CHAPTER VII

ECONOMIC ANALYSIS

The selection of the LTS for coupling with heat pump dryer should be based on a compromise between its performance and economic merits. The unit selection is usually based on the maximum energy saving in combination with the cost of construction of the LTS.

For this part, cost of loop thermosyphon made of copper tube, 0.01 meter OD, evaporator and condenser section of 0.45 meter, 24-loop circuit, length of adiabatic section of 1.2 meter, 12 fin per inche and R-123 as working fluid was considered. Internal rate of return (IRR) and pay back period was determined by considering the cost saving aspect of LTS.   The IRR is defined as the interest rate that makes the extra initial expense of the LTS compared to the conventional one without the LTS. The IRR is then evaluated as follows:

$$F = P(1+i)^n \qquad\qquad (7.1)$$

And

$$F = \frac{A}{i}[(1+i)^n - 1] \qquad\qquad (7.2)$$

Where,

P	present value
F	future value
A	annual
n	useful life, year
i	interest rate, ratios

From Equation 7.1 and 7.2

$$P(1+i)^n = \frac{A}{i}[(1+i)^n - 1]$$ solving this equation we can get i which is the required minimum rate of IRR.

Economics results

The conditions for evaluating the economic analysis are summarized as follows:

Item	Details
Initial cost	30000 Baht
Life cycle	10 years
Interest rate	6.50% per year

The results from experiment and simulation calculate specific energy consumption of about 10000-kJ/kg-water removed. If the water removed was 80 kg then the energy used is 80 x 10000 = 800000 kJ per batch of drying. The energy saved was 20% or 160000 kJ. This can be converted to electric units = 44 unit (1 unit = 3600 kJ). The 44.4 unit costs are 133 Baht (one unit = 3 Baht).

One batch can save 133 Baht, one batch is two day, operated 10 month per year. So, (10x30/2x133 = 19950 Baht) 19950 Baht can be saved per year.

Future cost is 56314 Baht. So, the pay back period is 2.8 years. The internal rate of return (IRR) is 30%. The conclusion it pays to adapt the technology of the loop thermosyphon.