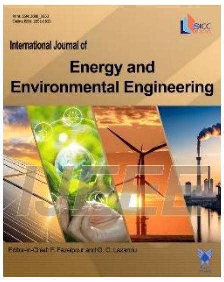

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Research Article

Thermodynamic Simulation of An Innovative Combined System Including CO_2 Power Cycle and Organic Rankine Cycle in Order to Reduce CO_2 Emission

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Original Research

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Abstract

In this research, by simulating the newly invented Allam cycle and creating a combined cycle based on Allam, the CO_2 produced in the Allam cycle is used as the working fluid and in addition to reducing the greenhouse effect, the energy wasted in the Allam cycle will be used as the energy supplier for two medium temperature and low temperature cycles. Reducing energy waste by creating a new combined cycle will lead to an increase in the LHV efficiency of the power plant and consequently reduce global warming and environmental hazards**.**Using Thermoflow software, the Allam cycle, organic Rankine cycle, and Rankine cycle were simulated, and then the aforementioned cycles were combined to reduce energy loss and the results were examined. The simulated combined cycle, in an ideal case, will increase LHV by 0.5% compared to the Allam cycle, and by considering the energy loss by the components in the Allam cycle, and then creating a combined cycle, it will increase efficiency by 0.98%**.** The creation of a combined cycle led to a reduction in energy loss in the system. The CO_2 produced in the power plant was contained in the system and also by examining the environmental conditions of the power plant and increasing the pressure to 1.127 bar, relative humidity of 10 %, and temperature of zero degrees, the LHV efficiency of the power plant increased. Increasing the efficiency of the power plant, reducing energy loss, and also absorbing CO_2, all will lead to a reduction in global warming and increasing environmental protection.

Keywords: Allam cycle; Net Power cycle; Organic Rankine cycle; Greenhouse effect reduction; Environmental risks

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1. Introduction

The current climate situation is “unprecedented in hundreds or even thousands of years.” The impacts of human-induced climate change are increasingly affecting all parts of the world [1]. Fossil fuels are fundamental drivers of technological and economic development and continue to dominate the global energy sector. The use of fossil fuels is not without consequences. The Intergovernmental Panel on Climate

Change (IPCC) has reported that around 40 billion tons of CO_2 are released each year [2].

Various developments are taking place around the world that have resulted in the remaining harmful effects of fossil fuels on the earth [3]. Among the types of energy, electrical energy is often used because it can be easily converted into other energy sources. The structures that are created to generate electricity are called power plants [4]. Conventional thermal power plants using coal, oil, and natural gas play a key role in large-scale electricity generation [5]. Hence, carbon dioxide emissions have become a very important issue in the last few decades and have attracted much attention [6]. Post-combustion carbon capture with a well-established carbon capture technology is crucial for current fossil fuel power plants [7] .

Researchers have proposed various methods to reduce costs and emissions, one of the most important of which is the research conducted by NetPower, which has developed a new thermodynamic cycle that burns fuel with pure oxygen, uses hydrocarbon fuels, captures 100% of atmospheric emissions, including carbon dioxide, and has a cost competitive with the best existing systems that do not even capture carbon dioxide [8]. Electricity infrastructure is crucial for economic prosperity and the support of essential energy services [9].

In recent years, the integration of distributed generation into power systems has been accompanied by new operational strategies [10]. Therefore, energy and economic systems models are crucial to inform decision-makers and policymakers about the challenges that energy generation may bring [11]. The electricity industry is dynamic and effective due to its infrastructural role and close relationship with parameters affecting economic and industrial growth. Therefore, increasing its efficiency and productivity is very important. The creation of new and improved power plants can well improve the current state of electricity supply networks [12]. The increasing awareness of the potential energy crisis has led many researchers to work on developing more efficient ways to use available resources [13].

Allam Cycle

The newly invented cycle by Allam was named one of the top ten technologies of the year in 2018. Allam's research over time suggests that his goals and activities revolved around the capture of greenhouse gases, especially carbon dioxide, which ultimately led to the invention of the current power cycle.

In 2006, Allam and his colleagues published a paper titled "Oxyfuel-derived CO2 purification for separation or use in enhanced oil recovery (EOR)," introducing an integrated process for CO2 compression and simultaneous purification to produce pure carbon dioxide streams as a purified product. This was Allam's first move towards the purification and beneficial use of carbon dioxide [14].

In 2013 and 2014, Allam and his colleagues published two separate articles introducing the new NetPower cycle, titled "High Efficiency and Low Cost of Generating Electricity from Fossil Fuels While Eliminating Atmospheric Greenhouse Gas Emissions, Including Carbon Dioxide" and "Oxyfuel, Supercritical Carbon Dioxide in the Allam Cycle: Developments of a New Cycle for Lower-Cost, Fossil-Fuel-Free, Emission-Free Electricity Generation," and promised to present this system in practice in the near future, stating:

The NetPower cycle represents a significant opportunity for the power generation sector. In the face of the increasing impacts of climate change caused by CO2 emissions, utilizing abundant fossil fuels without increasing the cost of electricity is a critical yet fundamental challenge that requires innovative new approaches. By leveraging novel applications of well-known technologies, the NetPower cycle could be a significant advance in oxyfuel power generation in the near future. It also offers the first system that eliminates atmospheric CO2 emissions while competing at all levels with conventional technologies that do not use carbon capture.

