

## Abstract

Water scarcity is the major challenge of the upcoming decades for the entire world. Middle eastern nations are prone to water scarcity due to very less rainfall, scarce fresh water sources, sandy surrounding and harsh humid climatic conditions. Qatar being the leader of natural gas production suffers from the same problem of pure and clean water. Water desalination techniques adopted so far are energy intensive and infidel to oceanic habitat. The use of vapor compression cycle for the condensation of atmospheric water vapor has various limitations such as complex machinery, high power consumption and periodical maintenance. This novel method utilizes heavy humid conditions of Qatar to obtain water from the atmosphere through Peltier effect. This method uses the dissimilarity of the conductors in the electric circuit such that when the current is made to flow through the circuit the heating and cooling effects are generated at the junctions where cooling temperature of the junction can be achieved below the dew point temperature thus forming the dew which is collected in the closed container as condensed atmospheric water. This technique is superior to other conventional methods of water production due to its cost efficient, energy saving, simple machinery and portability of the entire system.

## Introduction

- There is a huge amount of moisture in arid regions across the globe, often steps are taken to trap and extract the water from moisture from air has been attempted by using a atmospheric water generator device utilizing tradition evaporator condenser and compressor with cfc gas, the system utilizing theses is often heavy and highly energy intensive process
- with current experiment the whole 3 component energy intensive bulky system will be replaced by a thermo electric Peltier device that cool on one side and heats on side upon giving current which
- This system has high potential in humid area such as the gulf with humidity reaching up to 80% during the summer months
- The Pieter device have the potential to directly convert air moisture to usable and often drink water directly in a portable from factor
- This experimental project is aimed to study water condensation rate in various regions around Qatar
- This project will also study dew point with respect to humidity and rate of water collected

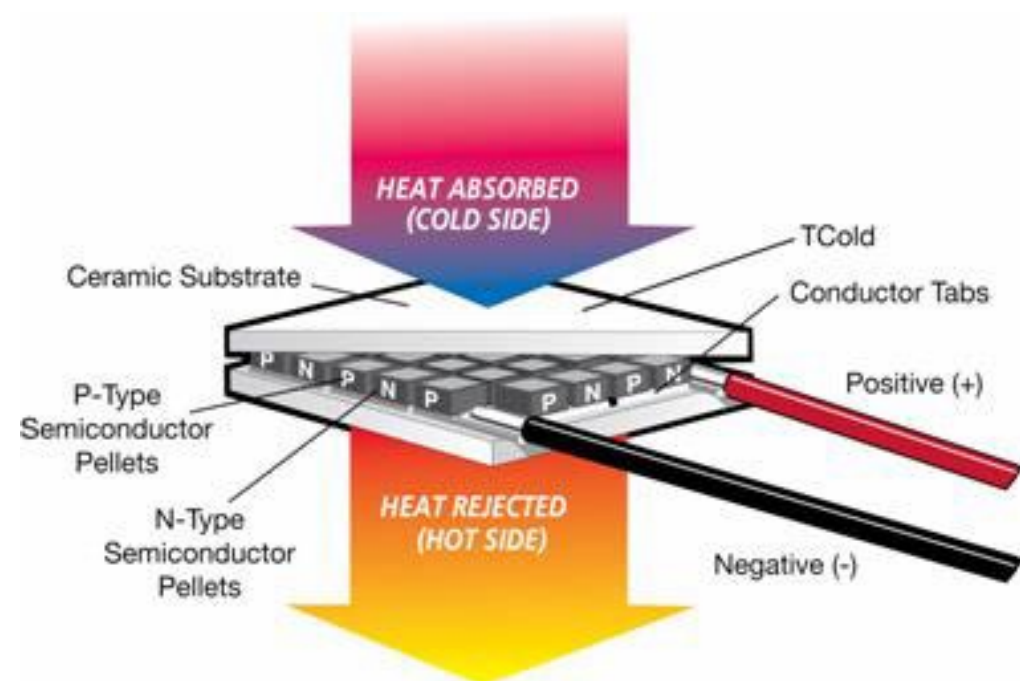


Figure 1: Peltier device

## Objectives

The main objective of the on going experimental study is to measure and demonstrate the possibility of absorbing water from humid air using The study focus on optimizing the use of Peltier device to generate water from air using new innovate technology this can be used for several various technology were it can be utilized for cooling or heating is required

