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Practical Application of Environmental Engineering Technology for the Management of Covid-19 Waste

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Abstract

The COVID-19 pandemic and its consequent biomedical waste is an unprecedented challenge worldwide. The large amount of extra medical waste from the response to the COVID-19 pandemic has put a tremendous strain on healthcare waste management systems worldwide, threatening human and environmental health. As per the approval of the Ministry of Health, Covid waste generated in the major healthcare waste-generating provinces (50% of the population) Western, Southern, and Central provinces in Sri Lanka was managed by the Sisili Hanaro Encare (Pvt) Ltd. which is the national priority for the clinical waste management. Accordingly, 1,148,000 kg of COVID waste generated from March 2020 to July 2022 was scientifically managed by Encare through advanced incineration technology. Three COVID waves were identified in the county and the Encare plotted those waves through the declaration of the waste quantity disposed of in the Encare incineration facility. According to the Encare waste disposal data analysis, COVID-19 waste has contributed to an increase in daily waste intake by 563 kg in 2020, 2,340 Kg in 2021 and 680 kg in 2022 (up to June). Minimization of cross-contamination of the virus while waste handling and scientific treatment of extra waste volume generated in the pandemic was the most challenging issue faced by Encare. The application of Encare, 's environmental engineering technology for the Covid-19 biohazardous waste handling process has significantly contributed to mitigating cross-contamination related to human contact and caring health of the people, and eco-friendly disposal of the waste has led to the protection of the environment adherence to the national environmental regulations. Following the safety hierarchy, engineering controls were kept as the most effective measures out of all, and they were implemented by the in-house engineering team owned by Encare. Specific leakproof closed-type Aluminium wheel bins were fabricated, and these bins were provided to waste generators/hospitals for COVID-19 waste disposal by following a bin-to-bin replacement system. After the quantity declaration, COVID waste bins were transported by using vehicles modified by Encare enabling automatic loading and unloading of waste bins. After the transporting of waste to the Encare incineration facility, the bins were automatically forwarded to the incinerator using a bucket feeder and incinerated through a high thermal incineration process with a total flue gas cleaning system. Through this engineering control and technology, the waste generated in all three waves was scientifically managed by preventing cross-contamination and was able to provide uninterrupted clinical waste management service for the country. As an emergency response plan, an emergency incinerator (4 Mt/day) was established in less than 3 weeks by the Encare environmental engineering team to cater to extra waste including vaccine dive waste and test kits generated in the pandemic situation. Comparatively, 2.1 million rupees monthly average operational cost was additionally borne by Encare for the management of Covid waste. In conclusion, the use of environmental technology through a trained in-house engineering team has successfully helped to mitigate adverse health and environmental impacts due to the pandemic. Otherwise, if the waste was handled unscientifically or mixed with municipal waste without implementing a proper emergency response plan, the situation of the country would be more dangerous by affecting social health, the economy and the environment.

Keywords: Biohazardous, Flue gas, Cross-contamination, Incineration, Safety hierarchy