Journal of Sustainability Perspectives

journal homepage: https://ejournal2.undip.ac.id/index.php/jsp/

A Best Practice of Water Management at Mahidol University, Salaya Campus, Thailand

Kitikorn Charmondusit[1,], Sasivimon Pungpermtrakul[2], Banchong Mahisavariya[3]*

[1]Faculty of Environment and Resource Studies, Mahidol University, 999 Phuttamonthon 4Rd. Salaya Phuttamonthon Nakorn Pathom 73170, Thailand.

[2]Devision of Physical and Environment, Mahidol University, 999 Phuttamonthon 4Rd. Salaya Phuttamonthon Nakorn Pathom 73170, Thailand.

[3]Office of the President, Mahidol University, 999 Phuttamonthon 4Rd. Salaya Phuttamonthon Nakorn Pathom 73170, Thailand.

*corresponding author: kitikorn.cha@mahidol.ac.th

Article Info

Received:
15 March 2021
Accepted:
25 May 2021
Published:
1 August 2021

DOI:

Presented in The 6th International (Virtual) Workshop on UI GreenMetric World University Rankings (IWGM 2020)

Abstract Mahidol University is one of the most environmentally friendly university in Thailand. The eco-university policy for sustainable development on campus and in the surrounding community has been implemented in order to balance of economic, social and environmental dimensions which will lead to efficient use of resources, social equality and improved quality of life of staff, students and the surrounding community. Water management of MU, Salaya campus is one of the successful case studies. Approximately 60% of the 1,867,792 square meters of campus was allocated for the green and water reservation areas including horizontal garden, vertical garden, botanic garden, original wetland, ditch and pond. The RINGLOOP project was installed in order to improve the performance of water distribution. The central wastewater treatment plant with activated sludge system has been constructed. The water conservation program with 100% of treated wastewater recyclable is implemented.

Keyword:

Mahidol University, water management, water reservation, wastewater, recycle

1. Introduction

Higher Education is an important sector for promoting sustainable development to society [1, 2]. Implementation of sustainability concept, such as improved environmental performance, enhanced public awareness, cost reduction on campus maintenance, and resources efficiency, to university campus is now widely focused. To create a campus sustainability, integrating of sustainability in educational, research, operational, staff and student behaviors need to be addressed [3].

Mahidol University (MU) has since developed into one of the most prestigious universities in Thailand, internationally known and recognized for the high caliber of

research and teaching. MU has the main campus located in Nakorn Pathom province, where is around 15 kilometers west from Bangkok. MU is organized into 17 faculties (responsible for both research and teaching), 7 institutes (mainly focusing on research), 6 colleges (mainly focusing on teaching) and 9 centers (mainly providing academic services). MU has approximately 24,000 students, of whom some 15,500 are undergraduate students and some 8,300 are postgraduate students. It also has a total of 3,000 academic staff responsible for teaching and research, as well as some 6,500 academic assistants, 5,900 administrative staff, and 8,700 other employees (including hospital employees).

MU has been concerned on sustainability issue. In year 2015, the eco-university policy has been implemented, which consists of 3 strategies including resource efficiency, low carbon technology and innovation, and community engagement. The main 6 indicators, such as material, energy, waste, water, building, and greenhouse gases emission, were implemented to all faculties, colleges, and institutes in order to monitor the progress of eco-university policy. Water management is an important issue for MU. Therefore, the environmental management system standard ISO 14001:2015 has been implemented and successfully accredited in year 2019. This paper presents a best practice of water management at MU, which could be served as a model for sustainable campus.

2. Water Management of MU

Water consumption of MU is mainly supplied by the Provincial Waterworks Authority of Thailand. Water is provided to all working unit in MU such as faculty buildings, student dormitories, research institutes, laboratory, food court, etc. Approximately 60% of the 1,867,792 square meters of campus was allocated for the green and water reservation areas including horizontal garden, vertical garden, botanic garden, original wetland, ditch and pond. The amount of water consumption in year 2018 is 1,001.2 million liters, which slightly decreased from year 2017 (see Fig. 1).

