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Modelling and Simulation of Solar Assisted Vapour Absorption Refrigeration System in TRNSYS

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Abstract- The need for effective and sustainable refrigeration technologies has intensified as a consequence of the growing need for thermal comfort across the globe and the continuing increase in Earth's ambient temperatures. In this study, TRNSYS software is used to develop and simulate a solar-powered vapour absorption refrigeration (VAR) system that is tailored to the environment of Karachi, Pakistan. The four-month simulation runs from April to July and replicates seasonal shifts in solar energy availability and system performance. The impact of important operating parameters, such as mass flow rate and chilled water temperature, on the system's coefficient of performance (COP) is evaluated using a thorough parametric investigation. The findings show that, in line with seasonal trends in solar intensity, collector temperature and heat gain peak in April and subsequently begin to decline by July. A chilled water temperature of 16°C and a mass flow rate of 0.4 kg/s yields the highest coefficient of performance (COP), whereas 10°C and 0.25 kg/s yield the lowest COP. Moreover, a decrease in the cooling water mass flow rate leads to a higher outlet temperature, whereas an increase in the cooling water inlet temperature causes the COP to decrease. These results offer important novel knowledge about the optimum parameters for operation.This study further contributes to enhancing effectiveness and efficiency of solar-powered absorption refrigeration systems in local climates.

Keywords- SVACS, TRNSYS, COP, Flat Plate Collector, HVAC System.

I. Introduction

The progression of removing heat from a low-temperature reservoir to a high-temperature reservoir implicates exerting effort in order to sustain the anticipated temperature in the low-temperature reservoir for human comfort or the preservation of any food or medication. This process is known as refrigeration. The required work is mostly done mechanically by the usage of compressors and fans, but that work can also be achieved through other sources like heat, magnetism and laser.

There are a number of applications of refrigeration systems, but these systems are widely used in preservation of food and crops, and for the human comfort in form of air conditioning. Air conditioning systems deals with the artificial treatment of ambient air by utilizing its vital factors such as temperature, moisture content, fragrance, circulation and cleanliness as per desired requirements of occupants.

The history of refrigeration systems goes as far as the requirement of comfort and food preservation for human kind. In the early days the refrigeration was done through natural means such as ice which was either transported from cold areas or was formed at midnight through radiation. In the late 17th century when it was realized that refrigeration through natural means is not sufficient for the mankind, artificial refrigeration was introduced in which the refrigeration was done by compressing an artificially manufactured fluid through the means of a compressor and then circulating it through air sealed system. The only issue with the compression refrigeration systems was their high energy requirement in form of electricity which is an organized form of energy to compress the fluid, and for the solution of this problem a totally new refrigeration systems were introduced named vapour absorption refrigeration systems, which no longer required any compressor or any mechanical means to work but only heat which is a low-grade form of energy can be obtained quite cheaply on earth. [1]

To energize an absorption chiller solar assisted cooling machine utilizes the solar hotness that produce a refrigeration effect in sustainable way; however, with the environmental temperatures, that produces quite a few issues because these gadgets block the interior pipes and stop the chiller operation because of crystalline structure. [5]

Ahmed (2015) in Transient System Simulation Software (TRNSYS) for two different configurations effectuate the simulation of single impact solar geared up cooling scheme primarily based on performance evaluation for two arrangements. The working fluid returns from the absorption chiller's generator in configuration 1, flowing towards the most recent stock tank. If the fluid temperature in the storage tank isn't always as accurate as the required temperature, the operational fluid returning from the absorption chiller in configuration 2 can also grow to be segregated from the collector storage tank loop. This is now sent into the auxiliary boiler. The outcome shown that, throughout the course of the summer, the configuration discussed later produced significantly greater savings than the first configuration. [6]

Stanciu (2017) examined the performance of a parabolic channel collector and a storage tank unit for a single operating day, simulating the single effect H_2O-LiBr absorption cooling of a solar-aided cooling appliance. Under a time-dependent cooling load, the solar absorption scheme's installation became restricted to functioning at grave energy efficiency. In particular, PT1-IST and PTC 1800 (Solitem) are two marketable Parabolic trough collectors that he suggested for solar meeting installation. The results showed that the use of industrial PTC 1800 creditors linked in collection with a renowned storage tank with capacities of about (ninety and one hundred and forty) kg was the most rated use for the scenario under study. The simulation demonstrated that the gadget operates continuously from 9:00 to 18:00 on a normal but slightly varied due to intermittent weather conditions. [7]

Kumar Laveet (2025) in this work conducted thermal performance investigation of solar-driven vapour absorption cooling systems for five major cities in Pakistan with diverse climatic settings using TRNSYS. The cooling system is simulated using two distinctive solar collectors: the evacuated tube collector (ETC) and the flat plate collector (FPC). To evaluate the system's performance the solar percentage (SF) and primary energy savings are used. Increasing collector area increased the solar fraction and $f_{saving,shc}$ while increasing volume of thermal storage resulted in decrease in solar fraction and $f_{saving,shc}$ for both FPC and ETC. At variable thermal storage capacities, the solar fraction diverges very little when using FPC but expressively with ETC. Established on solar fraction and $f_{saving,shc}$ the finest thermal performance was detailed in Peshawar. [8]

