

Introduction, The Sun is the main source of energy on our Earth so we should find the best ways to use it in the most useful aims and applications. The thermal solar collector is a type of solar collectors which its purpose is for water heating using energy comes from the Sun. It means that Solar collectors are heat exchangers that use solar radiation to heat a working fluid, usually liquid or air. They can be classified in three groups:

- Flat-plate collectors,
- Evacuated-tube collectors
- Focusing collectors.

& this will be included in details in **chapter one** .

In our project we study the flat plate collector and how to enhance the efficiency from it by using Phase Change Materials inside the storage tank.

The idea of storing the heat using the phase change material as they store and release thermal energy during the process of melting & freezing (changing from one phase to another) in form of latent heat & this will be included in details in **chapter two**.

Since the amount of latent heat in addition to the other part of sensible heat stored in water are expected to increase the efficiency of the system. Because by replacing an amount of water with PCM, the amount of latent heat stored in PCM is greater than the sensible heat in water during the same time of day.

The system construction and registering involving steps, materials and parts are included in details in **chapter three**.

Our experiments & results during the project period are included in details in **chapter four**.

The numerical solution using CFD and CFD software itself are explained in details in **chapter five**.