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Minimizing fuel consumption in printing process of glass bottle Industry

H.G.D. Chandrakumara,[1]N.S.M.P. Sadaruwan,[2]P.R. Dadigamuwa,[3] andT.S.S. Jatunnarachchi[3]

[1]*Training Centre, Ceylon Electricity Board, Sri Devananda Road, Piliyandala*
[2]*Lakvijaya Power Station, Ceylon Electricity Board, Narakkalliya, Norochcholei*
[3]*Department of Mechanical engineering, Faculty of Engineering Technology,*
The Open University of Sri Lanka, Sri Lanka

The main problem in the glass industry is the high fuel consumption for the processes of annealing and printing. Therefore, this study was focused on finding the methods of minimizing fuel consumption in printing process.

After printing the bottles, they are sent through a lehr called the 'Decorating Lehr' to adhere the print to the glass permanently. This lehr consists of a number of zones having different temperatures. Heating of the zones are done by LP gas burners, which consume a large amount of LP gas. In this study two methods were identified as the best ways of minimizing fuel consumption.

The first method is to design a waste heat recovery system to increase the bottle entry temperature of the decorating lehr. It was found that using a plate fin type air to gas heat exchanger, the outlet temperature of the air can be increased to 210^0C using the excess heat of the decorating Lehr exhaust gas, and it can be used to heat the bottles when entering the decorating lehr. Thereby fuel consumption to heat the bottles at entry can be reduced. Reduction in fuel consumption will be quantified after completing the design of the heat exchanger.

The second method is to analyze the temperature profile of the decorating lehr. It was found that the cooling rate of the lehr can be changed by adjusting the mat speed of the conveyer belt. Calculations were carried out for different types of bottles and trial runs were carried out accordingly. By controlling the heaters in each zone, temperature profile of the lehr was adjusted based on theoretical calculations. Thereby, 30 – 38% fuel savings can be obtained. Using above two methods, it was shown that the fuel consumption of the decorating lehr can be minimized by a considerable amount.

Key words: Annealing lehr, Decorating lehr, fuel consumption, heat recovery, flue gas.

tssaj@ou.ac.lk +94 712761774