Sokhansefat (2017) used TRNSYS software to simulate a 5-ton solar absorption cooling system transiently at the Niroo Research Institute (NRI) in Tehran. A parametric analysis estimates key performance factors, such collector loop mass flow rate, set point temperature of auxiliary boiler, Volume of storage tank, and collector area, affect system performance, predominantly the solar fraction. The outcomes show a potential 28% upturn in performance, and the ideal arrangement was determined to be a 33° collector tilt, boiler set point of 77°C, a collector area of 55 m^2, storage tank volume of 1 m^3, and optimum mass flow rate of 1000 kgh^{-1}. [9]

Anatonopoulos and Rogdakis (1996) calculated in Atenas, Greece using NH_3-$LiNO_3$ and NH_3-NaSCN the performance of absorption heat pumps. The outcomes establish out that NH_3-$LiNO_3$ become progressive to NH_3-NaSCN for heating since it affords an extra heat addition issue and dominant thermal power. The NH_3- $LiNO_3$ system affords an extra cooling electricity, at the same time as an extra coefficient of performance (COP) is accomplished by using NH_3-NaSCN. [10]

Florides (2002) Delivered under regular situations in Nicosia, Cyprus, simulation in Transient System Simulation Software for an H_2O-LiBr sun absorption cooling gadget. The optimization of the slope, storage tank, and place of parabolic sun collector changed into originated on this have a look at. The end result showed that the perfect length of the solar collector 15m_2 with a collector slope of 30° and 600 liters of garage tank for the generation of 84.24 GJ. [11]

Arzoz (2002) provided a 3-kW double effect absorption cooling simulation of NH_3-$LiNO_3$ by implementing a flat solar collector in Madrid, Spain. In accordance to the findings, the device needs operate as a solar collector at 15°C for around 6 hours in order to achieve a COP of 0.3 at a condensation temperature of 250. Thermal fluid reached an exceptional temperature of 100°C with a solar efficiency of 0.27. [12]

De Francisco (2002) carried out an absorption refrigeration machine test for the NH_3-H_2O at a load of 2 KW. The natural convection given off generated heat in absorber and condenser constituents and the scheme changed into manually controlled. A very small (0.05) COP acquired inside the consequences confirmed; however, the authors concluded that using force convection it could be optimized. [13]

Asim (2016) in his study utilized evacuated tube collector and an absorption chiller powered by boiling water were implemented to represent the system in TRNSYS software. Initially, a 12 cubic meter warm water storage tank was used for maintaining the indoor temperature at 26° C or below. During the cooling season, the collector area was feasible to sustain the room temperature at 26° C or lower. [14]

Agrouaza (2017) modelled in several cities of Morocco the solar cooling system and it was regular that the best annual COP value of 0.33 and solar fraction (30%) was acquired by Errachidia city. COP values were diverse from 0.12 to 0.33 totally across the year in other regions. [15]

In commercial absorption cooling system, the NH_3-H_2O and H_2O-LiBr are the traditional absorbent/refrigerant combinations practiced due to benefits in their thermodynamics properties with the greater COP acquired by Lithium Bromide-Water than ammonia-water system, though crystalline problems it has. The ammonia-lithium nitrate and NH_3-NaSCN system are fit choice to ammonia-water. Additionally, the positive aspect of working in air conditioning or refrigeration is possessed by each. Even yet, at high generator temperatures, the COP values are considerably higher compared to that of the NH_3-H_2O system. [16]

Kumar and Ambikesh (2025), in this study integrate both detailed indoor and outdoor experimental investigation with the development and evaluation of an aqua-ammonia diffusion Absorption Refrigeration (DAR) system with Photovoltaic (PV) technology drivers. Tests conducted outdoors assess actual operation under hot climate conditions, while indoor tests examine start-up conditions, thermal inputs, and evaporator loads to create performance characterizations and assess dynamic behavior. The system kept the evaporator temperatures from -9.5°C to 3.5°C for 94 hours of continuous operation, exhibiting a 12-13% efficiency in PV cells and an overall COP of 0.055, proving its viability for off-grid cooling applications in remote locations. [17]

Shirazi (2016) performance combined with solar thermal systems of single and multi-effect absorption chillers for collective heating and cooling solicitations was evaluated through a thorough feasibility study. According to the simulation results, using concentrating solar collectors in combination with multi-effect absorption chillers does not expressively advance single-effect systems when direct normal irradiance (DNI) is truncated. Though with multi-effect absorption chillers the installation of parabolic trough collectors in aggregation becomes reasonable in areas anywhere the direct component of solar irradiance accounts for approximately 60% of the total daily solar input. In these conditions, the system's efficiency and economic viability are improved by the smaller solar collector area requirement. [18]

Al-Alibi (2012) with single effect absorption chiller in Abu Dhabi estimated the performance of a solar system in a warm/ humid climate. He showed that paralleled to customary vapour compression cycles, the electrical energy consumption is 47% lesser. Their outcomes also specify that the collector area expressively affects the payback period in terms of economic enactment. [19]

Mammoli (2010) aimed at evaluating the active overall performance of the solar single impact absorption chiller at a certain time of the year by using certain direct procedures. The findings show that insulating the hot water storage tank can increase the solar portion by up to 60%. [20]