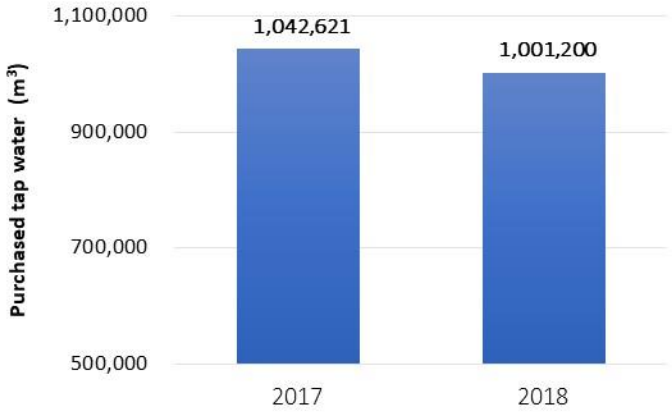

Figure 1. The comparison of water consumption in year 2017 and 2018.

In 1981, the oxidation pond system was constructed in Salaya campus. Without appropriate maintenance, some parts of the system were found as broken. A survey indicated that discharges released to rainwater canals in the University and public channels deteriorated the surrounding water quality. Therefore, the new central treatment system was designed and operated in 2014 to additionally treat 6,000 m3 wastewater per day. Activated sludge system was installed to improve the water quality as well as providing water with acceptable quality for irrigation in the University. After this project was

operated, the water quality of discharges was monitored and analyzed. 8 parameters including pH, bio-oxygen demand (BOD), suspended solids (SS), total dissolved solid (TDS), sulfide, total Kjeldahl nitrogen (TKN), oil and grease, and settleable solids of wastewater before and after treatment are monitored. Fig. 2-9 illustrates the quality of wastewater before and after treatment during January 2019-May 2020 from the central wastewater treatment plant at MU salaya campus. It can be seen that the wastewater effluent is treated in compliance with national and local standards [4].

