Harshit Khandelwal
16UME017

Camlin Page
Date / /

☆ Dynamic Behaviour of Medium temp. (200°C - 250°C) solar thermal power plant integrated with latent heat thermal energy storage.

Power Generation

Solar PV
efficiency = 15%

Solar thermal
efficiency = 18%

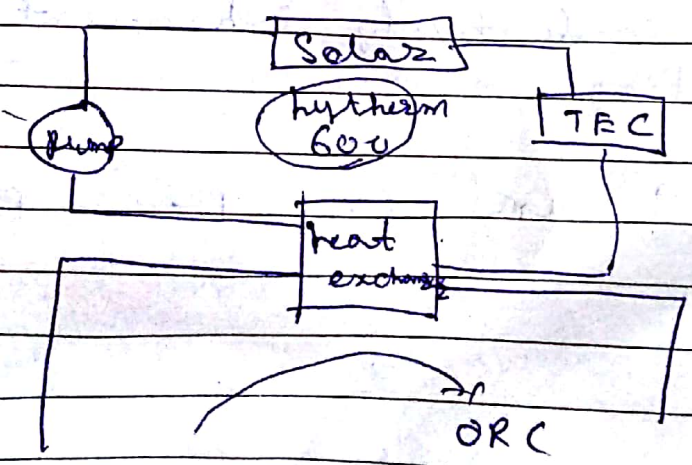
∴ Target:

⇨ Temp range = 200° C
challeng powers 100 kW - 1 MW

ORC → organic Rankine cycle
Advantage over rankine

(i) Long service life
(ii) Low maintaince
(iii) Full automatic
(iv) Can produce shaft works from medium heat source upto 370°C efficiency

Why thermal storage?



→ Ceramic (Al_2O_3) → used to store heat upto 1500°C - 2000°C

→ Thermal Conductivity C_u = 390 W/m.K

→ At high temp T > 360°C we have to use molten salt instead of fluid

* Properties of OPCM:

→ Most organic PCM with low melting point (~0.2)

Why we use organic?
→ freeze without much supercooling

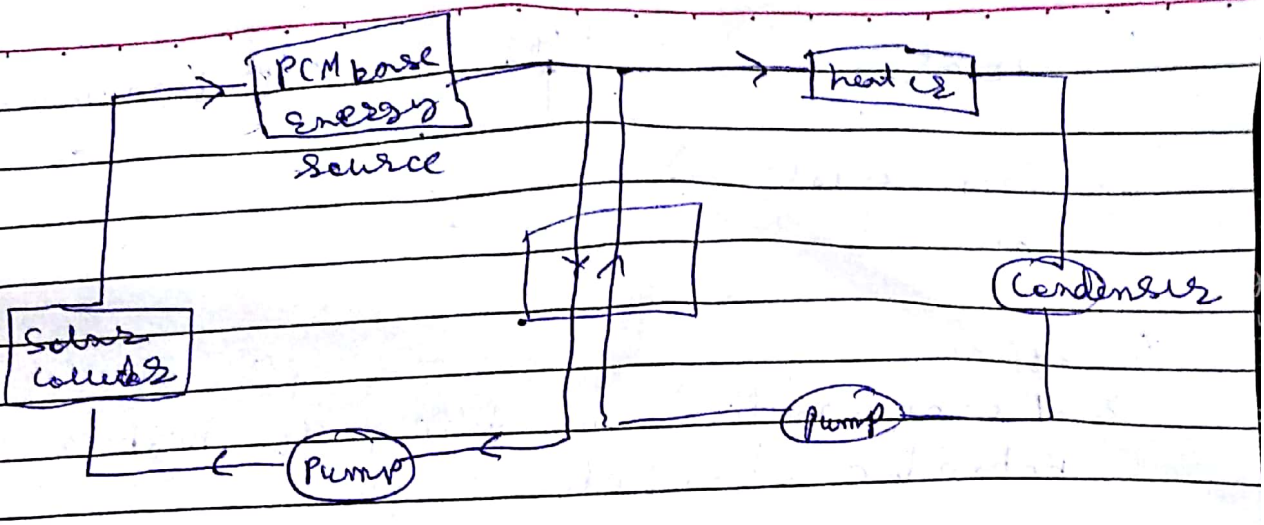
Improvement in HT

↓ Inc. in heat transfer Area
↓ heat transfer storage surface

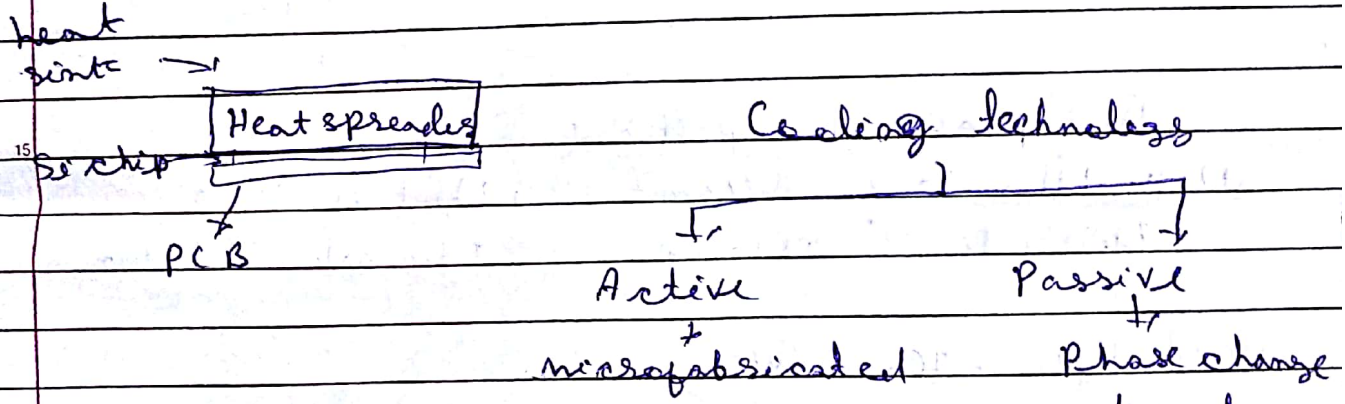
Improvement effective fins
↓ Extend surface or fins.

→ Thermal conductivity Enhancement by encapsulating in 35 316

* Encasil → used in power plant



Thermal management



* Micro-channel: has more area/volume Ratio
  Result in high heat transfer
  Dumbbell shaped Collector

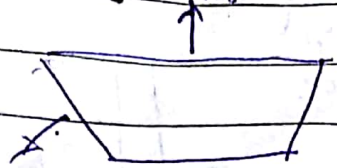
* Fabrication of micro channel (Silicon)

  Cleaning → oxidn → photolithography → etching → heaters deposition ← Waterbanding ← (thickness 75 - 1mm)

Camlin | Page
Date / /

* Effect

Most effective shape for micro-channel



trapezoidal channel

* Effect

→ Porous medium modelling of high scale

→ Rohsnbic channel

Reynolds no $Re = \frac{\rho u r}{\mu p}$

Heat transfer co-efficient = $\frac{D_m^n}{T_{max} - T_{bulk}}$

* Two phase flow pattern:

(i) Heat flux 20.70 W/cm² Flow rate 3 ml/min

(ii) Heat flow = 13.18 W/cm² Flow rate = 3 ml/min

(iii) Heat flow = 16.39 W/cm²

Flow rate = 3.5 ml/min

* ~~Experimental CHF~~ :