## Materials

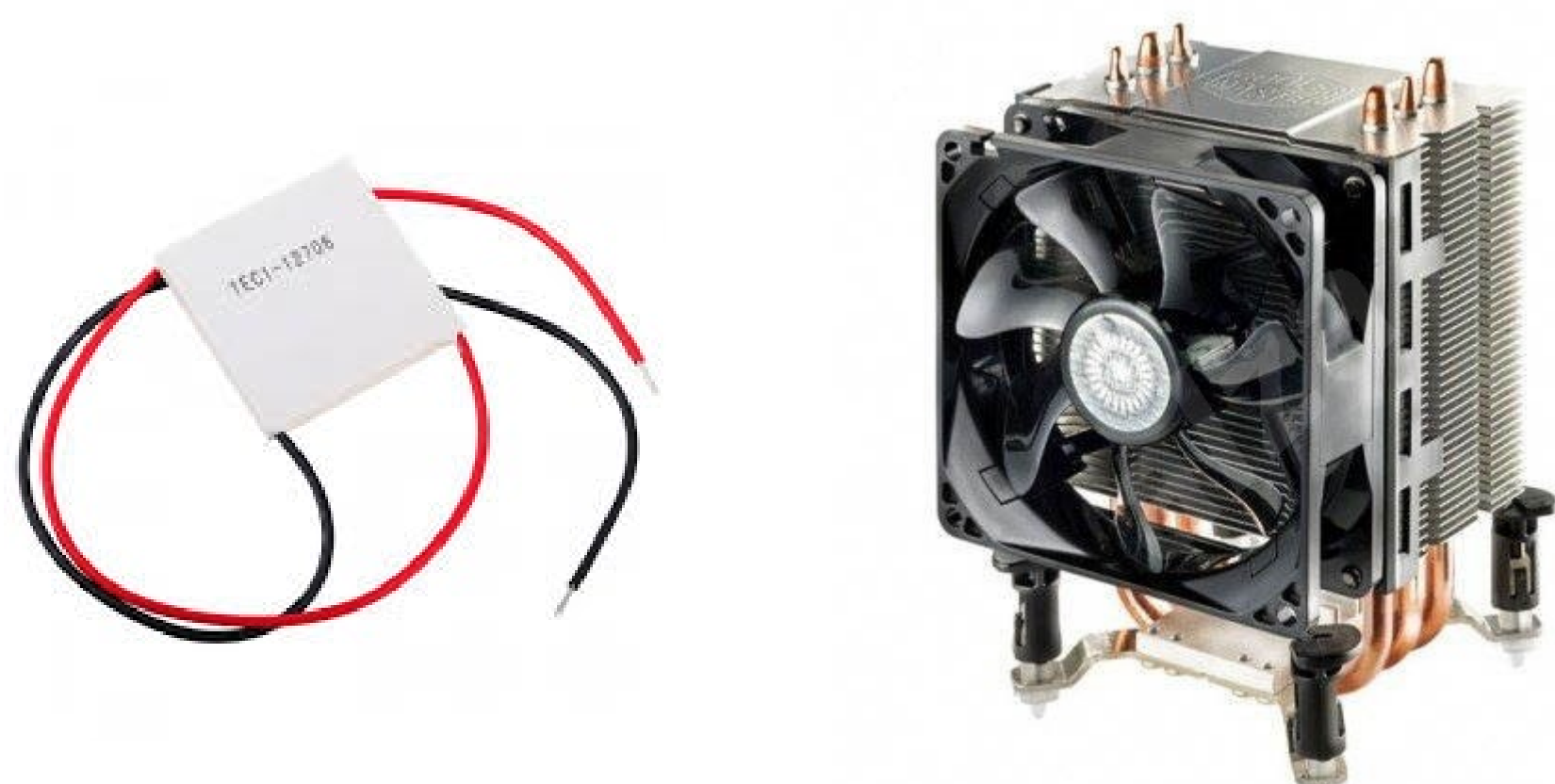


Figure 2 Peltier device and heat sink

## Methodology

in this experiment Peltier devices are used with part number 12706 and 4 of them will be utilized the Peltier device are attached to a heat sink and a cool sink using a thermal conductivity grease /paste, for the running if the experiment 240 v AC to 12v dc converter with constant 2 A current density for the cool sink two version are adopted 1 using a heat a hollow heat sink in a water bath and second system the heat sink utilized is using fins with 1.2 volt fans to extract and cool the heat sink via air

