Journal of Materials and Environmental Science
ISSN : 2028-2508
e-ISSN : 2737-890X
CODEN : JMESCN

J. Mater. Environ. Sci., 2022, Volume 13, Issue 11, Page 1339-1342

http://www.jmaterenvironsci.com

Recycling wastewater using a sustainable approach: A mini-review

Abdeljalil Adam [1]*, Nabil Saffaj [1], Rachid Mamouni [1]

[1] *Laboratory of Biotechnology, Materials, and Environment, Faculty of Sciences, University IBN ZOHR, Agadir, Morocco*
**Corresponding author, Email address: adam.abdeljalil@gmail.com*

Received 23 Oct 2022,
Revised 19 Nov 2022,
Accepted 21 Nov 2022

Keywords
- ✓ Environment
- ✓ Effluent,
- ✓ Renewable energy,
- ✓ Solar panels,

Adam.abdeljalil@gmail.com
Phone: +212660775429;

Abstract

In desert countries around the world especially in Morocco, industry, and agriculture utilize limited water resources. These have the ability to influence the water quality of the environment, individuals, and businesses. This work creates a complete simulation platform for the concentration of industrial waste released by industrial sites. The solar panels used to recycle industrial wastewater resembled in different storage facilities. This method is for small, off-grid implementations of renewable energy and saline effluent. Hence, desalination is undeniably one of the best effective methods for satisfying the demands of manufacturing and farming. Using saltwater greenhouses or solar stills, where evaporation is naturally reduced. Desalination that recycles wastewater, namely takes usage of moisture condensing in the atmosphere, the solar still impact, and the application of salt effluent seems to be integrated care for effluent recycling and reuse. It is feasible to construct sunlight concentration systems. This research looks at and analyzes a solar system with a parabolic reflector to concentrate radiation. The primary objective of this research is to examine the feasibility of desalinating industrial wastewater using a solar still powered by clean energy. In fact, as for the combination to work, the layout of solar stills and solar cells needs to be investigated closely.

1. Introduction

It is possible to purify industrialized effluent by injecting it into large ponds or permitting it to dry in full sunlight. These are a common approach to dealing with industrial waste water in several countries around the world [1]. Desalination has become a crucial water treatment process for the production of potable water, agricultural runoff, and industrialized water in several locations. The technique of desalination converts saline or untreated wastewater water into pure water. Different desalination processes have been developed; however, they may be broadly categorized into two categories: transmembrane processes and thermal absorption [2].

Several regions are failing to keep up with the growing demand for water. Therefore, the necessity for desalination methods and industrial effluents recycling has skyrocketed. In addition to several others, membranes filtering and distillation are the main known distillation techniques. A few have questioned their excessive energy use and detrimental environmental impacts [3].

Solar distillation appears to be the most efficient and affordable way for creating treated water [4]. Desalination considered to be the greatest effective technique for getting fresh water from saline. Nowadays, environmental contamination is one of the biggest controversial issues on a worldwide basis, and we have investigated effective techniques for reversing this trend. Industrial plants should

implement a detailed environmental approach to risk management [5] by methodically recognizing and controlling both inside and outside dangers [6].

2. Methodology

We examined the PubMed, Scopus, and Web of science databases for articles containing the keywords industrial effluent, recycling, and renewable energy. Included are special messages, reviews, books, and research projects on the topic published during the previous three years.