The authors believe that even in the absence of carbon regulations, this technology has the opportunity to make carbon capture an economic option, and could enable the wider use of cleaner, lower-cost fossil-fuel-based electricity generation much sooner than previously thought [15], [16].

Finally, in 2017, in an article titled "Demonstrating the Allam Cycle: An Update on the Development Status of a High-Efficiency Supercritical Carbon Dioxide Power Cycle Using Total Carbon Capture," Dr. Allam attempted to update information on the implementation process of the aforementioned cycle project, as well as provide details on how the cycle was constructed and provide explanations about the cycle in question. The following is an introduction to the cycle in question [17]:

The Allam Cycle is a new carbon dioxide cycle. An oxy-fuel power generation cycle that uses hydrocarbon fuels. While inherently near-absorbing, it captures 100% of atmospheric emissions, including carbon dioxide, and produces electricity at a cost that rivals even the best power generation systems that cannot capture CO2. The proprietary system achieves these results through a semi-closed, high-pressure, low-pressure ratio, recovered Brayton cycle that uses supercritical CO2 as the working fluid.

A significant reduction in energy losses is observed compared to steam and air-based cycles. In conventional cycles, the separation and removal of low-concentration combustion impurities, such as CO2, results in additional capital costs and increased parasitic power. As a result, the removal of CO2 in conventional cycles can increase the cost of electricity by 50–70%. The compelling economics of the Allam cycle are demonstrated with high target efficiencies of 59% net for natural gas and 51% net for coal (based on LHV) .

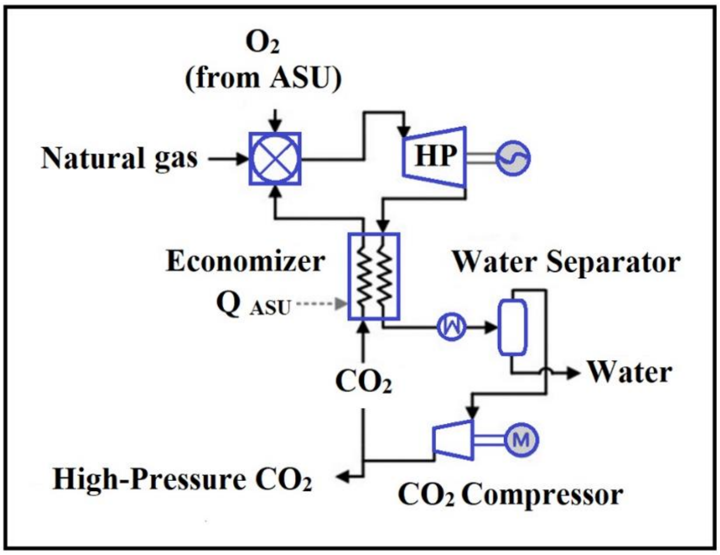

Figure 1. Working fluid flow in the Allam cycle [18]