the cooling side has comparatively smaller fins to the heat sink to have better cooling efficacy and equal condensation for vapor from air there are two form of cold sink utilized one each simple on one one each and one single unit cold heat sink connecting all the 4 Peltier devices in parallel for cold condensation side which will reduce the overall Dry spot regions in the coil tips

there are again two ways one with faciliated with fans with 1.2 v flow and one without accelerated flow

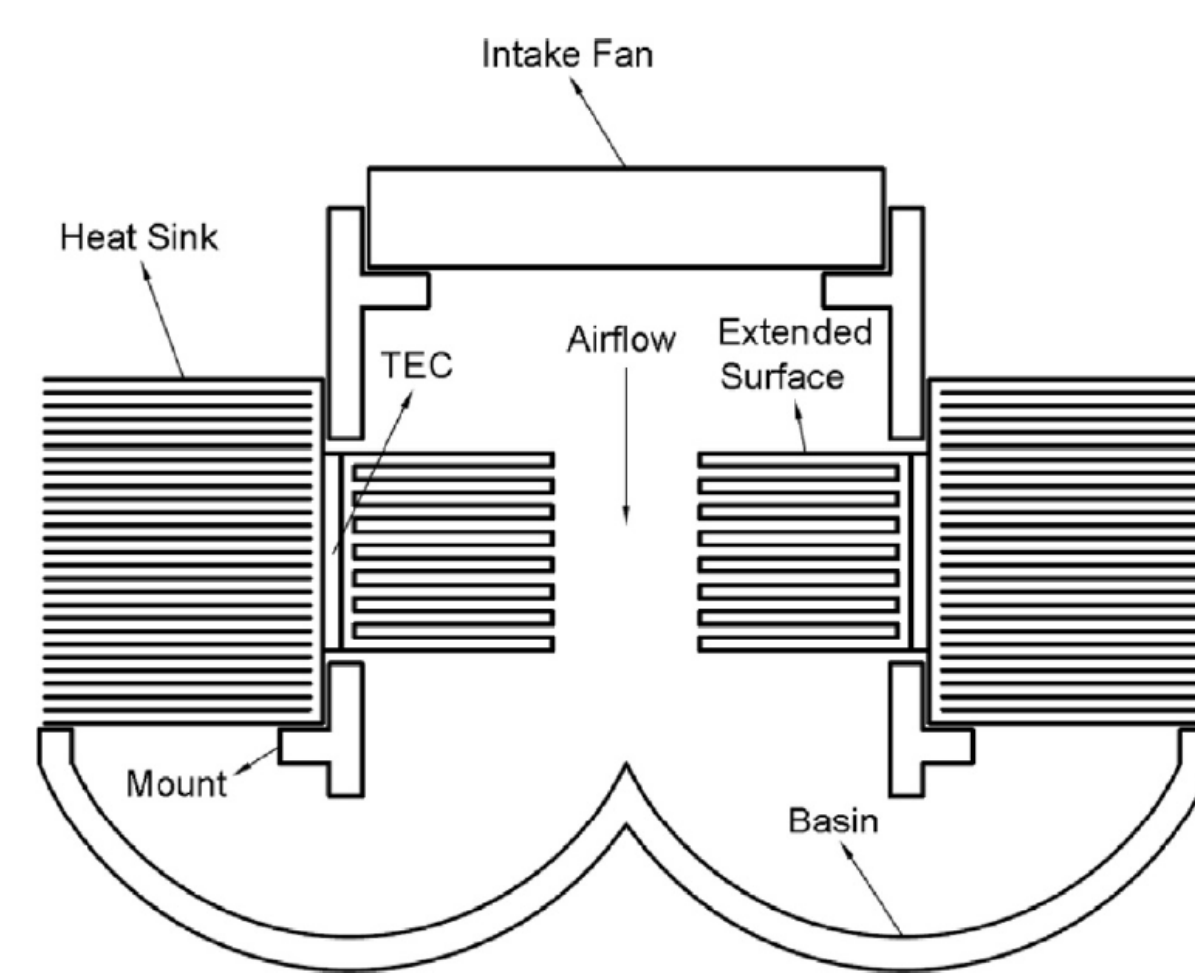


Figure 3: concept of final device

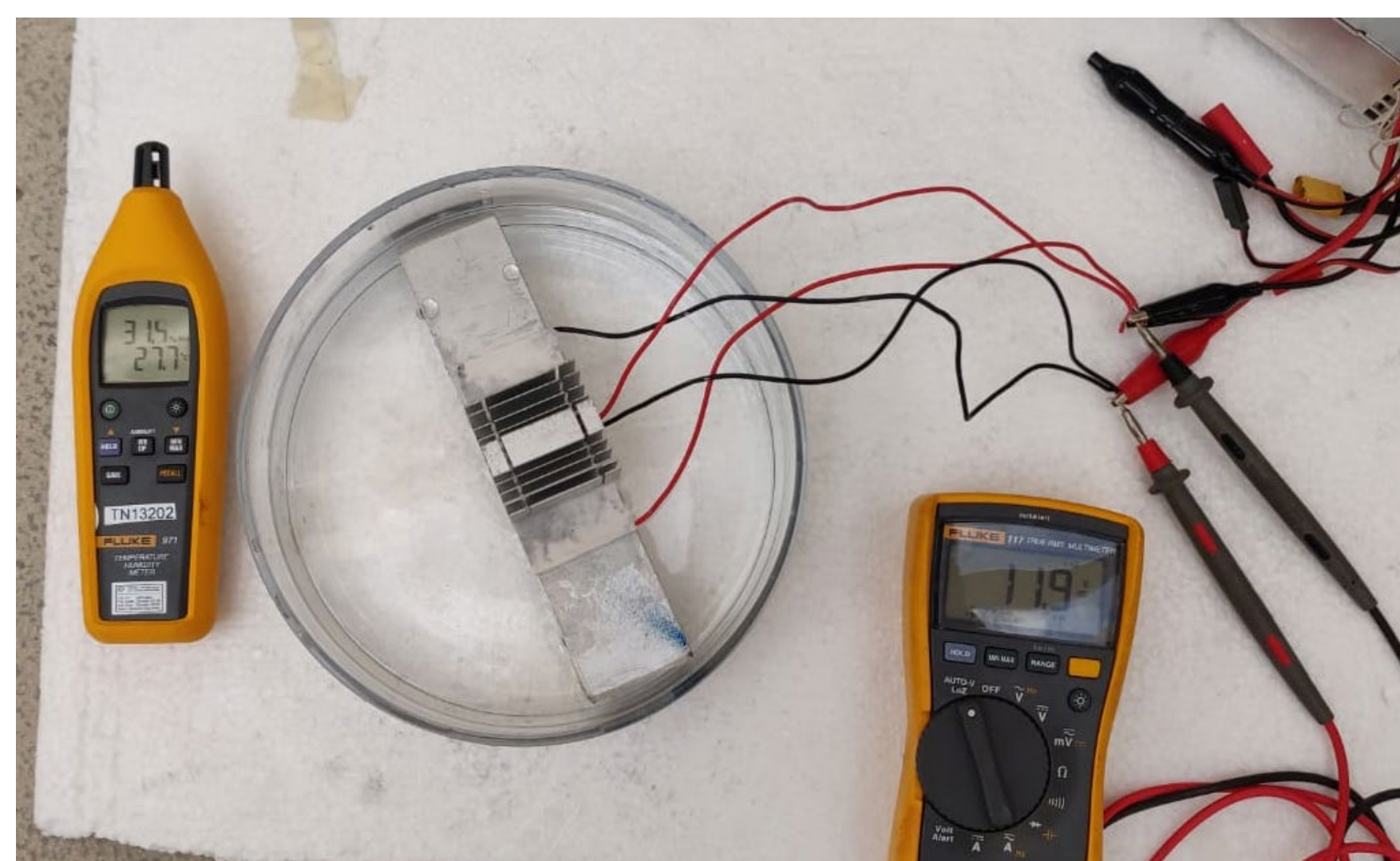


Figure 4: outdoor experimental setup

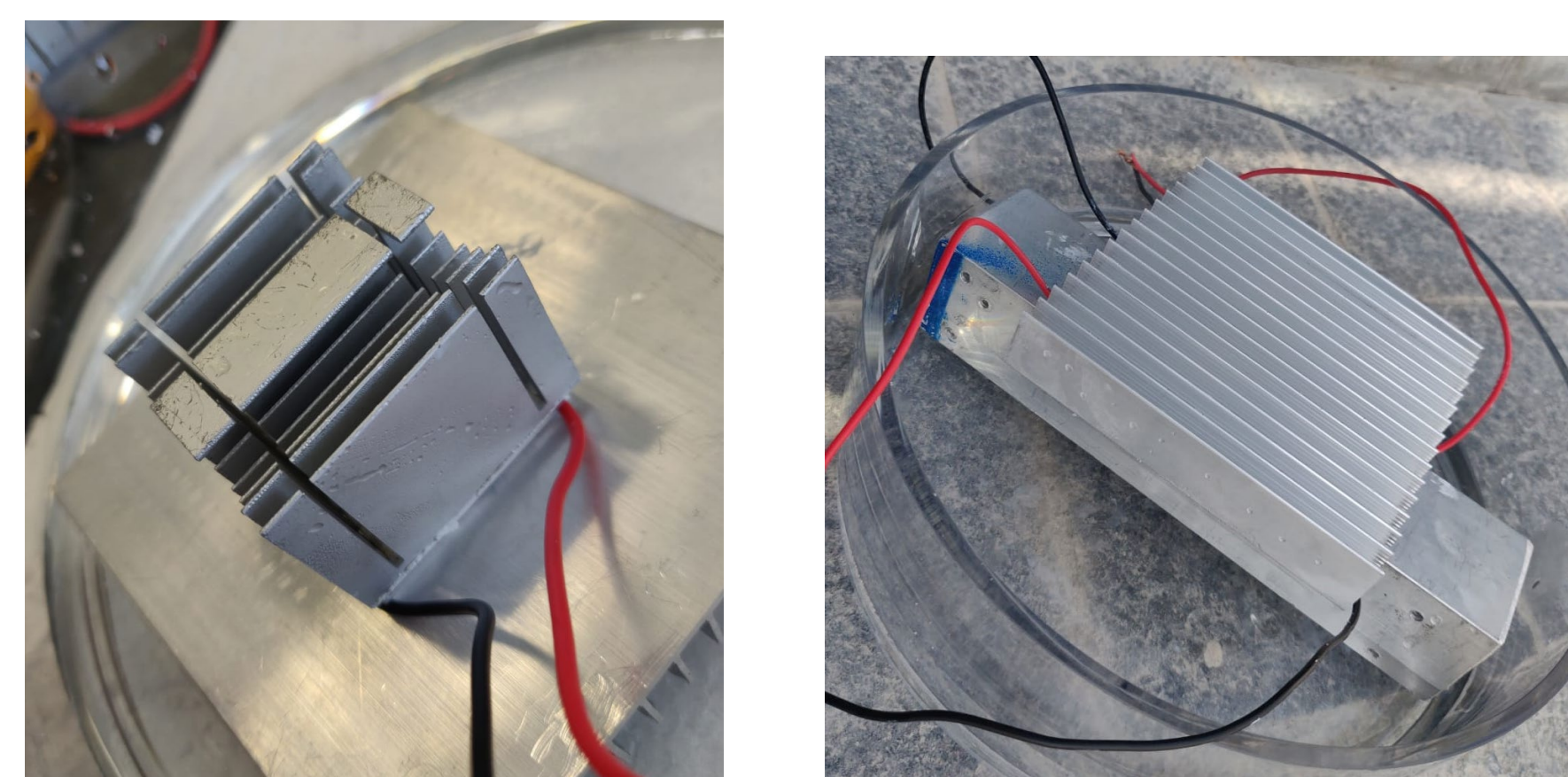