3. Results and Discussion

3.1 Proposed solution

Figure 1 shows a schematic of the proposed effluent distillation scheme

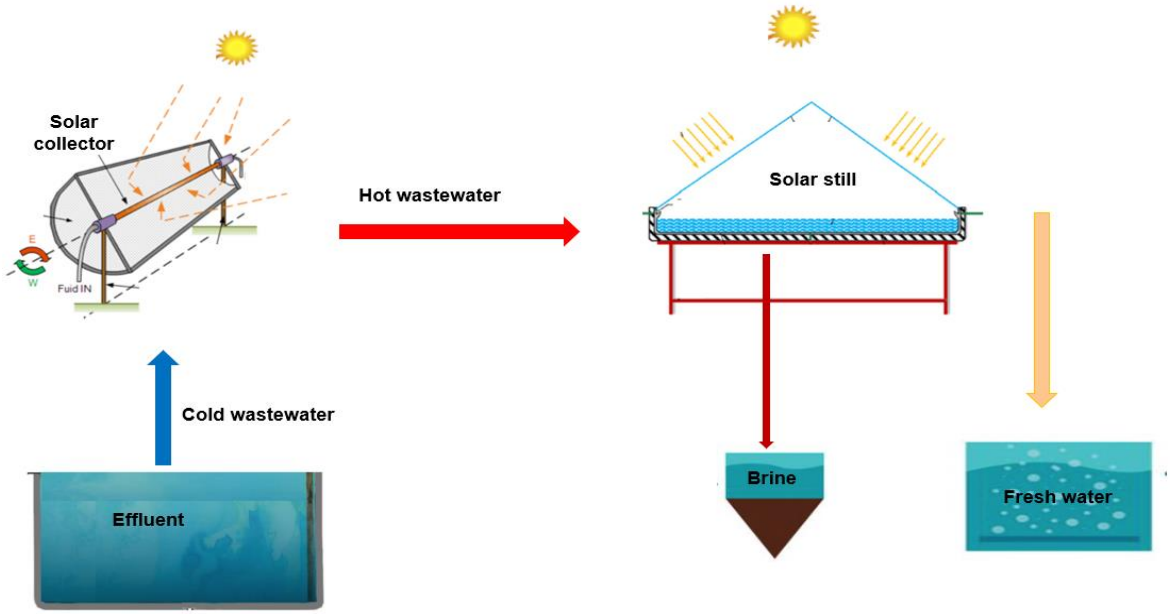

Figure 1. Proposed effluent recycling solution

3.2 Discussion & future works proposal

The approach proposed for linking a solar still with sustainable power may be utilized year-round since the solar still can be preheated by employing solar panels that rely purely on sunlight. A clear sky throughout the year suggests a condition that is favorable to this solution. It has already been determined how challenging it might be to satisfy the energy needs of the sector with renewable energies. Solar photovoltaic power and solar energy both assist in a sustainable and environmentally friendly energy source. To maximize the recycling of effluent released into water sources [7], it is advised that solar systems with reflection collectors be implemented. If the projected source of photovoltaic panels is utilized, the amount of energy required to recycle the wastewater will be decreased. Solar photovoltaic-powered solar parabolic collectors will be utilized to provide flawless sun tracking and, subsequently, continual functioning of the wastewater heating element.

Future studies may be fascinated in a technological modulation of reflection absorbers' thermal pipes. This is because the thermal tubes currently in use are designed based on the type of liquid often synthetic petroleum that is typically pumped through it. Nevertheless, the pipes studied in this review were made of glass or steel and glass, as we were examining the possibility of using effluent instead of synthetic oil. In addition to the environmentally beneficial effluent reprocessing employed mostly by solar distiller, the solar still will generate sludge as toxic waste that must be recycled via the use of

different processes. This technology, for example, will ensure waste prevention for wastewater recycling and enhance the circumstances for producing ceramic bricks from a mixture of water purification waste and conventional ceramic cement.

The climate, design, and operational parameters are the major influencing elements when comparing this review to other recent comparable studies. The production of the solar still was found to be linked to the ambient total sunlight radiation, the air temperature, and the wind speed. A smaller glass angle allows for more light transmission. Nonetheless, productivity is significantly affected by increasing initial water levels, water temperature, covers layer, the range between both the edge of the water and the condensation covering, and the use of pigments.

Future research could focus further on the design of solar stills and the design components that should be thoroughly investigated for each application, avoiding the usage of standard solar still designs. In our study interest, recycling wastewater using this solar technology, we may determine which sustainable solar still component to employ based on wastewater Physico-chemical analysis [8].

3.3 Economical discussion

The possibility of making solar stills completely out of inexpensive, environmentally friendly materials is advantageous for the ecology. A significant amount of research has been done on the challenges of providing power plants only with the electricity they require. Illustrative steps of renewable, green technology are wind and solar energy. In order to determine whether wind or renewable power may be used to power solar still systems. We located and investigated five productive rural locations [9]. They suggested that wind and solar electricity may be used to power saline solar stills since it is a reliable and sustainable form of energy production.

