Characterization and Management of the Solid and Hazardous Wastes from Manufacturing Industry

Guray Salihoglu, Ph.D.

Professor, Faculty of Engineering, Dept. of Environmental Engineering, Bursa Uludag Univ., Bursa 16130, Turkey. Email: gurays@uludag.edu.tr

https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000439

The special collection on Characterization and Management of the Solid and Hazardous Wastes from Manufacturing Industry is available in the ASCE Library (https://ascelibrary.org/page/jhtrbp/hazardous_waste_manufacturing_industry).

Manufacturing industry refers to those industries involved in fabrication, processing, or preparation of products from raw materials and commodities. Raw materials or commodities such as foods, chemicals, textiles, machines, wood, or refined minerals derived from extracted ores can be inputs for the manufacturing industry, which has a significant share in the industrial sector.

Turning raw materials into consumer products or intermediate products to be used in the production process results in the generation of all types of wastes. Depending on the nature of the raw material used, the technology used in the manufacturing process, and the environmental vision of the industrialists, waste types and waste amounts show a considerable variation.

The waste produced by the industrial activity includes any material that is rendered useless during the manufacturing process and very often ends up in the hazardous category. Examples include chemical solvents, wastewater treatment plant sludge, metal chippings, ash, paint sludge, wastewater, refinery sludge, and so on. Once generated, it is necessary to treat this waste according to waste management hierarchy, remembering to search for ways to prevent its formation first. Management of hazardous and nonhazardous waste from the manufacturing industry conscientiously while staying fully compliant will be required to minimize the risk to humans and the environment, to save resources, and to reduce the cost of management.

The main focus of this special collection is the management of wastes from the manufacturing industry, which covers life-cycle assessment (LCA), recycling and recovery, treatment, and disposal stages. The papers report on wastes from different types of industries, such as steel foundry, automotive industry, and fruit juice industry, as well as on environmental pollution resulting from toxic and nontoxic discharges from industries. The papers will be beneficial to both practitioners and researchers in the industrial waste management field.

The special collection opens with the paper by Özdemir et al. (2018), which presents the LCA technique for assessing the potential environmental aspects associated with steel rebar production with induction melting furnace. It is essential to be aware of all the process steps to make correct decisions on the management of the wastes that arise. The LCA technique can assist industrialists to identify the hot points to prioritize during the environmental management of the manufacturing process. Since the waste management hierarchy introduces the prevention step as the priority, LCA would help the accomplishment of this step first.

Characterization of waste is detrimental in its management. One of the papers in the special collection presents an example of this fact. Bolat et al. (2018) investigated the hazard potential of oil industry wastes and products for better management. The authors conclude that waste oil and oily waste samples should be recycled as raw materials and recovered as an energy source, and the hazardous nature due to high metal (Cr) content should be taken into account. The authors also stressed that uncontrolled combustion of waste oil and oily wastes might cause environmental problems. The paper by Bolat et al. (2018) underlines the importance of characterization before management with the associated findings.

Treatment of wastewaters, recycling, and recovery of the wastes are the next steps after waste minimization. One of the papers focuses on the treatment of boron-polluted waters. Güven et al. (2018) investigated the electrocoagulation process to treat the surface water collected from a mine site that carries high concentrations of boron. The paper by Güven et al. (2018) shows a possible level of pollution by mining activities and is an example of the possible treatment methods that could be applied when water is polluted by boron mining.

One of the papers of the collection presents an example of recycling of solid waste from mining activities. Salihoglu and Salihoglu (2018) investigated the recycling potential of marble sludge, which is generated from the cutting and grinding of marble. The authors applied geopolymerization technology to this aim. This paper shows that it is possible to recycle a solid waste such as marble sludge into a construction material.

There is a growing interest in industrial waste as a source of energy or fuel. The paper by Eleren et al. (2018) in the collection presents the theoretical biofuel potential of the waste generated during the production activities in the food industry (fruit juice). The authors underline the possibility of bioethanol production from fruit and vegetable wastes, and this management approach would result in a reduction of the burden on wastewater treatment plants of the food industry.

Waste-to-energy (WTE) plants receive several types of manufacturing wastes as refuse-derived fuel (RDF) that has high calorific value. However, a pretreatment step such as drying may be necessary before sending the moisture-containing waste to WTE plants. Yenikaya et al. (2018) analyzed the microwave drying process of water-based paint sludge from the automotive industry by investigating several influencing factors. Mekonnen et al. (2018) investigated the effect of the geometry, properties, and position of the sludge material load inside the oven on the microwave heating efficiency and electric field distribution.

References

Bolat, D., E. Can-Guven, K. Gedik, and P. B. Kurt-Karakus. 2018. "Investigation of hazard potential of oil industry wastes and products for better management practices." *J. Hazard. Toxic Radioact. Waste* 22 (4): 04018029. https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000419.

Eleren, S.Ç., Ş. Ö. Altınçekiç, and E. Altınçekiç. 2018. "Biofuel potential of fruit juice industry waste." *J. Hazard. Toxic Radioact. Waste* 22 (4): 05018002. https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000405.

Güven, E. D., E. Güler, G. Akinci, and A. Bölükbaş. 2018. "Influencing factors in the removal of high concentrations of boron by electrocoagulation." *J. Hazard. Toxic Radioact. Waste* 22 (2): 0401701. https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000389.

Mekonnen, S. A., S. Yenikaya, and G. Yenikaya. 2018. "Numerical and experimental analysis of the heating performance of a microwave applicator loaded with sludge material." *J. Hazard. Toxic Radioact. Waste* 22 (4): 04018017. https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000413.

Özdemir, A., Z. Günkaya, A. Özkan, O. Ersen, M. Bilgiç, and M. Banar. 2018. "Lifecycle assessment of steel rebar production with induction melting furnace: Case study in Turkey." *J. Hazard. Toxic Radioact. Waste* 22 (2): 04017027. https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000385.

Salihoglu, N. K., and G. Salihoglu. 2018. "Marble sludge recycling by using geopolymerization technology." *J. Hazard. Toxic Radioact. Waste* 22 (4): 04018019. https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000415.

Yenikaya, S., G. Salihoglu, N. K. Salihoglu, and G. Yenikaya. 2018. "Microwave drying of automotive industry paint sludge." *J. Hazard. Toxic Radioact. Waste* 22 (4): 04018015. https://doi.org/10.1061/(ASCE)HZ.2153-5515.0000407.