable energy production.