Eicker (2015) Investigated in various climatic situations a sun cooling machine; economic and lively overall performance are their high cognizance, viewing that the machine layout and active load has considerable role within the performance of the gadget it's miles viable to decrease the principal power of 40%-70%. [21-22]

Cucumo (2013) have accomplished by atmospheric air with parabolic trough creditors cooled a thermodynamics investigation and valuation of performance of solar vegetation. The plant life was inspected in two diverse operating approaches: at a constant flow rate and fluctuating outlet temperatures, and at an irregular waft fee and constant temperature at the collectors' aperture. The results achieved established an excellent performance with the assistance of that type of plant, which practices ambient air as a substitute for the extravagant and novel fluids. Because air functions as the engine's working fluid and the surrounding air is also suitable for the compressor's intercooling, it is also far less ostentatious from an engineering standpoint and demands no water. [23]

Regue (2014) investigated to enhance the processing of solar energy to thermal energy and curtail heat loss. They generated a comprehensive theoretical model accounting for parameters like average monthly solar radiation, direct beam radiation on the reflector, geometric concentration ratios, and the dynamics of heat transfer flanked by the receiver and collector. In addition to precise temperature estimation at the receiver, this model showcases the system's achievement of operational temperatures from 70°C to 200°C, which is appropriate for medium-temperature solar thermal applications. [24]

Drosou (2017) in his work has validated that enabling the using of a concentrated solar collector leads to prominently greater output temperatures in imperative to take advantage of the application of a double-stage absorption chiller with a greater coefficient of performance. On the other hand, the CST system takes up less area than a conventional flat plate collector when heat at low or moderate temperatures is preferred. The convergence of these factors allows for the removal of predominant challenges hindering the adoption of solar cooling technology, subsequently enhancing its performance beyond that of traditional air conditioning systems. The perseverance of the project was to develop an optional solar cooling system prearrangement for the building that would meet its energy requirements. The outcomes of these simulations are displayed in terms of economy performance, investment cost, solar percentage, and thermal loads. Assessments are generated with the intent of obtaining the most effective solar energy feasible to fulfil the room's energy requirements. [25]

Hussain (2025) conducted a TRNSYS-based performance analysis of a solar-assisted single-effect LiBr–H_2O absorption cooling system under the hot-arid climatic conditions of Peshawar, Pakistan. Their results demonstrated that the system was able to maintain stable chilled water temperatures around 7°C while achieving significant primary energy savings through optimized collector area, tilt angle, and thermal storage sizing.[26]
According to Lin (2025), the proposed solar-assisted desiccant wheel and adsorption cooling system achieved the highest average system COP in humid, high-solar-irradiance climates such as Guangzhou, while cooler or overcast conditions reduced performance and increased auxiliary energy requirements. [27]
Various research have been conducted on Vapour Absorption Cooling system but these studies were primarily limited to regions with dry and temperate conditions, and idealized climates. Due to which there is deficiency of inclusive dynamic modelling using the real time meteorological data that analyze the solar configuration performance under the hot and humid coastal climates as inherited by Karachi. By developing and simulating a Vapour absorption system for the real weather data for Karachi this study discourses this gap.

II. Vapour Absorption Cycle Description

The solar collector, generator, absorber, pump, condenser, expansion valve, and evaporator are the fundamental elements of a vapour absorption refrigeration system. This system incorporates a solar collector, which is made out of copper tubes painted black and housed in a glass container, to gather thermal energy from sunshine. Along with contributing to improving solar radiation absorption, its design makes it easier for heat to be transferred efficiently to a circulating solution of water and lithium bromide (LiBr). Water vapour is generated while the solution heats up and transferred to the condenser, where flowing water cools it. After going through an expansion valve, the condensed water's temperature and pressure decline. After entering the evaporator, the low-temperature, low-pressure water evaporates. The enriched LiBr solution in the absorber absorbs the resultant water vapour, releasing heat that is typically dissipated by cooling coils. The cycle is then perpetually continued by pumping the diluted solution back to the generator.
The temperature differential between the generator, condenser, and absorber coils determines the thermodynamic efficiency of vapour absorption systems. However, because flat solar collectors are used, the generator temperature of the solar vapour absorption cycle is mild, thus it is crucial to maintain the condenser and absorber temperatures as low as feasible. Because of its lower evaporation temperature, which aids in constructing the absorber and condenser to the lowest temperature constraints, the lithium bromide solution is marginally more practical than the ammonia water solution. [1]

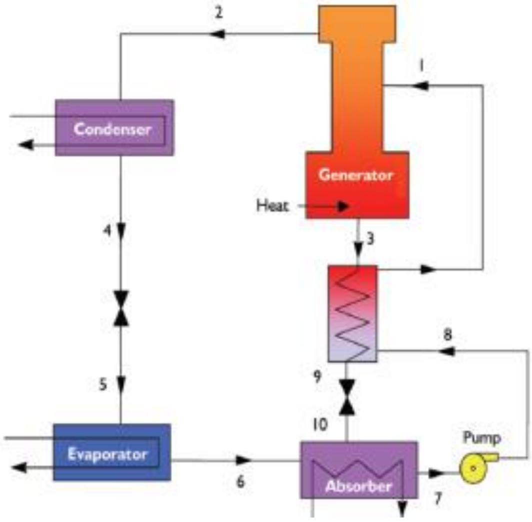

Figure 1: Schematic of Vapour Absorption Refrigeration Cycle (adapted and reproduced from [28])

