Analysis study and simulation of thermal collector performance used in hot climate of Muscat.

A thermal collector system design

UML Activity Diagramm

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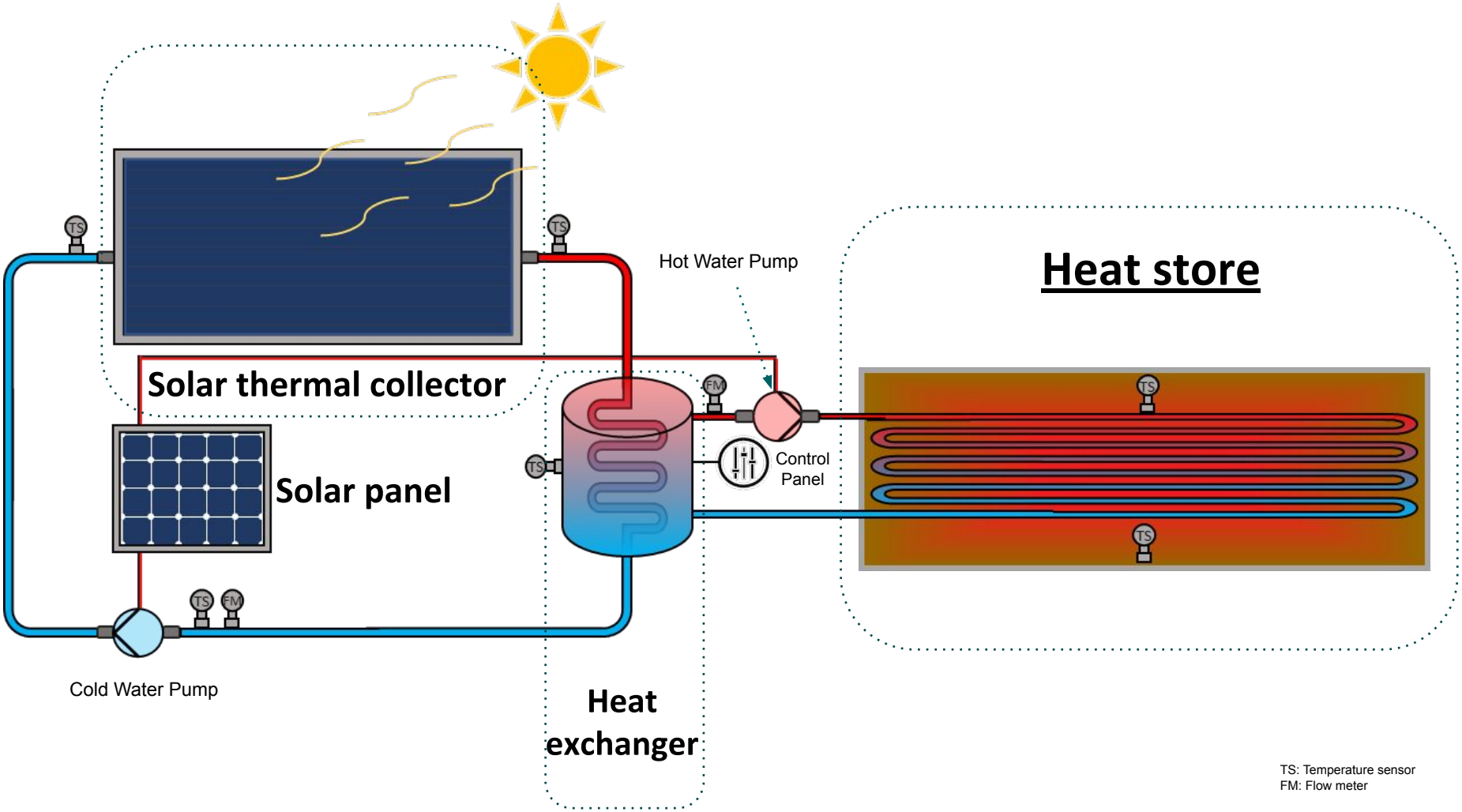
Project Methodology



Sensors
Temperature Sensor DS18B20

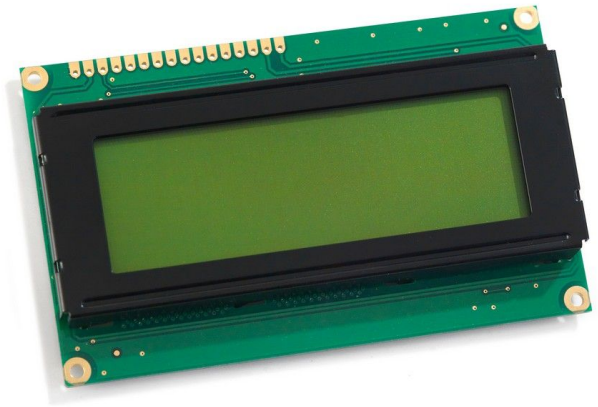
The sealed digital temperature probe can allow you to precisely measure the temperatures in wet environments with a 1-wire interface. It provides 9 to 12 bit readings in celsius so that only one wire needs to be connected from a central microprocessor.

