Abstract

A study on energy conservation and recovery measures was conducted at Premier Food Industries to identify opportunities which would cut down on the overall energy cost. This was guided by evaluation of energy cost distribution among the utilities in use. The biggest cost at 70% of the total energy cost was out of steam generation, 26% from electricity and the remaining from diesel and propane gas.

The study narrowed down on the refrigeration container and steam systems. The aim was to establish savings through insulation of condensate lines and pasteurization bath, evaluation of the efficiency of existing steam line insulation, heat recovery from boiler blowdown, preheating boiler make up water and pasteurization feed water using solar water heaters, covering the open pasteurization bath while in operation and finally evaluating the performance of the refrigeration container.

Through insulation, it was established that 90% of the heat loss could be conserved and the payback period was estimated as 6 months. Most of the heat conserved was due to radiation from the highly radiative surface which could be covered by a less radiative material. On the other hand, the existing insulation on the steam lines was found to be 3% less efficient at base surface temperature of 40°C. The pasteurization bath was determined to lose significant energy estimated 92% of the total losses when operating with an open surface. The loss due to evaporation could be eliminated by covering the surface.

Boiler blowdown had a high potential of recoverable energy discharged in the hot water at a high pressure to the drains. By use of a blowdown vessel, 86% of the energy could be recovered in flash steam and 14% from the discharge water. Blowdown flow rate of 138 kg/hr at 10bar would yield a payback period estimated as 4 years due to the high initial cost for the system despite the high returns realized.

Using solar water heaters to preheat water showed an extensive payback period determined at minimum of 7 years which was lengthy. This was due to the high initial cost of the solar water heaters. However, the system has potential considering Kenyas location at a high insolation region. Finally, the refrigerated container was evaluated to be inefficient due to air infiltration at the door. This resulted in a non-uniform temperature profile which caused the system to run longer to match the heat gain. It was also found that by

raising the operation temperature from -18°C to -10°C, 20% of the energy consumed was saved without any investment.