(ABSTRACT)

The problem investigated in this thesis is how to influence the internal air temperature of the greenhouse.The internal air temperature depends on the outside weather conditions and the heat gains and losses from and to the greenhouse .

The main objective in this thesis is the simulation of greenhouse with PCMs.The PCM problem was solved as one dimensional problem in a rectangular container (rectangular coordinates) for two types of boundary conditions; first with constant end wall temperature, and second with constant temperature of fluid (air) at the end walls.

A gutter connected model of the greenhouse without PCM was simulated in 23 July for AL_Aroub Agricultural School, 12 km north of Hebron. Its outside temperature and its direct solar radiation was used in that day. It was noticed that by changing the cover of the greenhouse and the outside wind speed, the inside air temperature of this model changes.

After that, this greenhouse model was simulated with different PCMs inside it. Assuming that the rectangular containers that are filled with PCM and the total convectional surface area equals 400 m^2.

Three days all over the year were chosen for the simulation. These were the 23rd of July, 21st of January, and 21st of April; one was in Summer, the second was in Winter, and the third was in Spring. The model was simulated with different PCMs and different cover materials of the greenhouse model.

The main conclusion is that the PCMs can be used to control the air temperature inside the greenhouse. In July, the PCM will lower the air temperature at mid-day time. Whereas, in winter time the PCM will raise the air temperature of the greenhouse at the night time.

To raise the convectional heat transfer at the PCM surface fans must be used. Simulation using fans gave good results in controlling greenhouse temperature at summer and winter days .

The types of cover materials investigated in the simulation are double polyethylene, single polyethylene, fiberglass, and glass. Each of them has its own thermophysical properties; the values of thermal conductivity and the transmittance coefficient of double polyethylene are lower than the values of remaining two covers, while the fiberglass has a larger transmittance coefficient than the single polyethylene, and single polyethylene has a larger thermal conductivity larger than the fiberglass.

Using double polyethylene, will lower the heat loss from

the greenhouse, and this will prevent the lowering of the inside air temperature, especially in winter.