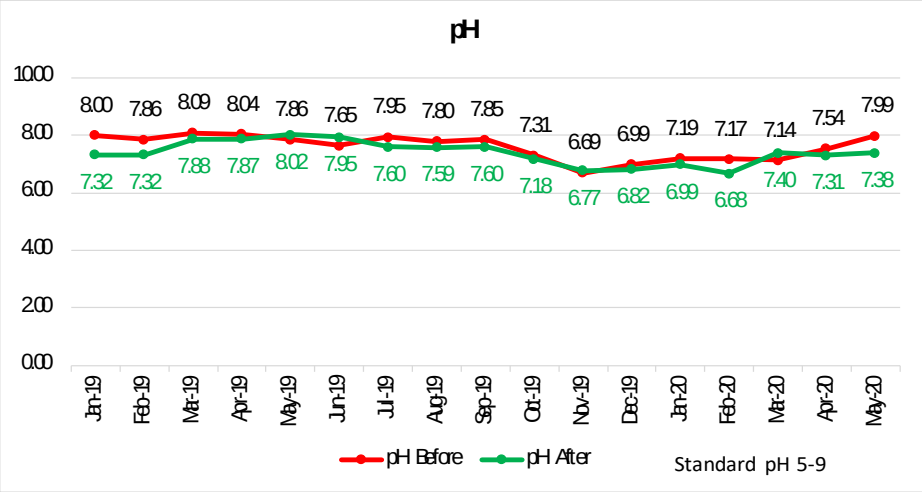

Figure 2. pH of wastewater before and after treatment

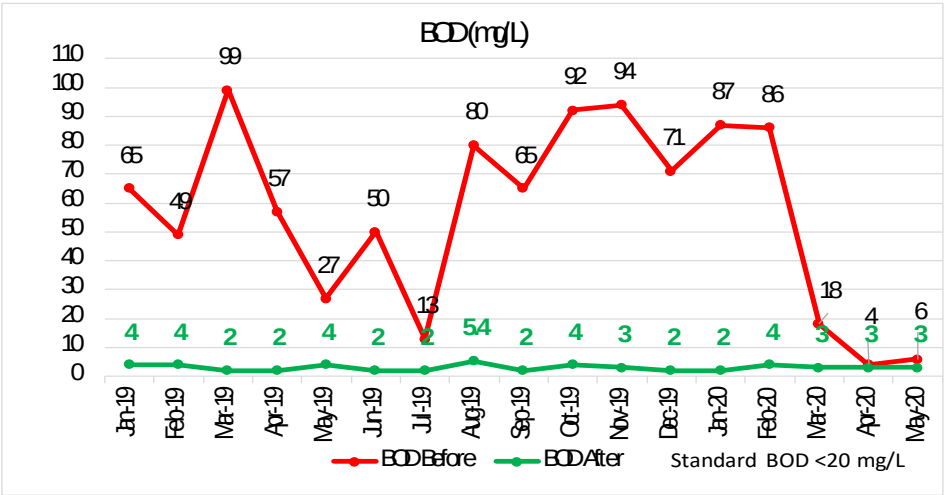

Figure 3. BOD of wastewater before and after treatment.

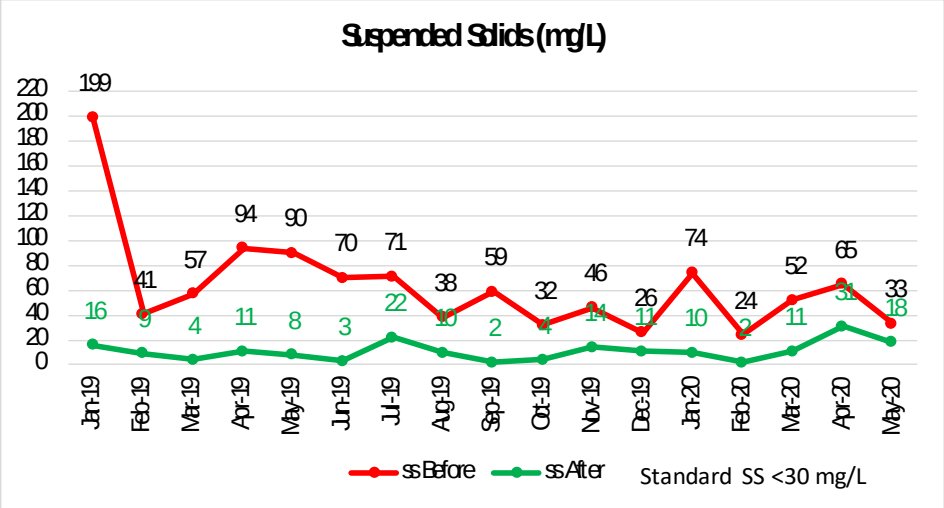

Figure 4. SS of wastewater before and after treatment.

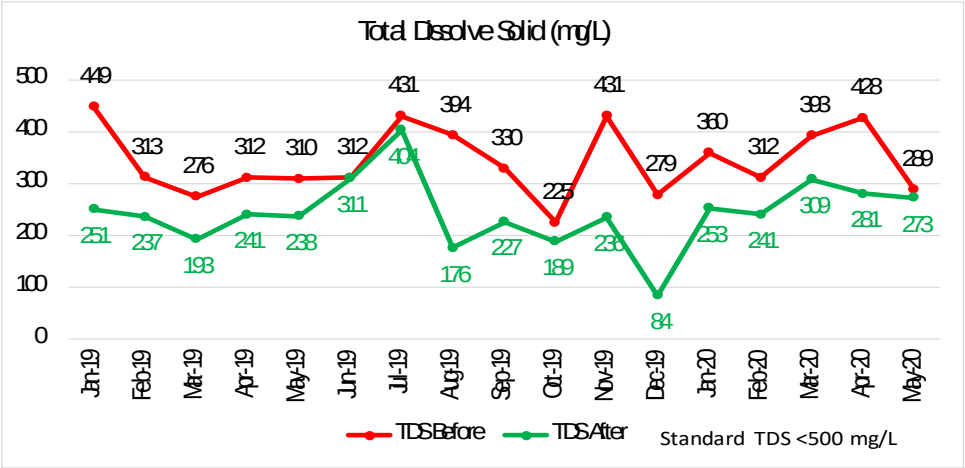

Figure 5. TDS of wastewater before and after treatment.