Figure 5: 2 of the 3 set ups used for the experiments

## Results

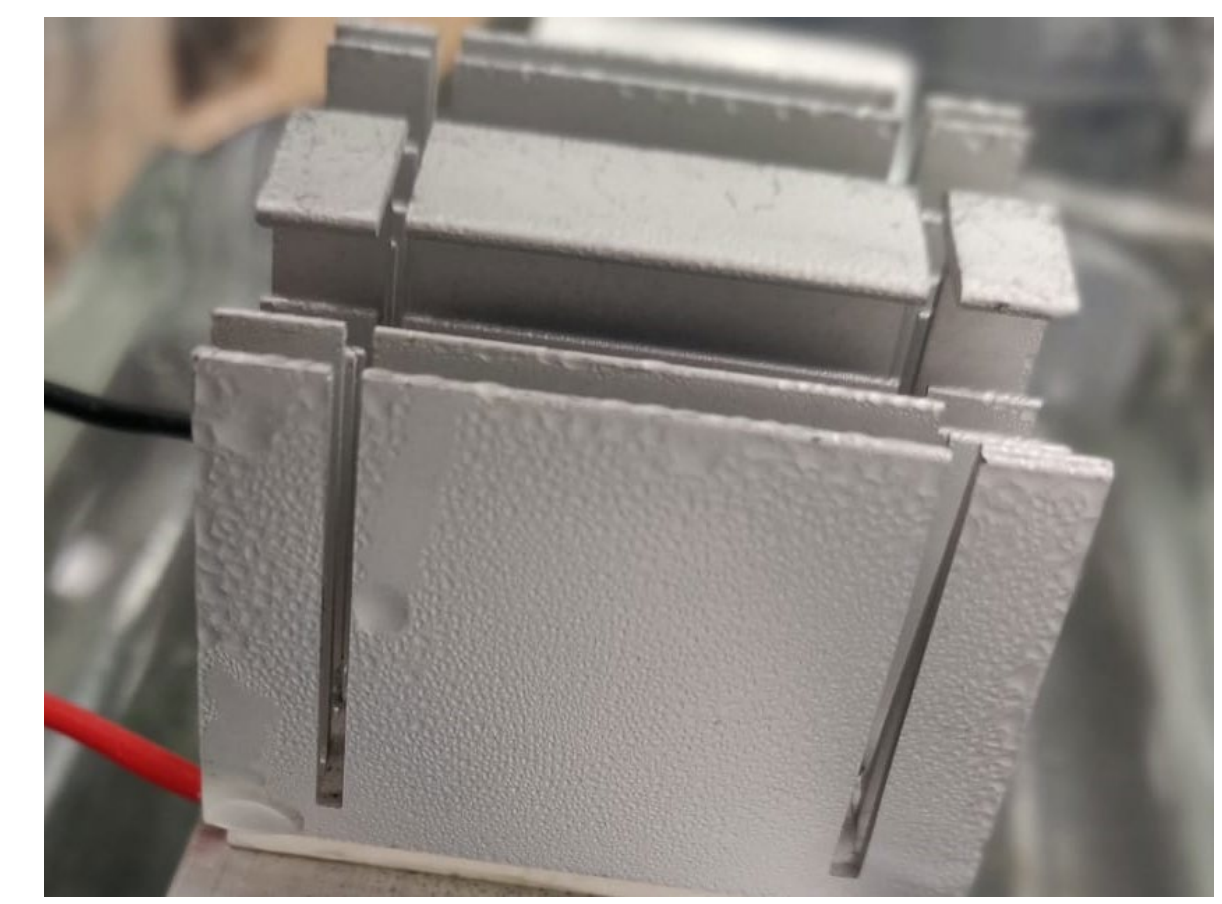
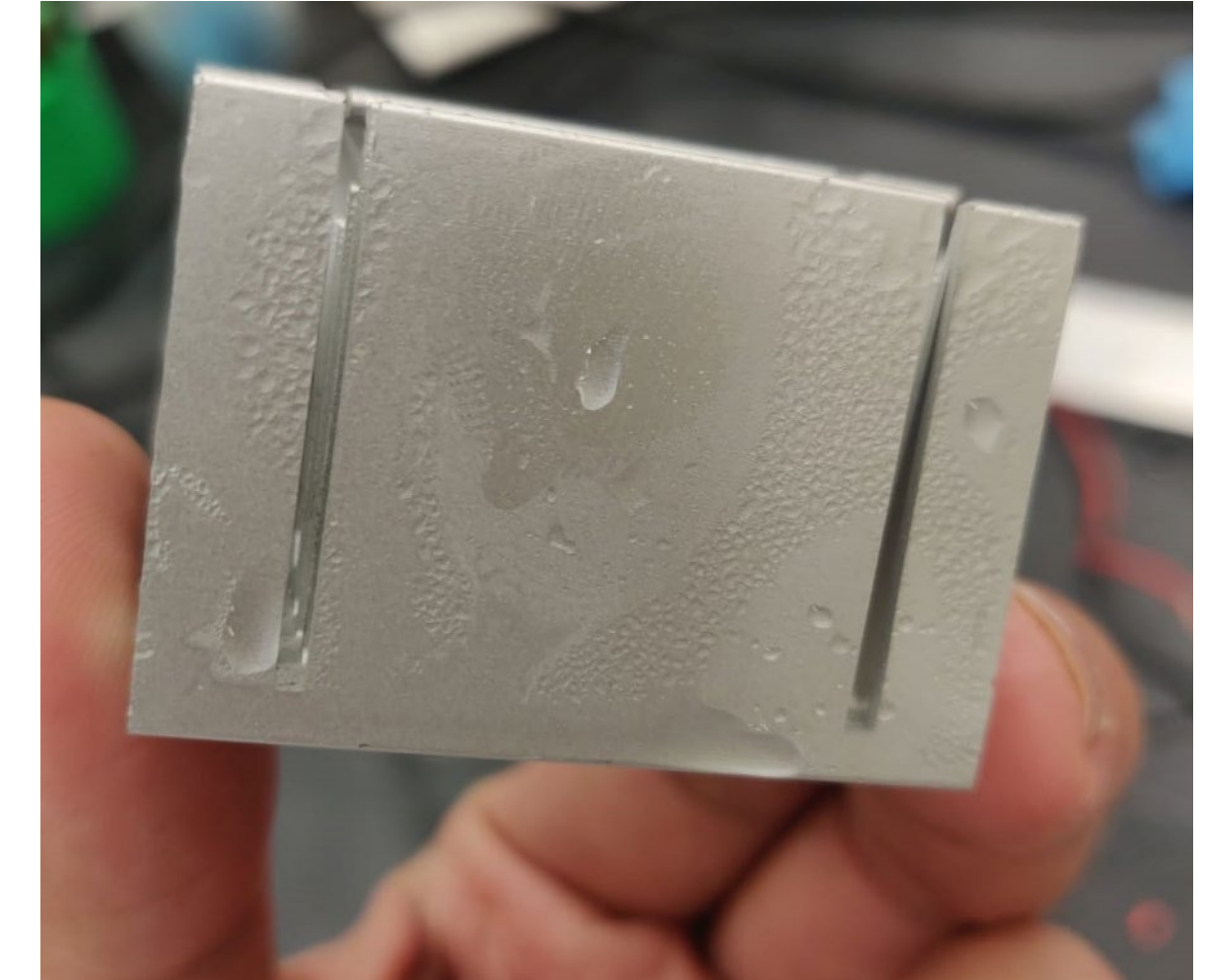


Figure 6 condoner coil after experimental run

- Water condensation with single Peltier device at running at 3 A and 10 volt collected condensate in 20 minute using first arrangement at 38% RH
- Water condensate seen with in 7 minutes at 2 A 12 volt with second arrangement at 40% rh