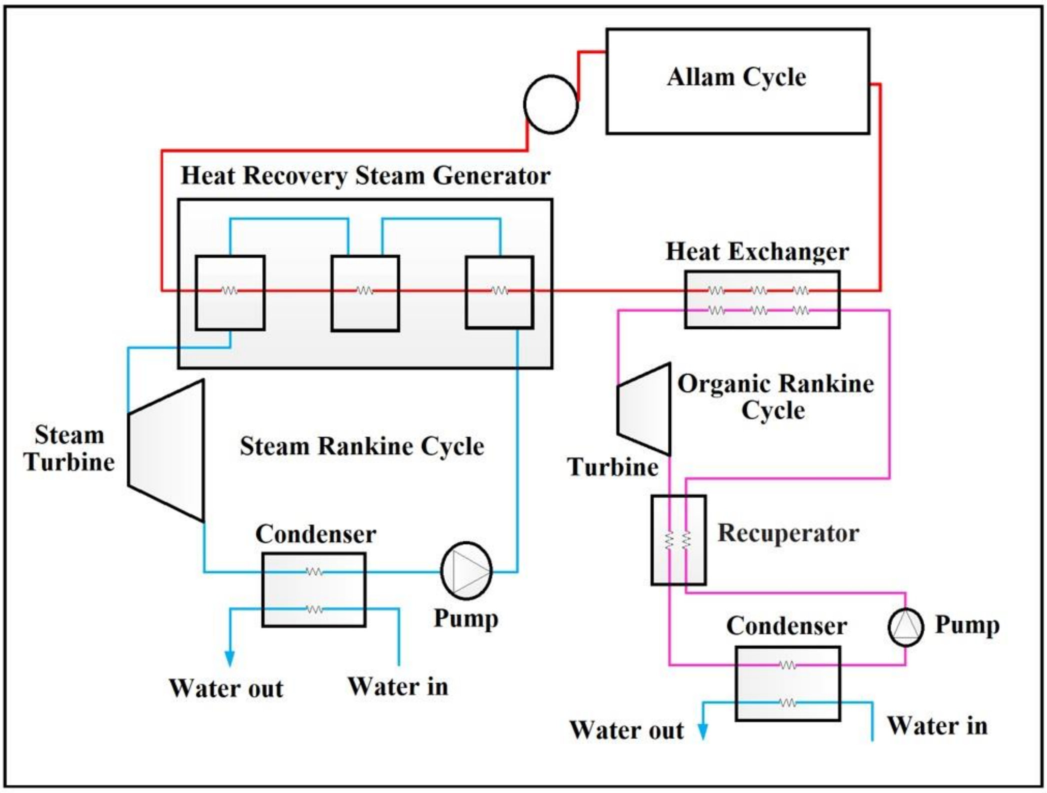

Figure 2. Schematic of the combined Allam, Rankine and organic Rankine cycles [18]

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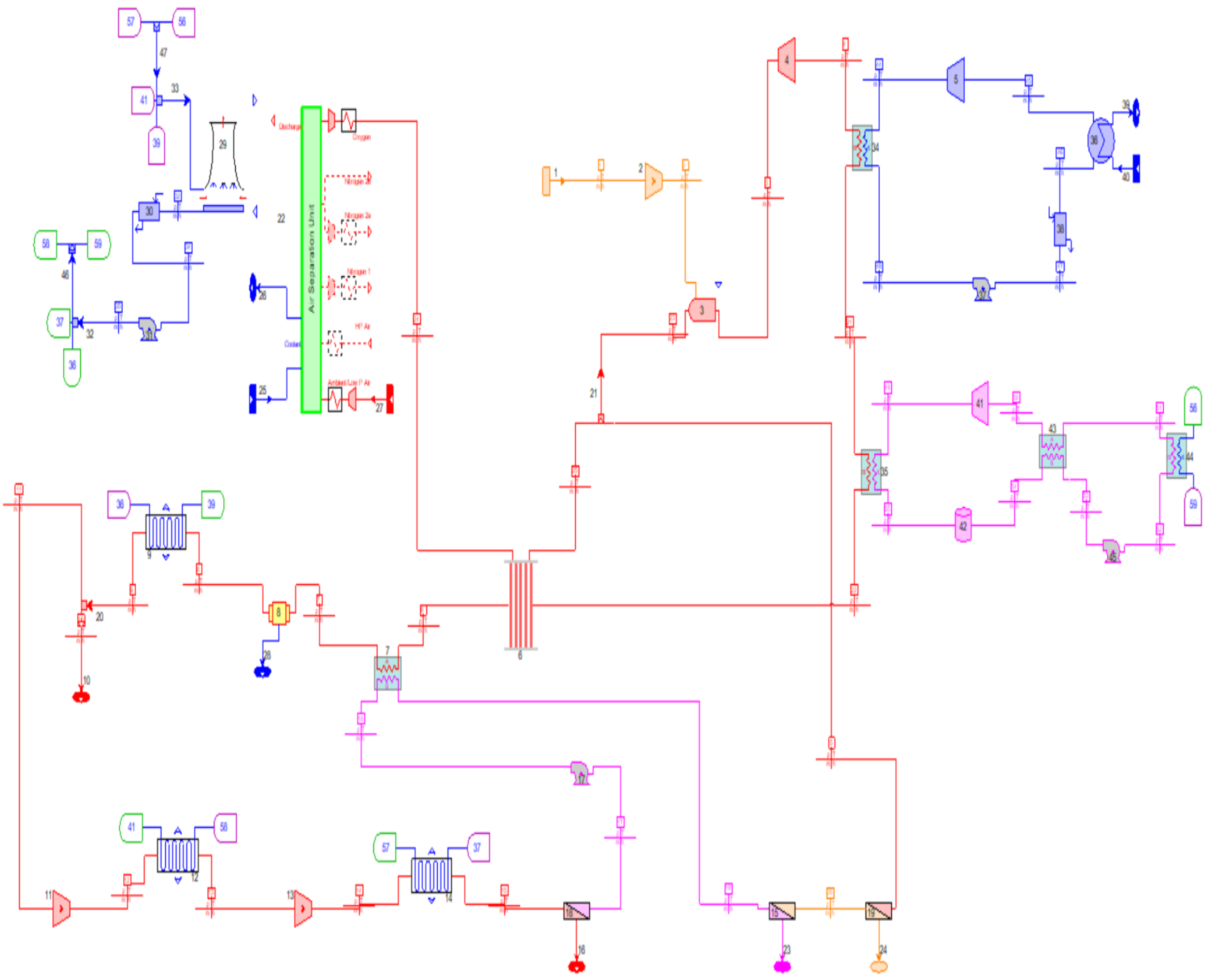

Figure 3. Complete schematic of the combined cycle modeled in Thermoflow software

The Allam cycle takes a novel approach to reducing greenhouse gas emissions: the use of oxy-combustion and the use of a high-pressure supercritical CO2 working fluid in a cycle with high recovery intensity [17].