Sensors
Flow Meter YF-S201

The sensor contains a pinwheel sensor that measures how much liquid has moved through it. There's an integrated magnetic hall effect sensor that outputs an electrical pulse with every revolution. The hall effect sensor is sealed from the water pipe and allows the sensor to stay safe and dry.

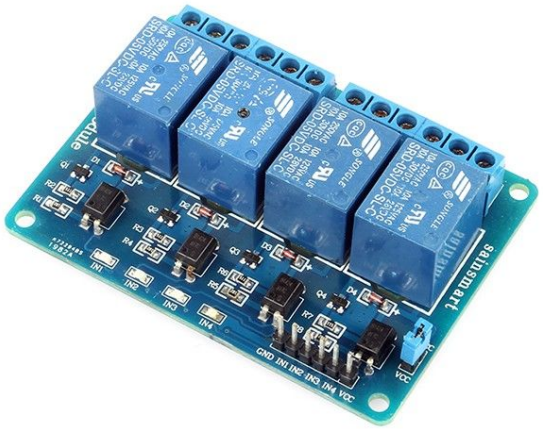
The sensor comes with three wires: red (5-24VDC power), black (ground) and yellow (Hall effect pulse output). The water flow can be easily calculated by counting the pulses from the output of the sensor.

Hardware
LCD Display 4X20



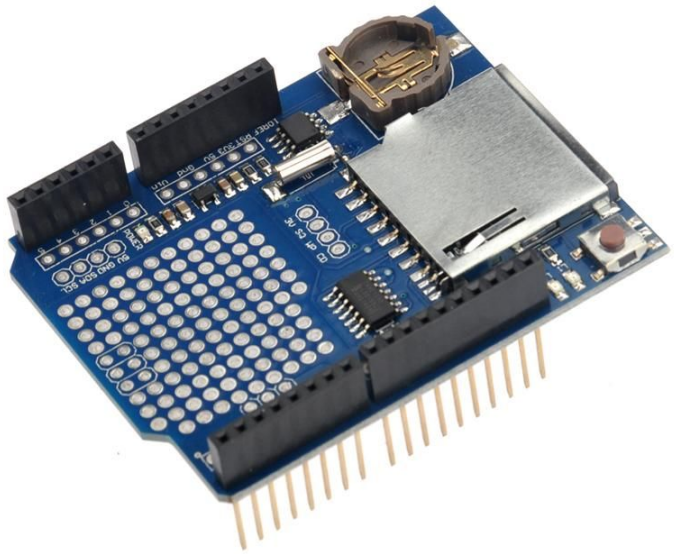
A 20X4 character LCD display with a green LCD and a green LED backlight.

Hardware
Arduino 4 Channel Relay Module



The relay module lets you to connect the Arduino to devices the use higher current or voltage. This is done with the use of 4 relays that that are rated for 7A at either 28V DC or 10A at 125V AC.
Each relay is switched on/off by an opto-isolated digital input that can be connected directly to a microcontroller output pin. Each relay has a Normally Open (NO) and a Normally Closed (NC) contact.

Data Storage
SD Memory Card Shield



The Arduino Board itself has just a small memory, so if data should be stored, a SD Card is necessary

This Shield also includes a Real Time Clock, so with the help of a small battery the date and time of the measurements can be saved.

All measurements can be saved in a .txt File, which can be imported into Excel.
A new line is created for example every second and the columns in the .txt file are separated by a comma.

Youtube Video Link

Arduino Code Link

Data Storage
Ethernet Shield

Allows an arduino board to connect to the internet using an ethernet cable. Allows for four socket connections. The Ethernet library can be used in sketches to connect to the internet via the shield.

There is an on-board SD card storage slot which can be used to store files over the internet. The slot can be accessed using the SD card library.

Data Storage
WIFI module

A self contained SOC with integrated TCP/IP that gives an Arduino access to a WiFi network.

It is capable of hosting an application on a network. Each module is pre-programmed with an AT command set firmware meaning that this can be easily connected to an Arduino device and get the same WiFi ability as a shield.

Has on-board processing and storage capabilities that can be integrated with sensors so there is minimal circuitry needed.

Data Storage
Bluetooth module

The module can be used to communicate between two Arduinos or communicate between the Arduino and any other compatible device with bluetooth functionality like a laptop. The module can be used to transfer data to another device but not multimedia like photos.

It has two operating modes. One is the data mode which is used to send and receive data from other bluetooth devices and the other is the AT command module which is used to change default device settings.

Data Storage
GSM SIM Card Shield

The GSM Shield is used to allow an Arduino board to connect to the internet, send and receive SMS, and make voice calls via the GSM library. The shield works easily with Arduino

GSM is an internal standard for mobile telephones. To access the internet, you need to obtain the Access Point Name and username and password from network operator. General Packet Radio Service is used to access the internet and send SMS. It can provide idealized data rates between 56-114 kbit per second.

There is an onboard SIM card slot to insert a sim card. The SIM card is used to request communications provides to send GSM coverage to the Shield.

Activity Diagramm