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Inter-comparison of energy consumption patterns in bull's trench and zig zag brick kilns of Nepal

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he brick industry plays a significant role in Nepal's energy consumption and contributes largely to our national economy. Large quantities of coal and other combustible fuels are used as major energy sources in firing bricks. In this study, we summarize results for seven kilns which include four straight line Fixed Chimney Bull's Trench Kilns (FCBTKs) and three Induced Draught Zigzag (IDZZ) kilns. This study particularly focuses on measurement of fuel feeding rate, temperature distribution, and flue gas parameters for several cycle of fuel feeding to quantify energy consumption and performance. Specific energy consumption (SEC) is one of the widely accepted methods of studying energy performance of brick kilns in terms of fuel consumption and total brick production. We found the SEC values of 1.15±0.29 MJ/kg of brick fired for FCBTKs and 0.84±0.23 MJ/kg of brick fired for IDZZ technology. The SEC for IDZZ kiln is lower than FCBTK with the difference of 0.31 MJ/kg. At the daily production of 35,000 bricks, the

potential for coal saving by adoption of IDZZ kiln over FCBTK is around 21700 MJ. This will save around 800kg of coal per day. Complete energy auditing of four FCBTKs and three IDZZ kilns was performed during this campaign. Flue gas losses and surface losses were found to be 33.33±4.03% and 27.27±5.10% of total energy provided for FCBTK. Similarly, flue gas and surface losses for IDZZ kilns were found to be 18.98±3.46% and 18.13±0.90%, respectively, of total energy input. This measurement shows that the flue gas losses and surface losses were among the major losses for FCBTKs and were significantly higher when compared to IDZZ kilns. Hence, our results suggest that adoption of IDZZ over FCBTK technology paves the way for energy conservation, air quality improvement, and on-site worker health safety.

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