2. Materials and Methods

In this research, the combined steam Rankine and organic Rankine cycles are simulated with the main drive of the Allam power generation cycle. The combined cycle is configured in such a way that the high-temperature waste heat first acts as the evaporator of the steam cycle and then the waste heat from the evaporator of the steam cycle is used as the low-temperature evaporator of the organic cycle. In this case, the effect of changing various parameters such as evaporator temperature and condenser pressure of the steam cycle on the output work values, total irreversibility, energy efficiency, exergy efficiency and exergy economic variables can be investigated.

The Allam cycle used in this study is a closed cycle and 100% of the carbon dioxide produced in the combustion process is captured. The results of this study, although it can be of particular environmental importance due to the capture of carbon dioxide, will also save fuel by increasing energy efficiency, which will double this importance. It is important to note that in most conventional methods of carbon emission control, the cost of electricity produced by the power plant increases significantly, but the use of the Allam cycle can bring environmental benefits to the project without imposing significant additional costs.

Figure 1 shows a schematic of the Allam cycle. As can be seen, natural gas and oxygen are the inputs to the system, and excess carbon dioxide is removed from the system.

Figure 2 shows the combined cycle. The combined cycle consists of the Allam cycle as the main driver, the Rankine cycle and the organic Rankine cycle (ORC). As can be seen in Figure 2, the waste heat in the Allam cycle is used during two stages in the Rankine and organic

Rankine cycles, which is considered as the main idea in this research [18].

To analyze this cycle, it is necessary to consider four sets of equations, including: mass conservation equations, energy equations, exergy equations, and economic equations. The mass and energy equations are obtained from the balance of equations (1) and (2). The exergy balance is also obtained for the control volume according to equation (3) and the exergy efficiency according to equation (4) [18].

$$\sum \dot{m}_i - \sum \dot{m}_O = 0 \quad (1)$$

$$\sum (\dot{m}h)_i - \sum (\dot{m}h)_O + \sum Q_i - \sum Q_O + W = 0 \quad (2)$$

$$\dot{E}_F = \dot{E}_P - (\dot{E}_D + \dot{E}_L) \quad (3)$$

$$\Psi = \frac{\dot{E}_P}{\dot{E}_F} = 1 - \frac{\dot{E}_D + \dot{E}_L}{\dot{E}_F} = 1 - \frac{\dot{I}}{\dot{E}_F} \quad (4)$$

$$\dot{Z}_K = CRF \times \frac{\Phi_r}{N \times 3600} \times PEC_k = (\dot{Z}^{CI} + \dot{Z}^{OM}) \quad (5)$$

$$CRF = \frac{i(1+i)^n}{(1+i)^n - 1} \quad (6)$$

Combined Cycle Modeling

To examine the Allam cycle, the main parts of this cycle were first redesigned in Thermoflow software. The production capacity of the aforementioned cycle, as considered in the Allam cycle, will be equivalent to 300 MW.

Since the aforementioned cycle was considered in an ideal state by Allam, all the numbers and calculations of the power plant were also examined and planned in ideal conditions by Allam, for this reason, initially, in order to design this cycle, an attempt was made to observe all the aforementioned items.

The modeled cycle is presented according to the numbers introduced by Netpower. Table 1 shows the numbers.

Ideal power plant conditions:

- Site altitude: zero
- Ambient temperature: 15°C
- Ambient relative humidity: 60%
- Wet bulb temperature: 10.82
- Ambient pressure: 1.013 bar

The main parts of this cycle will include turbine, evaporator, dehumidifier, coil, compressor, CO_2 pump, combustion chamber and also (ASU) or air separation unit.

The fuel considered in the Allam cycle will be natural gas. The specifications of natural gas are shown in Table 2.

Table 2. Analysis of natural gas elements extracted from thermoflow software

Element in gas	Amount in percent
H_2	0.36
O_2	0.07
N_2	3.61
CO	0.09
CO_2	0.34
CH_4	87
C_2H_6	8.46
C_2H_4	0.03
H_2S	0.04

After the mechanical activity of the turbine, the exhaust gas resulting from combustion has a maximum temperature and the most suitable point for connecting between the old cycle and the new cycle will be the turbine outlet. Therefore, as is clear in the aforementioned cycle, this coupling will be done using general heat exchangers available in the Thermoflow software.