III. Solar Vapour Absorption Refrigeration System

The invention of a sustainable refrigeration system named Solar vapor absorption systems have showed us the path towards to resolve problems like increasing energy demand and depletion of ozone layer and increasing global warming. This refrigeration system became very popular due to its higher efficiency and mostly for that it does not disturbs our natural environment. From a financial viewpoint using solar energy as a prime energy source is very eye catchy due to its global availability and it also to this that it comes without a price tag. What can be better than this no environmental impact and no running cost? The total power received by earth from the sun is $1.8x10^{11}$ MW, which is way much higher than the current energy consumption rate of the mankind. [1]
The figure 2 shows the schematic diagram of solar vapour absorption refrigeration system.
The cleanliness and its sufficient supply all over the world makes the solar energy one of the most promising nonconventional energy source. The only problem regarding solar energy is its variation in its intensity across the day with respect to time, which can also be overcome by storing the solar energy in its peak time for the later usage. [1]

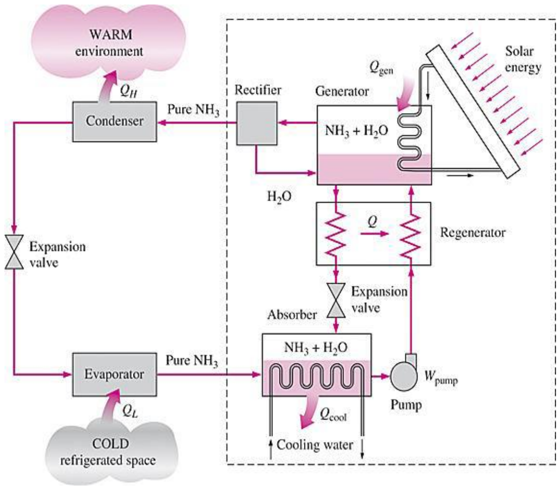

Figure 2: Schematic Diagram of Solar Vapour Absorption Refrigeration System (adapted from Çengel, Y. A., & Boles, M. A. (2015). Thermodynamics: An Engineering Approach (8th ed.). McGraw-Hill Education.)

IV. MODELLING IN TRNSYS

The determination of this study is to develop a TRNSYS model of solar assisted vapour absorption cooling system and then simulate this model for the weather condition of Karachi and then signify the influence of various input parameter on the performance of absorption chiller.

Firstly, the idea is developed from the fact that cooling demand of the present world is increasing day by day resulting in the increase in the demand of electrical power so idea was to develop a cooling system that uses renewable sources for its working therefore solar assisted vapour absorption arrangement is the best alternative of the conventional refrigeration system.

Once the idea is developed literature review of the related work is carried out to further understand the scope of this work and acquiring further information in this regard.

After literature review, the system is modelled using TRNSYS software and after the modelling is accomplished, the Meteonorm software is used to analyze the weather profile of Jamshoro to select the operating period for the system, then the system is simulated for the weather conditions of Karachi using the TRNSYS software

Finally, the parametric analysis is carried out to investigate the effect of various input parameters on the performance of the system.

V. TRNSYS SOFTWARE

TRNSYS offers a full and extensible simulation platform including multi-zone buildings. Engineers and researchers around the world validate new energy concepts using it from basic home water heating systems to building design and simulation and their equipment, occupant behavior, alternative energy systems (wind, solar, photovoltaic, hydrogen systems), control strategies etc. Via all prevalent programming languages (C, C++, PASCAL, FORTRAN, etc.), customers and external designers may swiftly construct conventional module prototypes owing to the DLL-based scheme. Additionally, TRNSYS may be freely incorporated with an extensive array of supplementary programs, such as Microsoft Excel, MATLAB, COMIS, and others, permitting pre- or post-processing or collaborative calls during the simulation. The application of TRNSYS software includes:

- Cogeneration, fuel cells
- Solar PV and Solar collector-based systems
- Wind/ Hydrogen energy systems
- Advanced/ novel design structures of Zero energy buildings and HVAC systems (natural ventilation, slab heating/cooling, double façade, etc.)
- Any kind of thermodynamic system that necessitates dynamic simulation.

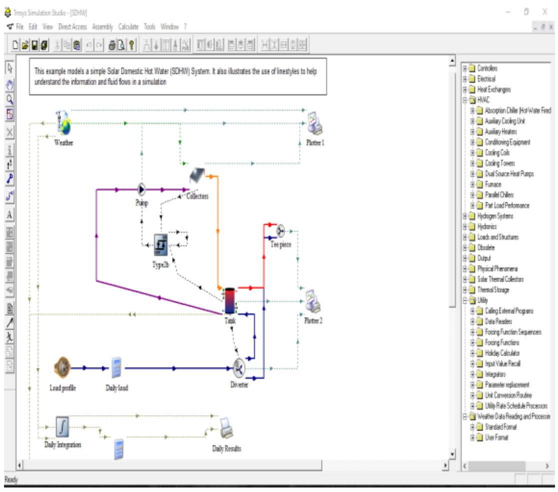

Figure 3: TRNSYS Software Simulation Studio

VI. DESIGN AND SIMULATION OF SOLAR ASSISTED VAPOUR ABSORPTION SYSTEM

System Description

The configuration in Figure 4 shows the system design adopted for this study. In order to evaporate the refrigerant in the generator the absorption chiller receives hot water at 100°C from the thermal storage tank.

