Sustainable wastewater treatment plants

- course content (for teacher)

Learning Competences

Student will learn:

- a conventional point of view on operation and purposes of wastewater treatment facilities;
- new vision on wastewater treatment plant as Water Resourse Facroties (WRF);
- real cases of resource recovery successfully implemented worldwide;
- necessity and possibilities of resource recovery for purpose of sustainable development.

Study materials:

Study materials are composed from online open access sources (text and video), presentations, and supervisors' instructions.

1. G. Lofrano and J. Brown, "Wastewater management through the ages: A history of mankind," Sci. Total Environ., vol. 408, no. 22, pp. 5254 – 5264, 2010, doi: https://doi.org/10.1016/j.scitotenv.2010.07.062. https://www.researchgate.net/publication/46148626_Wastewater_Management_through_the_Ages_A_History_of_Mankind
2. Magagna D. et al. Water – Energy Nexus in Europe, Publications Office of the European Union, Luxembourg, 2019, ISBN 978-92-76-03385-1, doi: 10.2760/968197, JRC115853. https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technicalresearch-reports/water-energy-nexus-europe
3. J. M. Lema and S. Suarez, Eds., Innovative Wastewater Treatment &Resource Recovery Technologies: Impacts on Energy, Economy and Environment. IWA Publishing, 2017.
4. L. Egle, H. Rechberger, J. Krampe, and M. Zessner, "Phosphorus recovery from municipal wastewater: An integrated comparative technological, environmental and economic assessment of P recovery technologies," Sci. Total Environ., vol. 571, pp. 522–542, 2016, doi: 10.1016/j.scitotenv.2016.07.019. https://www.sciencedirect.com/science/article/pii/S0048969716314656
5. P. Kehrein, M. van Loosdrecht, P. Osseweijer, M. Garfí, J. Dewulf, and J. Posada, "A critical review of resource recovery from municipal wastewater treatment plants – market supply potentials, technologies and bottlenecks," Env. Sci Water Res Technol, 2020, doi: 10.1039/C9EW00905A. https://pubs.rsc.org/en/content/articlelanding/2020/ew/c9ew00905a#!divAbstract

Course content

Student will be using various online sources of information (presentation, text, and video) to get familiar with the subject. Learning evaluation is done through online assignments. The background knowledge on wastewater treatment facilities, regardless of their importance or purpose for which they are constructed, will be given as open-source lectures in order to prepare the student to an independent work. Presentation addressed to resource reclamation and recovery technologies and their real applications municipal water treatment sector will be allocated for independent study hours. After studying this nugget the student will be acquainted with a history of wastewater treatment actions,

Author: Pia Haapea (LAB-University of Applied Sciences)

potential resources to be recovered from wastewater treatment plant (WWTP), drivers for reconstruction of WWTP to Water Resourse Facroties (WRF), and real cases of resource recovery successfully implemented worldwide.
Course assignments will include learning about real cases of water and nutrient recovery and reuse. Students will be following up modern vision on wastewater treatment based on waste-to-value and circular economy concepts in accordance with principles of sustainable development.

Assignments

Assignment 1.

Water reclamation and reuse (grading summary, assessment is qualitative, 1-5)

Prepare the presentation about one of the successful cases of water reclamation:

- Torreele facility https://youtu.be/fAnpZb30ecA
  http://www.demoware.eu/en/demo-sites/torreele
- Catalan Water Agency
  https://www.researchgate.net/publication/5492393_The_water_reclamation_and_reuse_project_of_El_Prat_de_Llobregat_Barcelona_Spain
- Windhoek, Namibia https://www.sciencedirect.com/science/article/abs/pii/0273122396004039
- Singapore, NEWater project https://www.pub.gov.sg/watersupply/singaporewaterstory
- Tokyo's Shinjuku district https://www.gesui.metro.tokyo.lg.jp/business/pdf/6-3_2008.pdf

Describe the needs and drivers of the selected project, why the implementation became possible, and what benefits were gained.

Overall instructions for assignments

- You can also use other information sources. The references list is mandatory.
- The Assignment should be in the form of MS word report and Power Point presentation.

The evaluation criteria are:

- Quality of the presentation and material
- Clearness and logic of the report
- The new and innovative conclusions for the subject

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