Table 1. Summary of Allam cycle Flows

Flow	Temperature (C)	Pressure (bar)
Turbine inlet	1150	300
turbine output	727	30
CO_2 Compressor inlet	20	29
Combustion chamber inlet	700	300

Rankine Cycle

This cycle is known as the medium temperature cycle. The Rankine Steam Cycle consists of a steam turbine, generator, condenser, water sink, water source, flow pattern indicator (flow direction) and also a pump.

Organic Rankins Cycle (ORC)

This cycle is in the category of low-temperature cycles due to the phase change of the working fluid at relatively low temperatures and is active in order to minimize energy losses and maximize the utilization of power generation cycles.

The mentioned cycle in the Thermoflow software will consist of a refrigerant turbine, generator, condenser, water sink and source, refrigerant pump, and also define the characteristics of the refrigerant**.**

The connection of the mentioned cycles to the NetPower cycle is done through the evaporator due to the two-phase nature of the working fluids.

Selection of the working fluid of the organic Rankine cycle

The selection of the working fluid of the ORC system is fundamentally a more complex task for the following two reasons:

1- The operating conditions and types of ORC heat source are very different: from a low-temperature heat source of 80 ° C (e.g., geothermal, flat-plate solar collector) to a high-temperature heat source of 500 ° C (e.g., biomass).

2- Except for some cases where the critical temperature is very low or very high, hundreds of substances can be selected as candidates for the ORC working fluid, which can be mentioned as hydrocarbons, aromatic hydrocarbons, ethers, perfluorocarbons, CFCs, alcohols, etc.

The fluid selection method is the most common method for fluid selection in the scientific literature. A simulated model of the organic Rankine cycle is considered and run with different working fluids [19].

According to the studies conducted in Thermoflow software, the most suitable working fluid for the modeled combined cycle was normal pentane (C_5H_{12}) and had the highest efficiency.

3. Results and Discussion

By creating a combined cycle, the efficiency of the power plant increased, which reduced energy loss. After the studies, the most suitable area for connecting the cycles to each other was the turbine outlet, because due to its maximum heat and temperature, it was evaluated as the place of maximum recovery of waste heat from the cycle. Also, by examining the conditions in the organic Rankine cycle using Thermoflow software, the working fluid suitable for the created conditions will be normal pentane. Natural gas was used as fuel in the Allam cycle, and the CO_2 produced from the combustion of this fuel in the cycle was reused in the system as a working fluid in the Allam cycle.

Controlling carbon dioxide emissions and energy waste has reduced the effects of global warming and environmental hazards. Considering the performance of the components in the Allam cycle and considering the performance of these components by Allam as 100% output, the Allam cycle is ideally combined with the other two cycles and the results will be as follows:

The LHV of the ideal Allam cycle combined with the other two cycles is 56.89%, which is a 0.5% increase in LHV compared to the ideal Allam cycle, which is 56.39%. In order to evaluate the simulated cycle in Thermoflow software, the results of the desired cycle were compared with the results of the Allam and colleagues' cycle, and the results are listed in the table 3. The Allam cycle is considered for ideal conditions and the results obtained are also based on this theory, in which case energy losses will not be clearly observed.

Table 3. Comparison of output values from the Allam cycle to software

Evaluated items	The ideal Allam cycle	Ideal cycle modeled in Thermoflow
Net Power Output	300000KW	300486KW
Lower heating value (LHV)	57.90%	56.39%
Turbine inlet pressure	300 bar	301.6 bar
Turbine inlet temperature	1150 C	1150 C
Turbine outlet temperature	727 C	721.9 C
Turbine outlet pressure	30 bar	29.6 bar

Therefore, in this section, we will implement the Allam cycle with the aforementioned assumptions so that energy losses in the net power cycle can be seen more clearly. Since the goal is to reduce energy losses, the components in this cycle will be considered with assumptions close to the real power plant [20]:

Table 4. Comparison of ideal efficiency and actual efficiency of main components

component	evaluated item	Ideal efficiency (%)	Actual efficiency (%)
Turbine	Mechanical efficiency	100%	99.6%
Turbine	Polytropic efficiency	100%	90%
Generator	Overall efficiency	100%	98.5%
First Compressor	Polytropic efficiency	100%	90%
First Compressor	Mechanical efficiency	100%	85%
Second Compressor	Polytropic efficiency	100%	85%
Second Compressor	Mechanical efficiency	100%	85%
Cooling Tower Pump	Isentropic efficiency	100%	85%
CO_2 Pump	Isentropic efficiency	100%	85%

The results of modeling the Netpower cycle and examining the actual efficiency percentage and ideal efficiency percentage will show that in the ideal case, the net electrical efficiency (LHV) will be 56.39% and in the actual efficiency percentage, this efficiency will be 49.58%. In this paer, by examining the desired environmental conditions, another step will be taken to increase efficiency and reduce global warming by constructing a suitable location for the power plant.