The small electrical requirements of ventilators and pumps can generally be met without the use of capacitors or converters, although studies indicate that solar panels might eventually be used in place of these devices. By doing this, folks who live off the grid will be able to lessen its carbon emissions whilst also having safe drinking water on hand. To address the needs of future generations, focused solar power plants may be built in just 1% of the nation's lands. Such techniques have a significant economic opportunity for recovering forests and supplying essentials like food, drinking, and electricity. The climate bearing this "lost" liquid might be pushed to raise and chill, providing much more water to the fog or cloud.

When comparing to working at a consistent rate, there is indeed a 40% energy efficiency. Comparing the net current value of the multiple components across a 10-year amortization period demonstrates that solar control-based solutions are more cost-effective under all pricing and purchase price suppositions (with and without a carbon tax to represent environmental costs). Consequently, solar component manufacturers may increase the accessibility of energy efficiency and saving designs by incorporating similar technologies into their line of products.

Conclusion

The most significant component of this survey's assessment is the notion of merging solar still technology innovation with reflector receivers to improve the usage of renewable energy to recycle and reuse wastewater released into superficial water and therefore to avoid environmental contamination.

Continued studies could be particularly interesting in the thermal pipe modulation of reflecting absorbers. This is so since the thermal tubes now in use are built to withstand the form of fluid that is commonly pushed through them, which is frequently synthetic petroleum. Moreover, because we were

looking at the prospect of using effluent rather than synthetic oil, the tubes examined in this research were built of glass or steel.

Considering that the continual exhaustion of natural resources, particularly water, and the degradation of their quality continue to be the century's top issues, the recommended technology would assist companies in recycling wastewater at a low cost and contribute to environmental conservation.

Acknowledgement

The authors would like to express their appreciation to the editors and the reviewers who provided informative and useful criticism on an earlier draught of this paper.

References

[1] A. Abdeljalil, S. Nabil, M. Rachid, Feasibility and sustainability of evaporation ponds as final basins for industrial wastewater: statistical evaluation of gross parameters, *Desalination and Water Treatment.* 257 (2022) 41–54.

[2] A. Giwa, N. Akther, A.A. Housani, S. Haris, S.W. Hasan, Recent advances in humidification dehumidification (HDH) desalination processes: Improved designs and productivity, *Renewable and Sustainable Energy Reviews.* 57 (2016) 929–944.

[3] O. Jaramillo, E. Venegas-Reyes, J. Aguilar, R. Castrejón-García, F. Sosa-Montemayor, Parabolic trough concentrators for low enthalpy processes, *Renewable Energy*. 60 (2013) 529–539.

[4] R. Sathyamurthy, S.A .El-Agouz, P.K. Nagarajan, J. Subramani ,T. Arunkumar, D. Mageshbabu, B. Madhu, R. Bharathwaaj, N. Prakash, A Review of Integrating Solar Collectors into Solar Stills *Renewable and Sustainable Energy Reviews*. 77 (2017) 1069–1097.

[5] A. Abdeljalil, S. Nabil, M. Rachid, Contribution to developing a new environmental risk management methodology for industrial sites, *Journal of Applied and Natural Science*. 14 (2022) 9 - 16.

[6] X. Zuo, K. Chang, J. Zhao, Z. Xie, H. Tang, B. Li, Z. Chang, Bubble-template-assisted synthesis of hollow fullerene-like MoS2 nanocages as a lithium-ion battery anode material, *Journal of Materials Chemistry A.* 4 (2016) 51–58.

[7] A. Adam, N. Saffaj, R. Mamouni, M. Baih, Characterization of industrial wastewater physico-chemical properties, *International Journal on Technical and Physical Problems of Engineering*, 14(2022) 219–227.

[8] A. A. Chokor, Metals'Content and Physicochemical characteristics of Well Waters in Sapele Metropolis, South-Southern Nigeria, *Journal of Materials and Environmental Science*, 12 (2021) 295-307

[9] A. Adam, N. Saffaj, R. Mamouni, Incorporating a viable Renewable-energy System towards Industrial Effluent Treatment & Reuse: A Short Review, *British Journal of Environmental Studies*. 2 (2022) 20–23. https://doi.org/10.32996/bjes.2022.2.2.4