



# Two Day – Technical Workshop Solar Water Heater deployment'

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DAY 1 , SESSION 4  
COMPONENTS DETAILS

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# Recap

- Climate change
- Basic solar geometry
- Guiding principles
  - Green house effect
  - Colour absorption
  - Conductivities
  - Thermo siphon
- Pre feasibility
- Component details

# Circulating Pumps

- Centrifugal-type circulating pumps are most commonly used in solar water-heating systems
- Centrifugal pumps generally have low power consumption and low maintenance and are highly reliable
- Head is the pressure the pump must develop in order to create desired flow through the system
- The flow rate value for pumps in a solar thermal system are always a function of the number of collectors used and the method of plumbing employed
- 2.4 -12 litres/min for a typical small scale system
- Consideration- Right material, Head and flow, AC/DC system
- The overall pressure a pump must create is determined by the height the water must be lifted and the frictional resistance of the pipe
- The pressure a pump must develop to overcome dynamic head varies with the size and length of the pipe, number of fittings and bends, and the flow rate and viscosity of the fluid

# Sensors and Controls

- The **differential controller** tells the pump when to turn on and off
- Typically for a high voltage pumps
- The controller, via sensors connected to the collector and the storage tank, determines whether the collector outlet is sufficiently warmer than the bottom of the tank to turn the circulating pump on
- The sensors are located at the collector outlet, and at the bottom of the solar storage tank. These sensors are thermistors that change their resistance with temperature
- The differential control compares the resistances of the two sensors
- The controller usually shuts the pump down when the temperature difference reaches preset value

## Check Valve

- It permits fluid to flow in one direction only. It prevents heat loss at night by convective flow from the warm storage tank to the cool collectors
- Check valves are either the "swing" type or the "spring" type.
- Swing-type check valves should be properly installed (i.e. not vertically upside-down which allows them to hang open)
- Low sun conditions produce lower flow rates, which may not be strong enough to overcome a spring-type check valve
- For systems using AC circulating pumps, spring-type check valves should be installed. The spring resists thermosiphon flow in either direction

# Pressure Relief Valve

- Every hydronic heating system must have protection against high pressures due to high temperatures
- A pressure relief valve of 3 bar is usually adequate to protect closed-loop plumbing systems from excessive pressures
- Temperature/pressure relief valves are not commonly used in the closed loop because high temperatures are common
- Pressure relief valves should be have a vent tube that directs escaping fluid to a bucket or floor drain
- Once one of these valves opens, it is wise to replace it, since they often do not fully reseal, scale or dirt particles may allow a slow leak

# Pressure Gauge

- Shows if the closed loop system is within an acceptable range of pressure
- A typical system pressure is on the order of 0.6 to 1 bar
- A pressure gauge is used as a diagnostic tool to monitor the state of the glycol charge
- A loss of pressure indicates a leak in the system that needs to be located and repaired

# Temperature Gauges

- Two temperature gauges in the closed loop and one in the water loop are optional, but valuable indicators of the system's function
- One gauge on each side of the heat exchanger in the collector loop shows the temperature rise across the collectors and the temperature change across the heat exchanger
- A temperature difference of 7 to 10°C indicates effective system operation
- One temperature gauge in the water loop between the exit of the heat exchanger and the entry to the storage tank will display the current temperature of solar heated water entering the storage tank
- The temperature gauges should have a range of 0 to 100 or 150°C
- A hot summer day may produce water temperatures in the solar loop around 90°C, although normally 80°C is the maximum temperature attained



# Valves – NRV, drain and other

- Non-Return Valve: To ensure the flow of water/fluid in one direction
- Return flow cools out the water which has to be avoided. Therefore at least one non-return valve is necessary in the solar loop.
- Gate valves and Drain valves- necessary for filling and draining purposes

# Accessories

<b>Thermometer</b>	Digital, Range 0 – 120 Deg C
<b>Flowmeter / water meter</b>	Mechanical or electromagnetic (digital)
<b>Strainer with spare mesh</b>	At cold water inlet, ASTM A126 Class B cast iron or similar metal casting with stainless steel screen size of 250 micron.
<b>Glycol container and fittings</b>	SS container of volume 5 litres with appropriate fasteners and level indicator
<b>Standard toolkit and spares</b>	Tools : Small hacksaw (6”), Pipe wrench, screwdriver, metal file, spanner set (as per need) Spares: Teflon tape/jute coir, 2 sq.m of insulation, 2 sq.m of aluminium cladding, strainer mesh – 2 nos., binding wire 18-20 SWG (5m), plumbing fittings, fasteners (50% of installed), washers and gaskets (100% of installed), multipurpose epoxy sealant M-seal similar (100gms)
<b>Fence and Gate</b>	1.2 m high fencing with 1.8 m R.C.C posts of standard design placed every 3 m apart, embedded in cement concrete blocks, every 15th post, last but one end post and corner post shall be strutted on both sides and end post one side only, provided with nine horizontal lines and two diagonals of barbed wire between two posts fitted and fixed with GI staples on wooden plugs or GI binding wire tied to 6mm bars nibs fixed while casting the post. Gate and supporting pillars as per BSR Civil WW0320

# Environmental implications

Material	Discarding/environmental impact
GI pipe	Scrap & recycle
MS structure	Scrap & recycle
MS/SS tanks	Scrap & recycle
Copper tubes	Scrap & recycle
Aluminum cladding	Scrap & recycle
Propylene glycol	Bio degradable, 20-30 days
Insulation	Can be reused in buildings envelop etc.
Glass	Reused



# Thank You

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