Investigating the Environmental Conditions of the Power Plant Site

(Ambient temperature, ambient pressure, ambient altitude, ambient relative humidity)

The power plant conditions at this site were considered ideal (zero altitude, ambient pressure of 1.013 bar, ambient temperature of 15 degrees Celsius, and ambient relative humidity of 60%).
Now we will change the mentioned items in five cases for each item: It should be noted that by changing one item, the other items are considered constant:

The effect of temperature changes on power plant performance

The ambient temperature ranged from 0 to 30 degrees Celsius, and the results for each item are as follows:
As can be seen, the best result is for Case 1, which has the highest LHV efficiency. In the case where the ambient temperature is zero, the lower heating value will be 52.3.

Figure 4 shows that increasing temperature in the power plant's environmental conditions will reduce the efficiency of LHV.

The effect of pressure changes on power plant performance

The pressure change was made in the range of 1 bar to 1.127 bar, and the results are shown in Figure 5.
As can be seen, the highest LHV efficiency will be for case five. In the case where the ambient pressure is 1.127 bar, the LHV will be 52.66%.
Therefore, as the pressure in the site environment increases, the net power will increase.

The effect of altitude changes on power plant performance

The altitude change item will actually cause a change in the pressure item. In this context, five cases were examined. The base case has zero height and the other cases vary from five meters to twenty-five meters, respectively.
As can be seen, changing the altitude from zero to twenty-five meters will have no effect on the gross production capacity.

The effect of Relative humidity changes on power plant performance

The relative humidity in eight different cases varied from 10 to 80 percent. The results are as follows: As can be seen from the Figure-8, increasing the relative humidity of the environment will lead to a decrease in the Lower heating value (LHV) efficiency of power plant.

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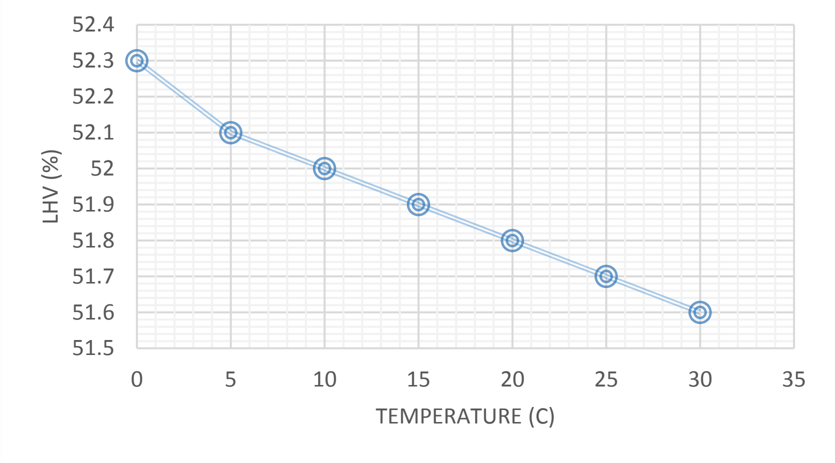

