

Recycling and Waste Management

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Techno-environmental feasibility of wood waste derived fuel for cement production

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Transforming waste into resources amongst industrial symbiosis networks towards circular economy has been key scientific interests. Not only for it to reduce the environmental consequences of societal waste burden, but it also improves materials efficiency and conserve natural resources. The co-processing of wood waste derived fuel (WDF) as an alternative fuel in cement production would minimize the consumption of fossil fuels and reduces the quantity of wood waste to be disposed at landfills. The techno-feasibility of consuming post-consumer wood derived fuel (WDF) in practical co-processing application is rarely reported. A trial burn of WDF in supplementing 20% of coal was successfully conducted in a cement plant in Hong Kong to evaluate the techno-environmental feasibility of the engineered WDF. The pelletized wood produced from post-consumer wood waste, which was generated mainly from waste wood pallets of the local logistic industry, was found to be suitable to be transformed into an engineered fuel for energy recovery in the cement plants, based on its physical and chemical characteristics. The stack continuous emission parameters during the WDF trial burn process complied with the statutory emission standard while the periodic sampling of particulates, dioxin, mercury, cadmium and thallium, and other heavy metals were about 60%, 2%, 21%, 6% and 7% of the statutory emission standard, regulated for baseline coal-firing operation. No adverse impact on the cement clinker production process and on the quality of the clinker produced was observed. Based on LCA, compared to using coal as the only fuel, about 16% reduction of GHGs emission was achieved when consuming WDF as a co-fuel

(20%) at the precalciner. It can be concluded from the findings that WDF could be utilized as an alternative fuel for partial replacements of coal, as the co-processing met the specific process parameters and complied with the regulatory limits.

Speaker Biography

Michael Yue Kwong Wong conducted the trial burn of wood waste derived fuel (WDF) at the Green Island Cement Plant in Hong Kong in May 2017. He designed a WDF feeder process and completed the engineering, procurement and construction of project within a tight schedule of 6 months. He commissioned the equipment factory and site acceptance testes, the biomass logistics, the actual 24/7 pilot plant operation, the fuel and emission sampling and testing, as well as the writing of the final project report. In which his works has proven the feasibility of using WDF as an alternative fuel (AF) in cement plants leading to the subsequent licensing exercise for the commercial use of WDF and other AFs in the cement plant. His role as a Process Superintendent in recent years is to improve the plant process and to explore the opportunities of efficient use of alternative fuel and raw material (AFR) recycling. Prior to that he worked as a Project Manager under a corporate venture capital environment involved in the environmental business development covering MSW co-combustion and Hydrogen energy and hybrid mobility. He earned his undergraduate degree in Chemical Engineering from the University of Alberta and sub-degree in Industrial Occupation Safety from the Hong Kong Polytechnic University, and pursued and received his post-graduate degrees in Environmental Management from the University of Hong Kong and Finance from the Chinese University of Hong Kong. His early exposure on the application of AFR involving the recycling of Coal Ash, FGD Gypsum and a chemical waste MARPOL derived fuel (MDF) dates back to 1993-1996 with his first job as a Process Engineer.

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