SUMMARY

The increase of milk consumption in south East Asia requires an increase in milk production. Cows suffering from heat stress are a big problem for milk producers in these hot and humid countries. The consequences of heat stress for cows are declines in food consumption which leads to declines in milk production and fertility. If the cows shall be able to produce more milk, they or their surrounding environment must be cooled in some way.

The objective of this thesis was to find out the total cooling demand in a milk centre with 160 cows, 40 cows in a double 20 parlour and a holding area fitting 120 cows. Also a proposal for mechanical cooling of the milk centre should be created.

The thesis is a theoretical study where a calculation model has been made to be able to identify and quantify the different contributions of supplied heat to the milk centre. The calculations have been made representing the worst case and from that the refrigerate requirement has been established. After having the refrigerate requirement the refrigerate plant that will cool the milk centre have been dimensioned.

Climate conditions were taken from Kuala Lumpur, Malaysia, which is a low land area near the ocean. This area has been chosen to get the worst climate for milk production. The calculations were made with an outdoor temperature and relative humidity at 32 °C and 60 %, respectively. The indoor climate was set to 24 °C and 80 %, which gives a THI of 73. U-value in walls and roof was 0.5 W/m²K and the floor had a value of 0.3 W/m²K.

The refrigerate requirement in the milk centre was calculated to 271 kW. Almost 80 % was caused by production of heat and moisture by the cows. Heat and moisture that was brought inside the milk centre with the ventilated air caused 16 % of the refrigerate requirement. The heat gained from solar radiation caused 4 % of the refrigerate requirement and only 1 % was caused by transmission through walls and floor.

The calculations made with the calculation model showed that the number of cows in the milk centre makes a big difference to the refrigerate requirement. It also indicated that the material on the outer surface of the roof should be shiny and bright so the radiation from the sun is reflected. Furthermore, it showed the importance of controlling the ventilation rate to a minimum.

In this thesis the used technique for cooling the air in the milk centre was compressor cooling. The total power consumption was calculated to 66.2 kW. With the energy price in October 2004 in Malaysia the energy cost for cooling the milk centre during the warmest month of the year should be USD 2627 (18 389 SEK). If this energy cost is divided on the number of kilo milk that is produced in the milk center in that month the cost will end up at USD 0.003 (0.021 SEK) per kilo milk. The investment cost for the total cooling system will be in the quantity of USD 300 000 (2 100 000 SEK). Because the cows will only be cooled for two hours a day in the milk centre it is hard to say if the milk production will increase and make an investment in mechanical cooling feasible.