Figure 4. The effect of temperature changes on power plant performance

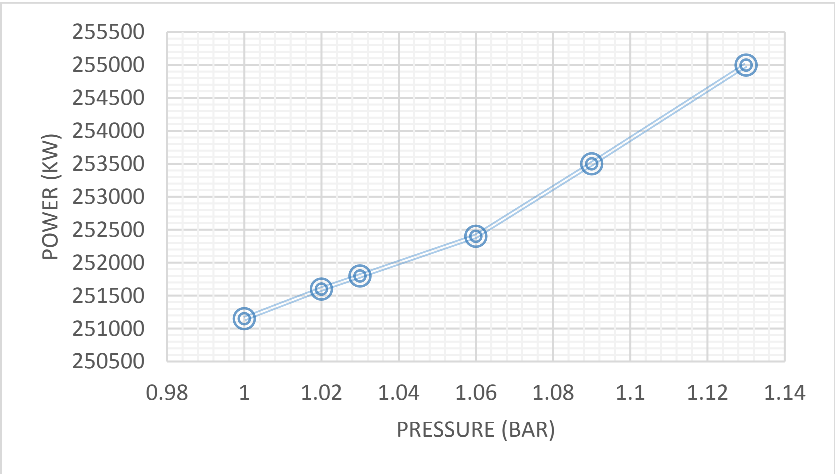

Figure 5. The effect of pressure changes on power plant performance

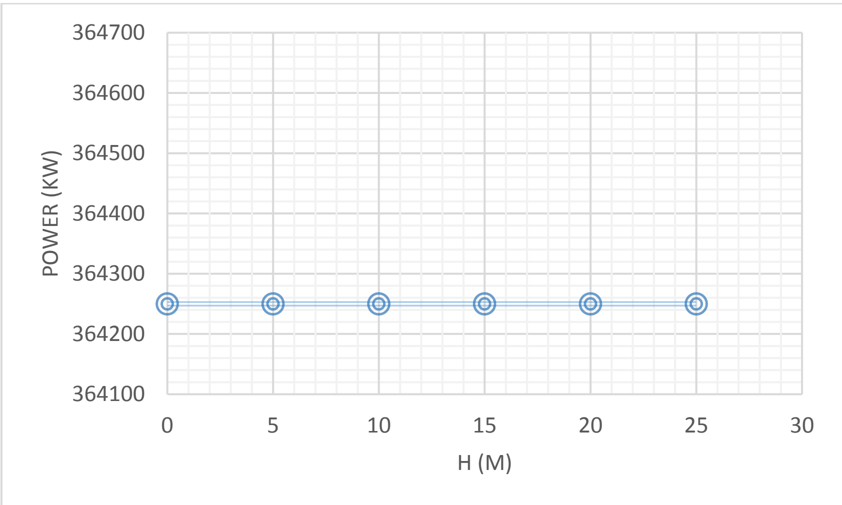

Figure 6. The effect of altitude changes on power plant performance

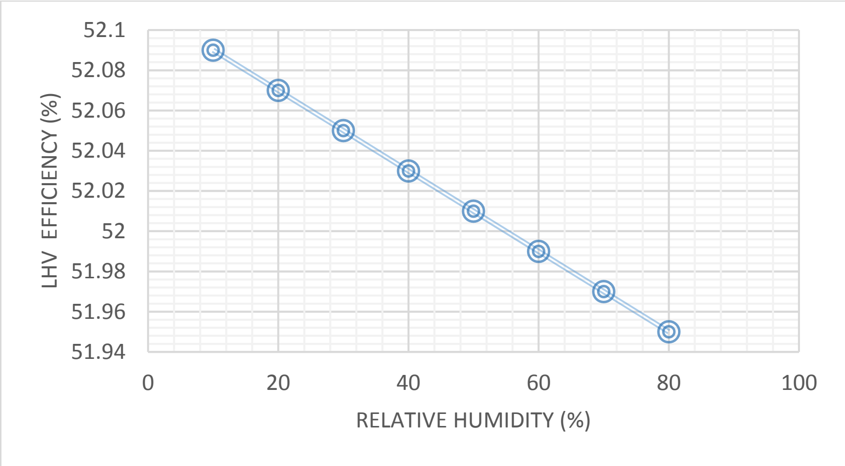

Figure 7. The effect of Relative humidity changes on power plant performance

4. Conclusion

Using Thermoflow software, the Allam cycle, organic Rankine cycle, and Rankine cycle were simulated, and then the aforementioned cycles were combined to reduce energy loss and the results were examined. The simulated combined cycle, in an ideal case, will increase LHV by 0.5% compared to the Allam cycle, and by considering the energy loss by the components in the Allam cycle, and then creating a combined cycle, it will increase efficiency by 0.98%**.** The creation of a combined cycle led to a reduction in energy loss in the system. The CO_2 produced in the power plant was contained in the system and also by examining the environmental conditions of the power plant and increasing the pressure to 1.127 bar, relative humidity of 10 %, and temperature of zero degrees, the LHV efficiency of the power plant increased. Increasing the efficiency of the power plant, reducing energy loss, and also absorbing CO_2, all will lead to a reduction in global warming and increasing environmental protection.

Authors Contribution
All authors have contributed equally to prepare the paper.

Availability of data and materials
The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Conflict of interests
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] Iranfar A, Saraei A. Numerical study of nanoencapsulated phase change material inside double pipe heat exchanger. Heat Transf Asian Res. 2019; 48: 3466-3476. doi: https://doi.org/10.1002/htj.21549

[2] Javadi Yanbolagh D, Mazaheri H, Saraei A, Jafari Mehrabadi S. Experimental study on the performance of three identical solar stills with different heating methods and external condenser fully powered by photovoltaic: energy, exergy, and economic analysis. Energy Sources A Recover Util Environ Eff. 2020; 46: 16397-16417. doi: https://doi.org/10.1080/15567036.2020.1817187

[3] Fazelpour F, Bakhshayesh A, Alimohammadi R, Saraei A. An assessment of reducing energy consumption for optimizing building design in various climatic conditions. Int J Energy Environ Eng. 2022; 13: 319-329. doi: https://doi.org/10.1007/s40095-021-00461-6

[4] Riyahi N, Saraei A, Vahdat Azad A, Fazelpour F. Energy analysis and optimization of a hybrid system of reverse osmosis desalination system and solar power plant (case study: Kish Island). Int J Energy Environ Eng. 2022; 13: 67-75. doi: https://doi.org/10.1007/s40095-021-00418-9

[5] Pouran M, Fazelpour F, Gharehpetian GB, Saraei A. The effect of phase change material application in double skin façade on energy saving of residential buildings considering different climates: a case study. Energy Sources A Recover Util Environ Eff. 2023; 46: 209-227. doi: https://doi.org/10.1080/15567036.2023.2282143