In fact, this setup is customarily used when there is a pooled storage between the solar collector and the absorption chiller loop. As extended as the hot water temperature at the storage tank's outlet stays lower than the predetermined threshold, the auxiliary heater will supply the remaining heat and bring the water's temperature up to the requisite level. Between the storage tank and the solar collector, a controller standardizes the current of fluid. When the collection's exit temperature increases above its inlet temperature, the controller actuates the pump.

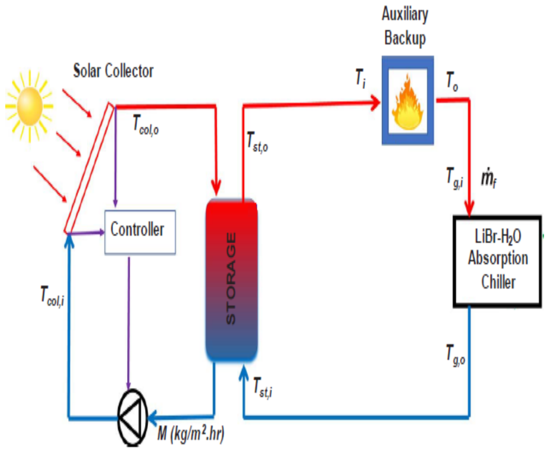

Figure 4: Illustration of Model Design and its Primary Components (Adapted and Reproduced from [6])

VII. TRNSYS MODEL

For the climatic conditions of Karachi, Pakistan (24.8607° N, 67.0011° E) with a peak cooling load of 5 tons of refrigeration (17.55 kW), a solar-assisted single-effect absorption cooling system is designed and dynamically simulated in TRNSYS version 16. Thermal requirements for the system are based on the hot humid climate of Karachi. For performance assessment, Typical Meteorological Year TMY data is applicable. The goal of this research is to perform a comprehensive dynamic system analysis under varying operational and environmental conditions, as well as the influence of key design parameters such as solar collector area, storage tank volume, flow rates, and their impact on performance and energy efficiency. To achieve these objectives within TRNSYS, some reasonable approximations are made which do not alter the dynamic behavior of the system.

- During simulation, the implications of the working fluid's boiling or freezing aren't taken into consideration.
- All the piping system is considered perfectly adiabatic to neglect any heat loss in the associated piping and/or valves.
- Any loss of mass of working fluid is not incorporated during simulation as no pressure relief valve is used.
- Between the components and the ambient there is no heat exchange.
- Any the transport delays in the fluid cycles are neglected.

The representational interpretations of the solar cooling system in TRNSYS for the configurations discussed in the previous section is shown in Figure 5.

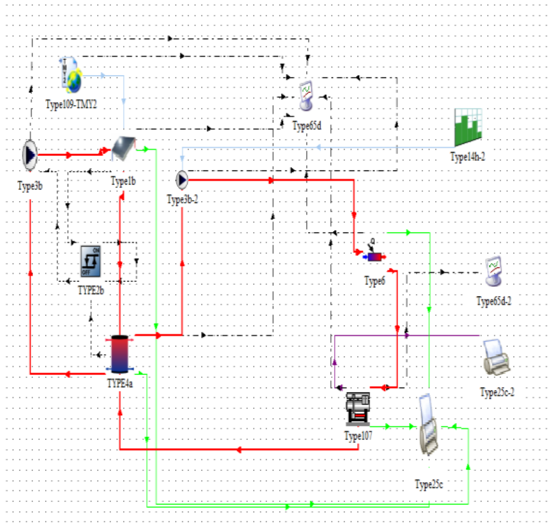

Figure 5: Visual Representational of the Configuration in TRNSYS Simulation Studio Environment

VIII. RESULTS AND DISCUSSION

Weather Profile

The weather profile was reviewed in order to determine the absorption cooling system's (ACS) period of operation. For the purpose to execute this investigation, a year's duration of atmospheric variables acquired through Karachi city's meteorological data were simulated employing Meteonorm 7.2 software.

Meteonorm calculates a long-term weather profile in detail and provides user-definable meteorological inputs. The climate profile was then analyzed and presented in the form of the following graphical illustrations, each highlighted by key environmental parameters that significantly influence the operation of the solar-assisted absorption cooling system: Figure 6 Ambient temperature variations throughout the year, including maximum and minimum daily temperatures Peak ambient temperature values occur during April and July, during which daily maximum temperatures are always exceeding 42°C. Such temperatures directly influence the thermal load and, accordingly, the operational efficiency of the cooling system. Figure 7 Solar radiation variation throughout the year, both global and diffuse. Global radiation indicates that, between April and July, the month with the highest solar insolation is located from April to July. There are higher levels of global radiation than at any other month of the year, resulting in greater solar energy availability during this period. This increase in available solar power is critical to maximize the effectiveness of the solar thermal collectors as the primary input of power for the absorption system. Figure 8 Sunshine duration trends as well as astronomical sunlight duration over the year are shown. Days with the longest effective sunshine periods of the year, a crucial element for the efficient harvesting of solar energy, occurred between April and July. These longer daylight hours further enhance solar energy capture potential, further increasing the feasibility and efficiency of the solar-driven cooling process during the coldest periods of the year.