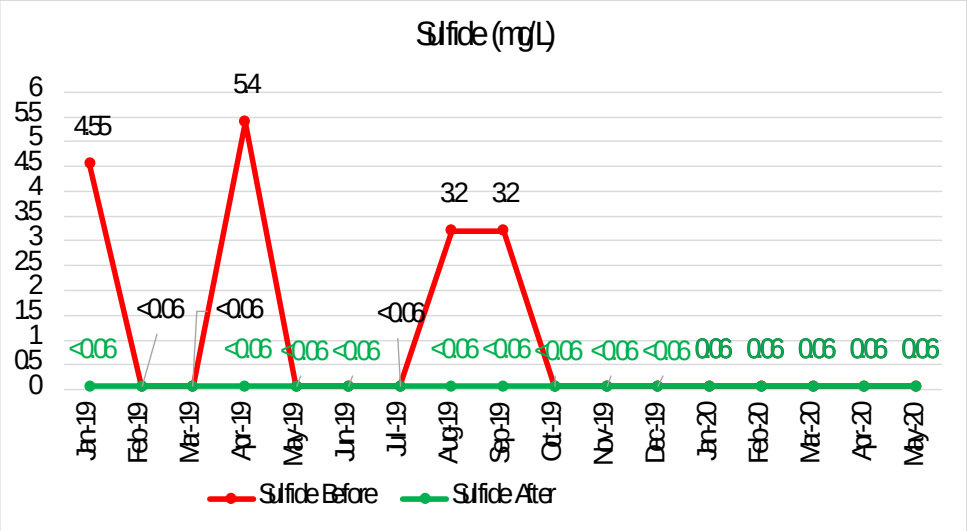

Figure 6. Sulfide of wastewater before and after treatment.

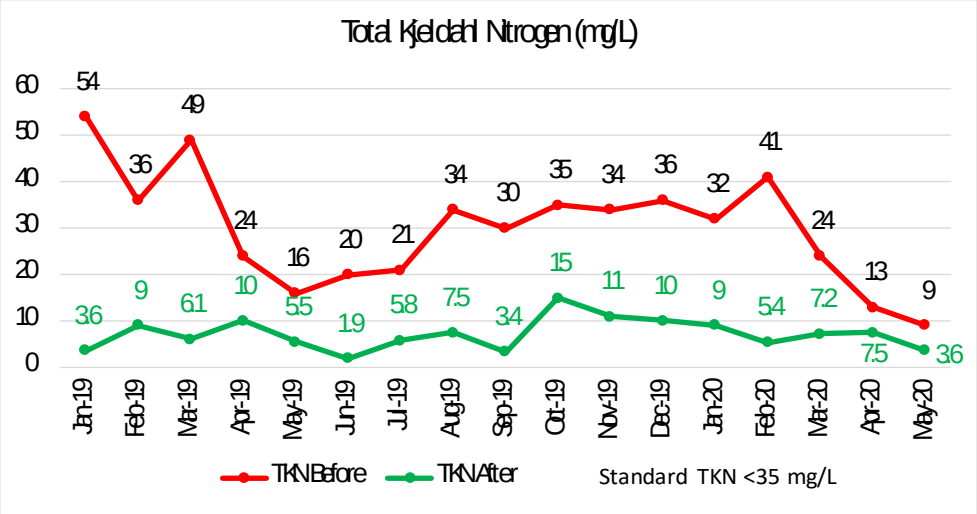

Figure 7. TKN of wastewater before and after treatment.

