Analysis of real-scale experiences of novel sewage sludge treatments in an Italian pilot region

Marco Ragazzi*, Elena Cristina Rada, Roberta Ferrentino

Civil, Environmental and Mechanical Engineering Department, University of Trento, Via Mesiano 77, I-38123 Trento, Italy,
Tel. +39 0461 282609; Fax: +39 0461 282672; email: marco.ragazzi@unitn.it (M. Ragazzi), Tel. +39 0461 282613;
Fax: +39 0461 282672; email: elena.rada@unitn.it (E.C. Rada), Tel. +39 0461 282669; Fax: +39 0461 282672;
email: ferrentino roberta@gmail.com (R. Ferrentino)

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ABSTRACT

Four case studies, related to real-scale novel solutions for sewage sludge management are presented. The described experiences concern an Italian region Trentino Alto Adige (TAA). In Italy, few years ago, solutions as landfilling of thermally dried sludge, composting and direct application on land were considered viable options. Today the sector is going quickly towards a crisis, as sludge is no longer accepted for landfilling (because of its biodegradability) and its direct or indirect application on land is more and more restricted in some regions. As a consequence of this situation, in Italy alternative options are studied, and TAA can be considered a pilot region thanks to the presence of multiple interesting case studies. Sludge minimization is widely studied, but in real scale the first Italian plant was constructed in TAA only recently: this plant is based on the principles of solid separation and biological cannibalization of the biomass. The target is the reduction of 50% of the solid load of sludge. The strategy of minimization has been adopted in an activated sludge plant already existing. The wet-oxidation option has been adopted in a civil wastewater treatment plant in TAA. This solution is generally adopted for industrial sludge but the high cost for the management of sewage sludge in TAA made it a viable option too. Pyrolysis of sewage sludge is performed in one real-scale plant in TAA. The pyrolysis gas is combusted and the generated gases are cooled to the operating temperature of the downstream fabric filter. The combustion heat is first used to increase the temperature of the special thermal oil adopted in a sewage sludge thermal drier; then it is used to heat process water for preheating the air of the sewage sludge thermal drier. Concerning the co-combustion of thermally dried sludge in cement works, the real-scale experience that is under discussion in TAA concerns the partial substitution of pet coke in a plant where a SCR (Selective Catalytic Reduction) system is already adopted. SCR in the off-gas treatment line of cement works is not common in Italy. A novelty of this case study concerns the planned adoption of an experimental low-cost system of NO2 monitoring at the ground level in the territory as an alert system. In the present paper, the four TAA case studies are analyzed and compared.

Keywords: Co-combustion; Minimization; Pyrolysis; Sewage sludge; Wet oxidation

*Corresponding author.

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