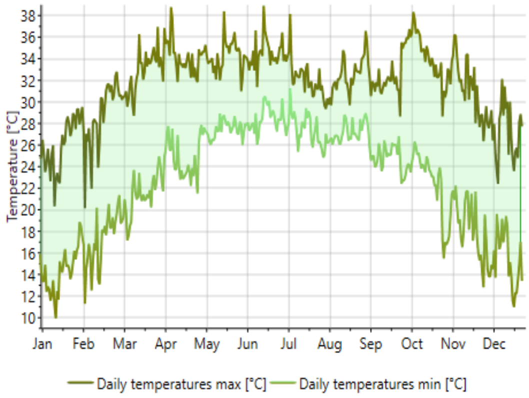

Figure 6: Monthly Variation of Maximum and Minimum Temperatures for Karachi

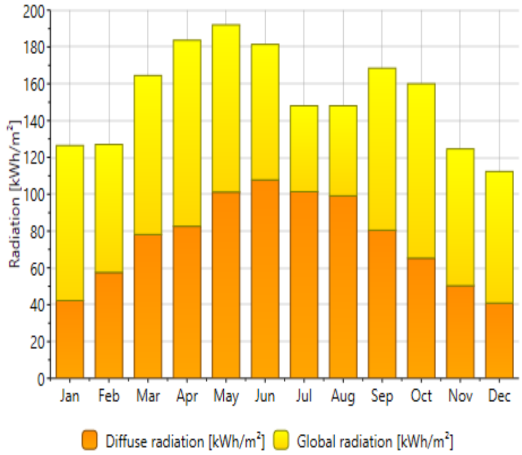

Figure 7: Monthly Variation of Global and Diffuse Radiation for Karachi

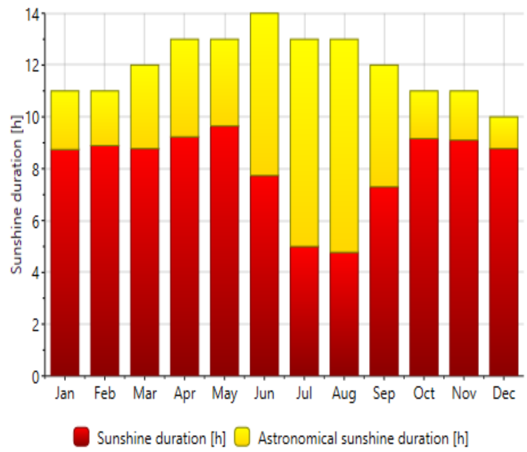

Figure 8: Monthly Variation of Sunshine Duration

Recognizing that of the maximum ambient temperature, global and diffuse radiation, and sunlight length, the period from April to July (2160-5088 h) was selected for operation of the absorption system depending on the meteorological observations presented above.

Dynamic Simulation Results

This section shows the graphical representation of the dynamic output of several parameters for the months of April, May, June and July, including ambient temperature, chilled water temperature, collector temperature, average storage tank temperature, collector heat gain, and COP.