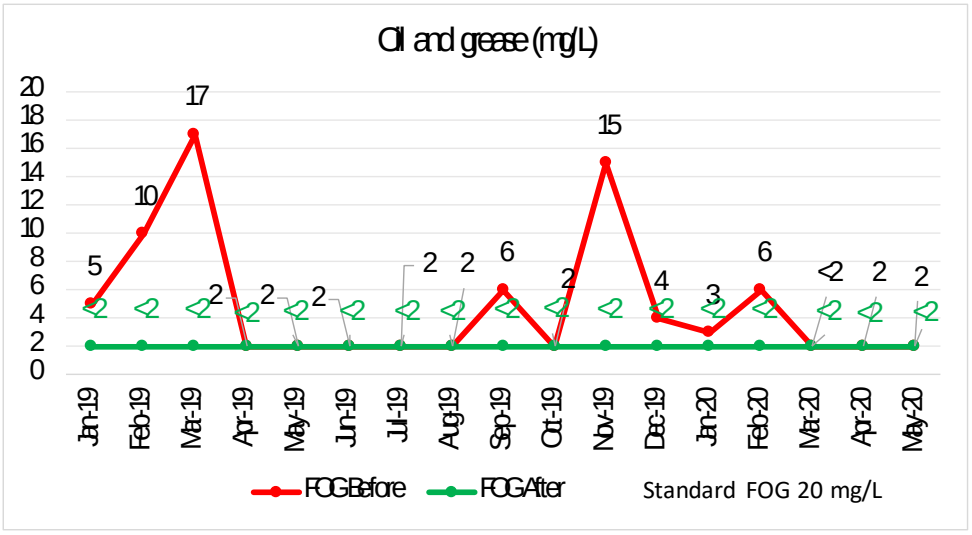

Figure 8. Oil and grease of wastewater before and after treatment.

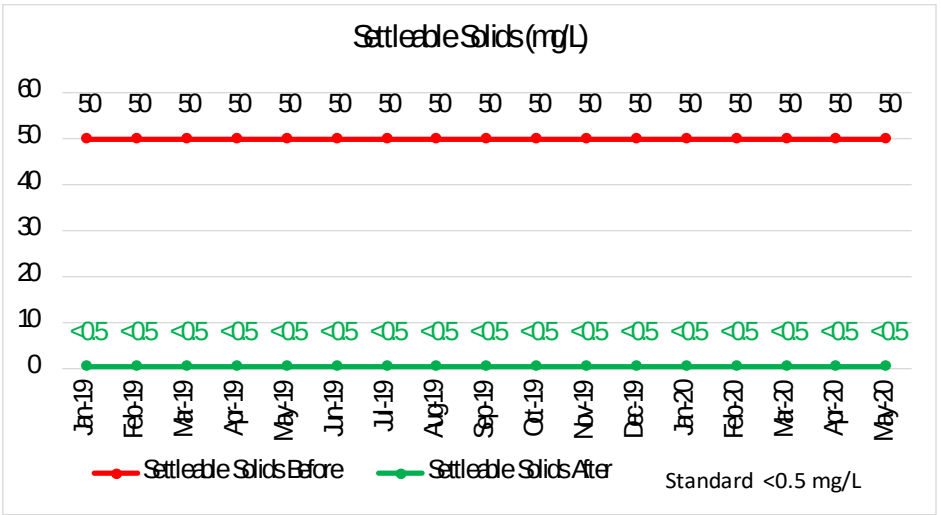

Figure 9. Settleable solids of wastewater before and after treatment.

Through development of infrastructure system in the University, more buildings were constructed for supporting the educational and provisional services. Increasing population and buildings existing in the University led to more requirement of energy and water resources. Due to water demand increase in the University, the RING LOOP construction project was initiated in Salaya campus to improve the performance of water distribution for 19 zone areas. The RING LOOP system operates by 6 directional valve ponds and pipes system. This system improves efficiency of water management especially rainwater collection and wastewater treatment system for water reuse. Dredging of the 7-kilometer canal and ponds in the University play a role as carrying large amount of precipitation and treated discharges. Furthermore, the dredging removes the accumulated sediment and organic matter. After this project, carrying capacity and flow rate of water in the system will be improved. This water harvesting system is also expected to be available in the dry season.

