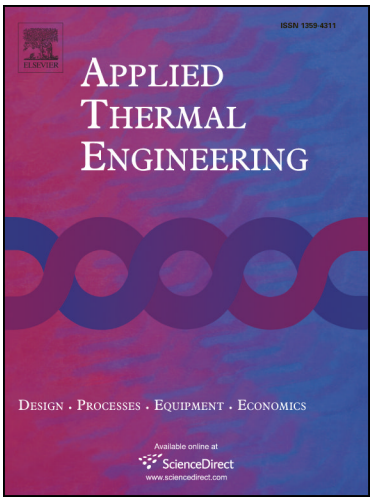

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PII: S1359-4311(16)33105-2
DOI: http://dx.doi.org/10.1016/j.applthermaleng.2017.06.047
Reference: ATE 10566

To appear in: *Applied Thermal Engineering*

Received Date: 6 November 2016
Revised Date: 6 April 2017
Accepted Date: 10 June 2017

Please cite this article as: H. Hosseinizand, C. Jim Lim, E. Webb, S. Sokhansanj, Economic analysis of drying microalgae *Chlorella* in a conveyor belt dryer with recycled heat from a power plant, *Applied Thermal Engineering* (2017), doi: http://dx.doi.org/10.1016/j.applthermaleng.2017.06.047

Economic analysis of drying microalgae *Chlorella* in a conveyor belt dryer with recycled heat from a power plant

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Abstract

The objective of this research is to estimate the cost of drying microalgae chlorella in a conveyor belt dryer using waste heat from an industrial source. The recycling system consists of a run around thermal fluid between two tube heat exchangers. The dryer is mathematically modeled and the mass transport coefficient is obtained from empirical thin-layer kinetic data.

The dryer and heat recovery system are designed for the production of 1000 kg/h dried microalgae at a moisture content of 10% (wet basis, w.b.). The input moisture content can range from 35 to 75% (wet basis). Depending upon the applied Hand factor, the total cost to dry microalgae from 55% to 10% ranges from $46.13 to $109.64 per ton of dried product. Using natural gas assumed at $6.27/GJ, the drying cost increases to $83.47 per ton (using hand factor equal to 1). The drying cost using a commercial spray dryer is $109.05 per ton of dried product (using hand factor equal to 1). The paper discusses the sensitivity of drying costs to initial moisture content as well. The results show that integrating waste heat recovery with conveyor belt dryer decreases the drying costs of chlorella drying in comparison to two other drying methods.