Editorial

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The three articles in this issue of the *Waste and Resource Management* journal deal with different aspects of the circular economy as it affects different industries in the construction sector: the manufacture of steel products showing the potential for energy recovery in an integrated steelworks, the use of residue from paper pulp manufacture in plaster products and the potential of artificial intelligence to estimate construction waste. Each paper has already been available on the Institution of Civil Engineers' Virtual Library homepage, where every paper that has been successfully peer-reviewed appears before publication in the journal.

The article by Giles *et al.* (2021) is a comprehensive and clear exposition of the benefits of waste heat recovery (WHR) in a large integrated steelworks, using the example of the series of changes made in the Tata steelworks, formerly British Steel, in Port Talbot, UK. The article examines the decisions that led to the introduction of a heat network, eventually connecting all the operating modules in the plant. These decisions were taken initially to improve the economics of the plant's operations. Subsequently these factors have been bolstered by regulatory controls introduced initially through the Integrated Pollution Prevention and Control regime and latterly by the Environmental Permitting Regulations 2010 (HMG, 2010). These regulatory controls affect larger industrial installations that have to demonstrate to the appropriate environmental regulator, in this case Natural Resources Wales, that they are upgrading their operations to achieve best available techniques (BAT) using the comparative data of other plants throughout the world, in order to minimise their environmental impacts. These impacts include the heat losses of the plant, which is the focus for this article's examination of WHR.

The extensive diagrammatic illustrations used in this article certainly provide the reader with a clear picture of the extent of the changes made over the past two decades. Only by adopting this range of technical and operational innovations can the plant compete against overseas companies that benefit from lower energy costs, especially for electrical power, and satisfy BAT requirements.

The second article shows how a waste, commonly referred to as lime mud (LM), can be used successfully as a partial

substitute for gypsum to manufacture plaster mouldings and plasterboard products. LM is generated from the production of paper pulp in kraft cellulose plants, of which there are many in Brazil, where the authors are based. Tolosa *et al.* (2021) added LM to gypsum, substituting at proportions of 5, 15 and 25%, and then examined the performance of those samples against pure gypsum samples on a number of key operational performance parameters over three time periods: 7, 14 and 21 days.

This article also incorporates a review from the scientific literature of those key performance attributes, where available, for a whole series of other waste materials that have been used to produce plaster products. Although gypsum is an abundantly available material in Brazil and globally, it is good to examine ways in which the disposal issues of LM can be ameliorated by its utilisation as a raw material in basic and widely used building products.

One aspect that is not discussed or examined is the potential impacts when plasterboard products incorporating LM are recycled, because in the UK, for example, there is a considerable amount of plasterboard that is processed for the recovery of the gypsum for the manufacture of new plasterboard products, a further contribution to the circular economy for construction products. In this case it is the regulatory requirement to remove plasterboard from landfill that has aided this recovery, processing and remanufacturing potential. In the UK and most European countries there is a further gypsum substitute material that is used for the manufacture of plasterboard: gypsum produced from flue gas desulfurisation abatement at incineration plants. Also in the UK, an alternative productive use for LM, in addition to those outlined by the authors, would be land spreading on arable land, particularly where the soil is acidic.

The researcher of the third article is also from Brazil, but this article deals with an increasingly important aspect of future waste and resource management: artificial intelligence (AI) and machine learning. These innovations I have come across mainly through my involvement in their potential advantages for waste sorting at materials recovery facilities. In this article, André Nagalli (2021) shows how AI can be applied to estimate the amount of construction wastes that are generated in

construction projects. There are several different options available to assess the amount of construction waste likely to be generated from projects and the author evaluated these in some detail in his research.

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