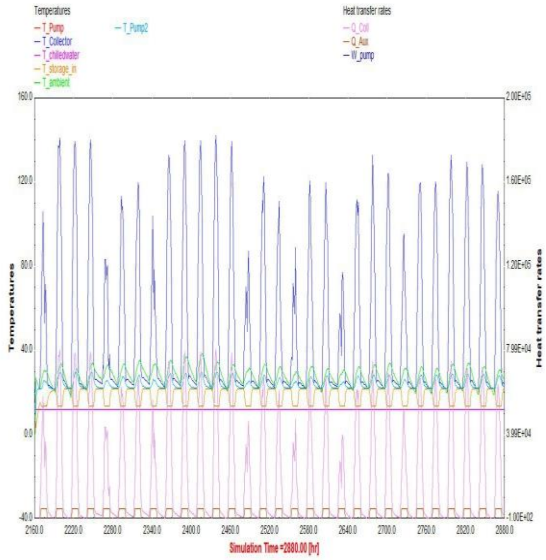

Figure 9: Dynamic Simulations for April

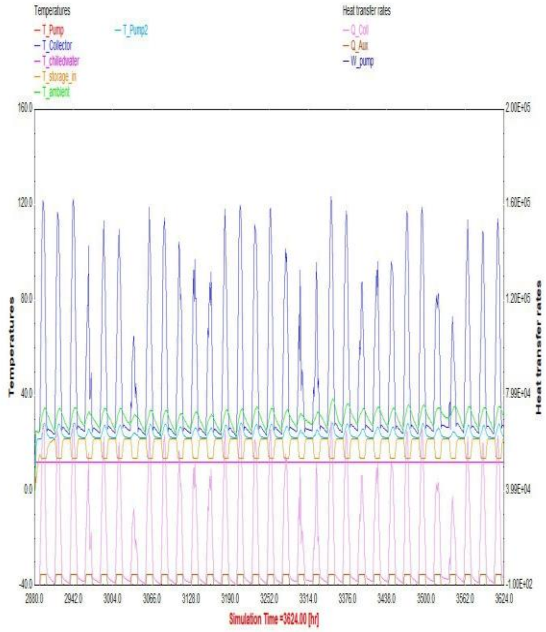

Figure 10: Dynamic Simulation for May

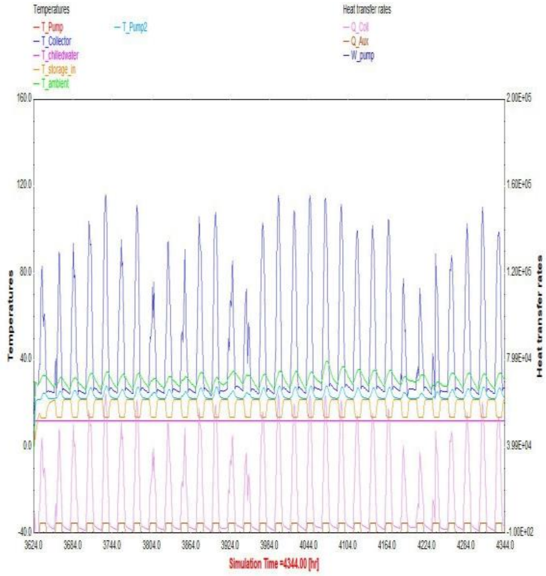

Figure 11: Dynamic Simulations for June

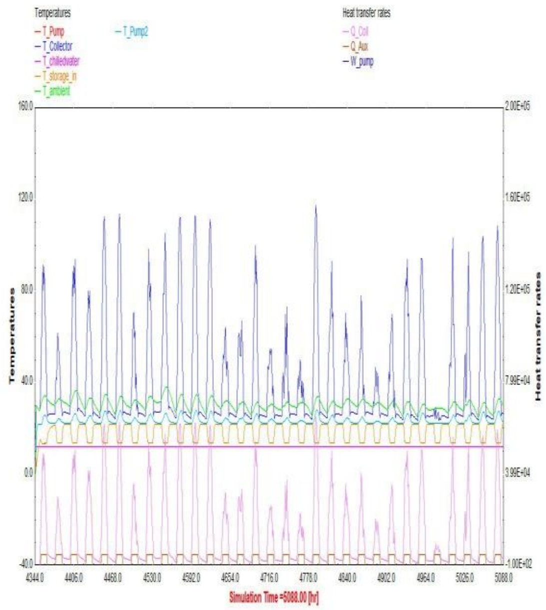

Figure 12: Dynamic Simulations for July

Based on the graphical representation of the collector temperature and heat gain, the data indicating monthly fluctuations of system performance are presented. April has the highest peak values for collector temperature — meaning that the primary loop can attain its maximum temperature during this month. The collector heat gain peaks in April mean that the most amount of heat is transferred to the primary loop, which thus has the highest absorption of solar energy from the sun in that month.

In contrast, July has the lowest peaks for both collector temperature and heat gain — meaning that the primary loop receives the lowest amount of heat in July — representing reduced system performance under the conditions of that month. The data for May and June reflect moderate collector temperatures, which are located between April and July in terms of thermal performance. The other parameters of the system remain relatively constant throughout the four-month period: As noted, while solar input and temperature change seasonally, the other aspects of the system do not change significantly. Additional conclusions reflect an interest in taking seasonal consideration into account when optimizing performance of solar thermal systems.

