ANALYSIS AND REDUCTION OF ENERGY CONSUMPTION IN A MANUFACTURING SETUP (A CASE STUDY OF FARMERS CHOICE LIMITED)

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E221-003-002/2012

A Thesis Submitted in Partial Fulfillment for the award of the Degree of Masters Science in Industrial Engineering and Management in the School of Engineering, Dedan Kimathi University of Technology

April 2016

Declaration

I declare that this project is my original work and has never been presented to this institution or to any other institution for examination or for any other purpose.

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Certification

I certify that the above-mentioned student carried out the work detailed in this report under my supervision.

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Abstract

Energy cost comprises a significant proportion of expenditure in manufacturing industries. At Farmer's Choice, the production has been fairly constant while the energy consumption has been increasing steadily thus increasing the production cost and constraining the profitability of the organization. The aim of this study was to analyze energy consumption in the facility of Farmers Choice and identify energy saving opportunities (ESO) for the company. The study was guided by the following specific objectives; identifying and analyzing significant energy consuming units in the company; developing means and methods of energy saving mechanisms in the company and evaluates the economic viability of the suggested solutions.

The study employed quantitative research design where secondary and primary data on energy consumption were used. A root cause analysis (RCA) was conducted to determine the highest energy consuming equipment. Different energy systems of the plant facility were analyzed, such as refrigeration systems, electrical motors, air compressors and lighting systems. The energy consumption for each of the systems were estimated using measurements, calculations, interviews, historical data and assumptions.

The findings showed that, there was an average monthly specific energy increase in electricity, fuel oil and diesel from 15.12GJ/Ton, in the year 2013 to 15.41GJ/Ton, in the year 2014. Units in the refrigeration and meat processing section were operating inefficiently with load factor of between 39.8% to 61.2% and as low as 13.1% to 57.4% respectively. To reduce energy consumption, adopting LED bulbs for lighting, power factor improvement, use of Variable Speed Drives and retrofitting. The alternative On-Grid connected solar system was considered to offload grid demand. The aggregate cost of implementing these energy saving strategies was found to be ksh.65,584,200, with annual energy savings of ksh.22,191,620.31.The economic analysis showed that the payback period for the investment is 2.8 years while the total Greenhouse Gases (GHG) reduced were 699712.01kg CO2. Further, the study empirically validated the theory of Quasi-Active power factor correction by showing how P.F improvement can be used to enhance saving and conservation in a manufacturing set-up. In addition, the study provides useful reference to the industrial practitioners on how to efficiently manage and conserve energy and reduction of Green House Gases.