



305/C

An analysis of alternative technologies of cement production based on a life cycle approach

S. Karunaratne,* C. Prabashana, and E. D. H. Silva

Sri Lanka Institute of Information Technology

The objective of the present study is to compare the CO₂ emission from selected global and local cement manufacturing processes using life cycle approach (cradle to gate). All the inputs and outputs of the processes were obtained from the published literature, global cement manufacturing data (production and CO₂ emissions), annual reports of cement manufacturing companies, local cement production data, US energy information administration, and Sri Lanka Central Bank reports. Accordingly, clinker production has been identified as the most impactful phase of the cement production life cycle. According to the analysis of data from year 2009 to 2017 from global cement manufacturing companies, it was clear that carbon emission varied significantly with the percentage of alternative fuel usage. The carbon emission has been reduced up to 607 kg CO₂e/ton of cement in year 2013 when the alternative fuels usage raised up to 28.4%. An estimated amount of 1.1 million ton of CO₂ was emitted from local cement industry during the year 2007 compared to 35 to 93 million tons of CO₂ of selected global cement manufacturing companies. The sources of alternative fuel varied from fossil waste (15-20%) to biomass (5-10%). Local cement manufacturing process reduced CO₂ release up to 673.5 kg CO₂e/ton of cement by the introduction of 19% of alternative fuels in 2007. Local cement manufacturing statistics predict the cement production will be increased by 8% each year. Therefore, estimated quantity of 3,666,518 MT of cement will be produced and as a result 2.24 million tons of CO₂ per year will be emitted by 2020. Hence, the reduction of carbon emissions throughout the cement manufacturing process is a must. According to the available statistics, biomass such as rice husk, sugarcane bagasse, corn waste, cinnamon trunks, municipal solid waste and sludge from waste treatment plants can be used as an alternative fuel source in local cement manufacturing to a large extent due to the significant amount of waste produced. Furthermore, the use of blended cement is recommended over the Portland cement due to the environmental savings throughout its life cycle.

Keywords: Alternative fuel, clinker, emissions, kg CO₂e/ton

E-mail: shiromi.k@sliit.lk