Parametric Analysis

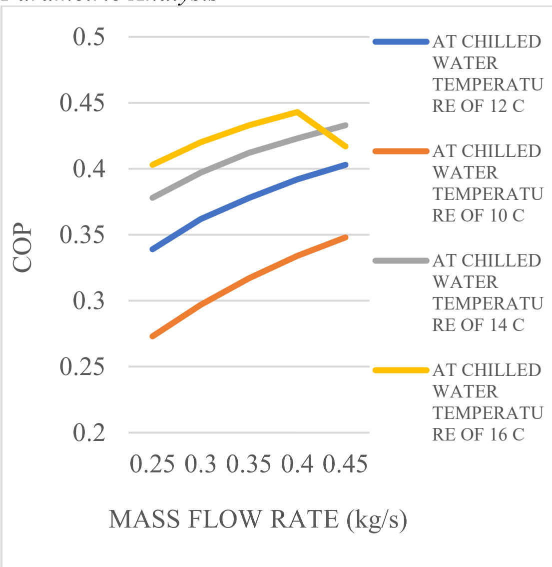

Figure 13: Effect of $T_{chilled}$ and $m_{chilled}$ on COP

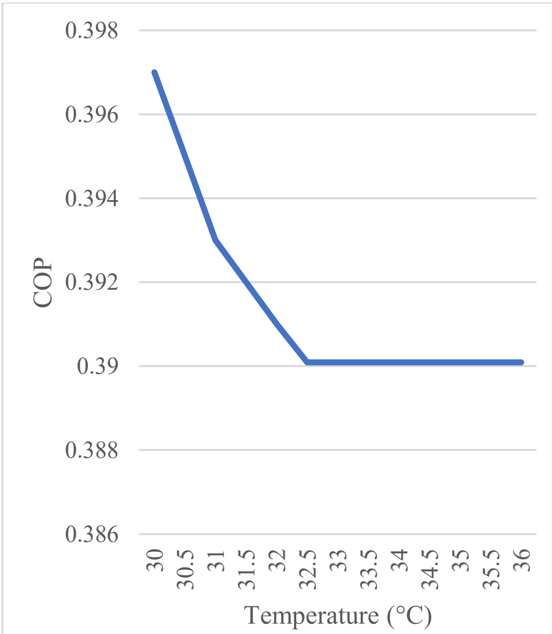

Figure 14: Effect of Cooling Water Temperature on COP

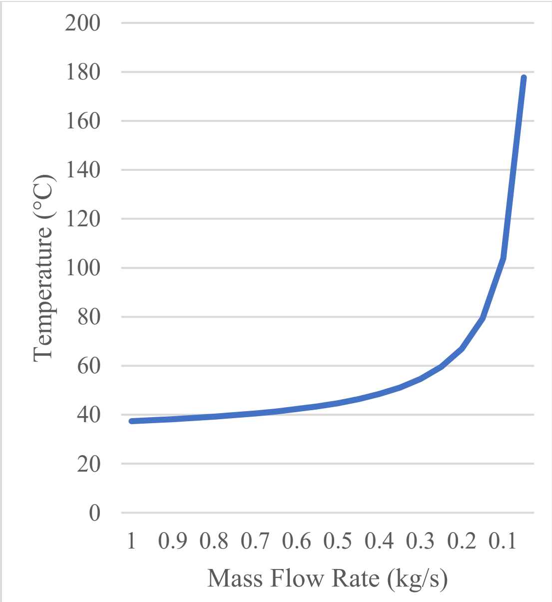

Figure 15: Effect of $m_{cooling}$ on $T_{cooling}$ Outlet

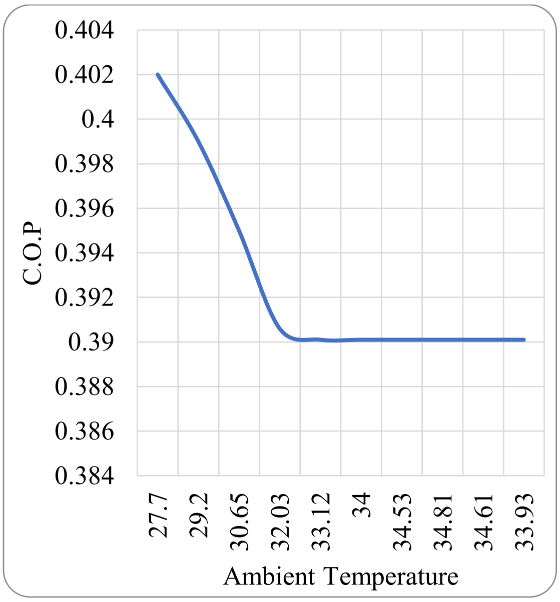

Figure 16: Effect of Ambient Temperature on COP

IX. Conclusion

In order to assess the thermal performance of a solar-assisted single effect absorption cooling system with a maximum cooling capacity of 5 TR was developed and simulated on TRNSYS in this investigation. All the available standard TRNSYS library modules are used. The system is simulated for four months from April to July using the meteorological data of Karachi (24.8607° N, 67.0011° E) in Pakistan. Furthermore, a parametric analysis has been performed to study the effect of the chilled water intake temperature, chilled water mass flow rate, and cooling water inlet temperature on the system performance. Performance data from the system show seasonal variations and operation characteristics which are discussed below:

- Collector temperature and heat gain peak in April and July respectively. This indicates that the primary loop is at its hottest temperature during April (April was chosen as the most efficient month for solar energy collection).
- In July the collector temperature and heat gain peak at their lowest points and implies a low heat transfer to the primary loop.
- Other system parameters are relatively consistent over the four months.
- The system has its highest coefficient of performance at 16°C chilled water with mass flow rate of 0. 44 kg/s and low pressure on discharge (temperature of 10°C for 10 minutes and 0. 25 kg/s in summer).
- Any increase in the cooling water inlet temperature causes the COP value to decrease. COP decreases to 30. 5% when the inlet temperature is 32. 5°C and no change is further due beyond this value.
- When the cooling water mass flow rate is reduced, the outlet temperature increases. An increase in the outlet temperature occurs especially when the cooling water mass flow rate is less than 0. 02 kg/s because the outlet temp rises rapidly.
- Higher ambient temperatures also cause lower COP values.

Future Recommendation

The future work recommended for this project include:

- To construct the solar vapour absorption cooling system's working model.
- To perform the load calculation for a particular space/zone and then design the system for this load.
- To perform environmental and economic analysis of this system.
- To perform
- feasibility study of proposed model for different cities in Pakistan

Nomenclature

ACS	Absorption Cooling System
COP	Coefficient Of Performance
FPC	Flat Plate Collector
PTC	Parabolic Trough Collector
TRNSYS	Transient System Simulation Software
SVACS	Solar Vapour Absorption Cooling System

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