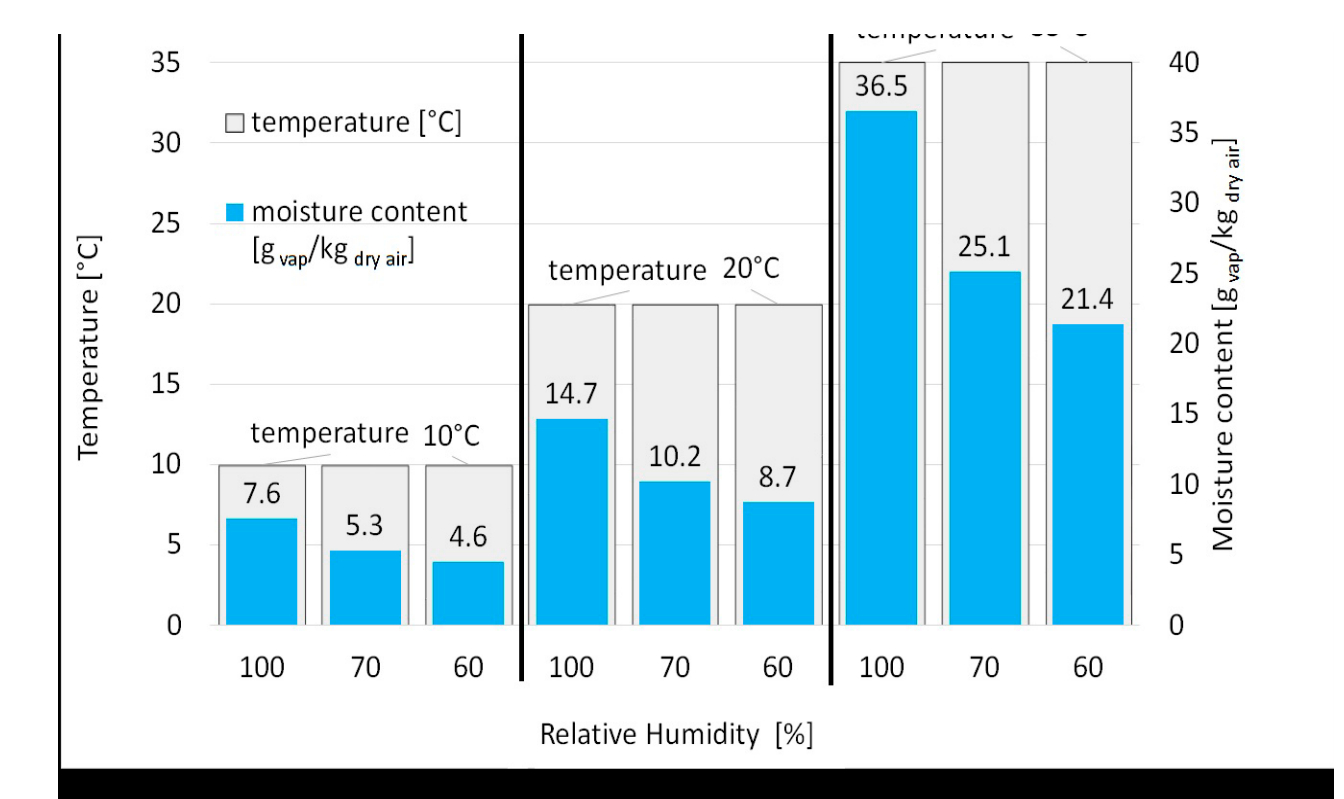


Figure 7 relative humidity graph

## Conclusions

- In this experiment it was analyzed that using a TEC device is able too cool the condenser coil to dew point temperature which condenses the moisture from air
- It was also observed that changing the different type of heat and cool sink has effect on the time required for water drop lets to be formed
- The experiments proves with better optimization and higher relative humidity will be easily be able to condense 100 ml water in 60 mins from single Peltier device
- This system uses very low voltage power supply

## Acknowledgements

This concept was initially proved with the help of Dr Kishore and Dr Khaled Peltier device I also thank continuous support of Dr syed Mohammad javed zaidi