MU has supported work units to save water resource as well as reuse and recycle for reducing water consumption. In 2018, the University continued offering many campaigns and supplementing resources for water conservation. The recycle wastewater system has been installed as shown in Fig. 10. The main recycle water pipelines were constructed in order to feed all recycle water to buildings. the carwash self-service station by using reused water for clean up and other water conversation programs were implemented.

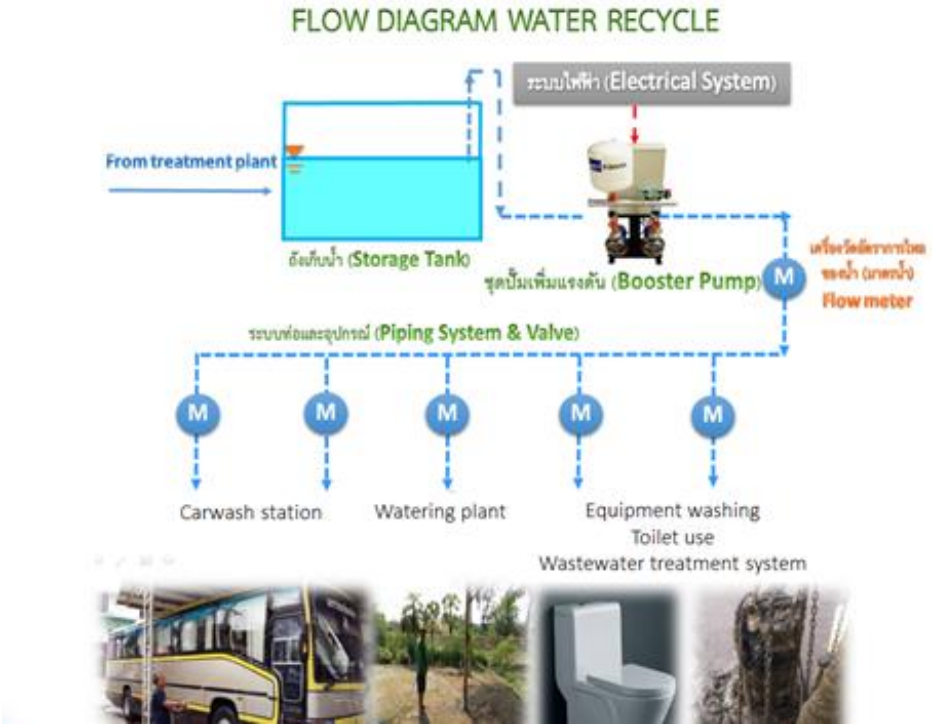

Figure 10. The recycle wastewater system

3. Conclusion

MU recognizes that the awareness on environmental conservation and sustainability are important. The university attempts to provide a favorable environment for learning and having physical structure which is in harmony with society and environment. Best practice of water management at MU illustrates the whole system of water conservation and water efficient programs, which can lead to a sustainable water resource consumption in campus.

References

1. Ramos, T.B., Caeiro,, S., Hoof, B.V., Lozano, R., Huisingh, D., Ceulemans, K., 2015. Experience from the Implementation of Sustainable Development in Higher Education Institutions: Environmental Management for Sustainable Universities. J. of Cleaner Production, Volume 106, pp. 3-10.
2. Holm, T., Vuorisalo, T., Sammalisto, K., 2015. Integrated Management Systems for Enhancing Education for Sustainable Development in Universities: A Memetic Approach, J. of Cleaner Production, Volume 106, pp. 155-163
3. United Nations Educational, Scientific and Cultural Organization (UNESCO), 2020. Higher Education and Sustainable Development Goals. Available online at https://en.unesco.org/themes /higher-education/sdgs.
4. Pollution Control Department, 2020. Effluent Standard of Thailand. Available online at https://pcd.go.th (in Thai).