[6] Yanbolagh DJ, Saraei A, Mazaheri H, Mehrabadi SJ. Exergoeconomic, environmental, economic, and energy-matrices (4E) analysis of three solar distillation systems equipped with condenser and different heaters. J Therm Eng. 2021; 7: 1640-1653. doi: https://doi.org/10.18186/thermal.1025916

[7] Khademy M, Saraei A, Abyaneh MHJ. Application of trigeneration system power by concentrating photovoltaic-thermal solar collectors for energy demands of an industrial

complex. Int J Energy Environ Eng. 2022; 13: 1101-1128. doi: https://doi.org/10.1007/s40095-022-00512-6

[8] Ahmadi A, Noorpoor AR, Kani AR, Saraei A. Modeling and economic analysis of MED-TVC desalination with Allam power plant cycle in Kish Island. Iran J Chem Chem Eng. 2020. doi: https://doi.org/10.30492/IJCCE.2020.117914.3851

[9] Behmounesi SA, Saraei A, Afshar H, Ashtiani HAD, Dehghani-Sanij A. Techno-economic analysis of optimally hybrid photovoltaic-wind systems to meet the energy demand of a residential building in six different areas of Iran. Energy Convers Manag. 2024; 322: 119131. doi: https://doi.org/10.1016/j.enconman.2024.119131

[10] Houshmandi S, Allahyaribeik S, Saraei A. Hybrid SVR & Q-learning MPPT for PV systems: enhanced energy efficiency and environmental preservation. Int J Environ Sci Technol. 2026; 23. doi: https://doi.org/10.1007/s13762-025-06855-x

[11] Parviz M, Ahmadi-Danesh-Ashtiani H, Saraei A, Afshar H. Numerical simulation of forced convection of ferro-nanofluid in a U-shaped tube subjected to a magnetic field. Alex Eng J. 2023; 66: 1015-1030. doi: https://doi.org/10.1016/j.aej.2022.12.031

[12] Asayesh M, Kasaeian A, Hajiseyed Mirzahosseini SA, Saraei A. A semi-enclosed cavity receiver for linear Fresnel reflectors: parametric analysis, CFD simulation and experimental study. Appl Therm Eng. 2025; 278: 127422. doi: https://doi.org/10.1016/j.applthermaleng.2025.127422

[13] Behmounesi SA, Dehghani-Sanij A, Afshar H, Saraei A, Danesh Ashtiani HA. Optimizing the series-parallel configuration of flat-plate solar collectors for domestic hot water supply. J Build Eng. 2025; 106: 112567. doi: https://doi.org/10.1016/j.jobe.2025.112567

[14] Bakhshayesh A, Ozgoli HA, Mirzahosseini AHS, Saraei A, Ezam M. Sustainable approach to integrate a conventional power plant and renewable energies, coupled with the Goswami cycle and Maisotsenko heat exchanger. Can J Chem Eng. 2024; 102: 3061-3076. doi: https://doi.org/10.1002/cjce.25241

[15] Dokhaee E, Saraei A, Jafari Mehrabadi S, Yousefi P. Simulation of the Allam cycle with carbon dioxide working fluid and comparison with Brayton cycle. Int J Energy Environ Eng. 2021; 12: 543-550. doi: https://doi.org/10.1007/s40095-021-00401-4

[16] Dokhaee E, Saraei A, Mohsenimonfared H, Yousefi P. Exergy and thermoeconomic analysis of a combined Allam generation system and absorption cooling system. Int J Energy Environ Eng. 2022; 13: 267-273. doi: https://doi.org/10.1007/s40095-021-00440-x

[17] Nazarzadehfard A, Saraei A, Jafari Mehrabadi S, Mohsenimonfared H. Exergy and thermoeconomic analysis of the combined MED desalination system and the Allam power generation system. Int J Energy Environ Eng. 2021; 12: 679-687. doi: https://doi.org/10.1007/s40095-021-00409-w

[18] Ebadi A, Saraei A, Mohsenimonfared H, Jafari Mehrabadi S. Thermoeconomic analysis of combined steam and organic Rankine cycle with primary mover of Allam cycle. Int J Energy Environ Eng. 2022; 13: 231-239. doi: https://doi.org/10.1007/s40095-021-00434-9

[19] Bao J, Zhao L. A review of working fluid and expander selections for organic Rankine cycle. Renew Sustain Energy Rev. 2013; 24: 325-342. doi: https://doi.org/10.1016/j.rser.2013.03.040

[20] Ahmadi A, Noorpoor A, Kani A, Saraei A. Examining performance and optimization of a cogeneration system comprised with Allam cycle and MED-TVC for generating power and drinking water: case study, Kish Island. J Therm Eng. 2021; 7: 1704-1718. doi: https://doi.org/10.18186/thermal.1025944