

# INNOVATION SCIENCE AND TECHNOLOGY



Scopus || Electronic journal specializing in Scopus

**ISSUE 6**

 Acceptance of papers June, 2025



**Acceptance of papers**

Published monthly



**Topics**

economics, technology, social sciences



**EDITOR-IN-CHIEF:**

Mirzaliev Sanjar Makhmatjon ugli

**DEPUTY EDITOR-IN-CHIEF:**

Makhmudov Nosir Makhmudovich  
DSc., Prof., Academician

**DEPUTY EDITOR-IN-CHIEF:**

Ochilov Bobur Bakhtiyor ugli – Senior  
lecturer at TSUI

THE SCIENTIFIC-POPULAR ELECTRONIC  
JOURNAL **"INNOVATION SCIENCE AND  
TECHNOLOGY"** HAS BEEN REGISTERED  
UNDER THE NUMBER **C-5669633** BY THE  
AGENCY FOR INFORMATION AND MASS  
COMMUNICATIONS (AOKA) OF THE  
REPUBLIC OF UZBEKISTAN, EFFECTIVE  
FROM OCTOBER 9, 2024.

**CONTACTS**

Phone: **97-748-70-03**

Website: <https://ist-journal.uz>

Email: [munis.iriskulova@gmail.com](mailto:munis.iriskulova@gmail.com)

The scientific electronic journal "Innovation Science and Technology" has been included in the list of scientific publications recommended for the publication of main scientific results of dissertations for the award of PhD and DSc degrees in economics and technical sciences, in accordance with the Resolution No. 370 of the Presidium of the Higher Attestation Commission of the Republic of Uzbekistan, dated May 8, 2025.

**Editorial board:**



**Sharipov Kongiratbay Avezimbetovich,**  
Doctor of Technical Sciences (DSc), Professor



**Abdurakhmanova Gulnora Kalandarovna,**  
Doctor of Economic Sciences (DSc), Professor



**Cham Tat Huei,**  
Doctor of Philosophy (PhD), Professor (Malaysia)



**Muhammad Imran Sadiq**  
Doctor of Philosophy in Economics (PhD),  
Professor, Malaysia



**Ahmed Aziz Ismail**  
Doctor of Technical Sciences (DSc),  
Professor (Egypt)



**Lee Chin**  
Doctor of Philosophy in Economics (PhD),  
(Malaysia)



**Asongu Simplicé**  
Doctor of Philosophy in Economics (PhD),  
Cameroon



**Rui Dang**  
Doctor of Chemistry (DSc), Professor, China



**Zahoor Ahmed**  
Doctor of Philosophy in Economics (PhD), Turkey



**Shujaat Abbas**  
Doctor of Philosophy in Economics (PhD), Russia



**Tina A Coffelt**  
Doctor of Philosophy in Educational Sciences  
(PhD), USA



**Judy B. Smetana**  
Doctor of Philosophy in Economics (PhD), USA

# CONTENTS

Decoding the crypto ecosystem: a bibliometric and conceptual study of blockchain assets and their alignment with sustainability goals.....	6
<b>Sultonov Ikromjon Shukhratjon ugli, Dr Maya Sari SE MM, Adon Asep Miftahuddin</b>	
Taxation in transition: a comparative analysis of indonesia and uzbekistan's tax systems (2011–2023).....	15
<b>Masharipov Azizbek Murodjon ugli, IDA Farida Adi Prawira, Prof, Dr. Alfira Sofia</b>	
Traditional methods of assessing the effectiveness of women's entrepreneurship.....	21
<b>Raxmonova Aziza Tolibovna</b>	
Educational costs.....	27
<b>Usanova Mekhriniso Norkobil kizi, Toni Heryana</b>	
Sustainable development of foreign investments in uzbekistan's economy: analysis, challenges, and opportunities.....	32
<b>Khusanova Khojiyabonu Rovshan kizi, Denny Andriana</b>	
The role of transportation in improving the export potential of the national economy.....	40
<b>Narziyev Umidjon Baxrillayevich</b>	
Methodology of teaching english: traditional and modern approaches.....	46
<b>Ravshanova Ziyoda Qahramon Qizi, Xoliqova Dilafruz Shuhratovna</b>	
Work-life balance, teacher wellbeing, and educational outcomes: a cross-national analysis toward achieving sdgs 3 and 4.....	50
<b>Rikhsiboev Azamat Murodali ugli, Dr.askolani, SE.,MM, Annisa Ciptagustia, SE.,M.Si</b>	
Simple innovations and firm performance in transitional economies: a qualitative case study of artel electronics in uzbekistan.....	59
<b>Alloyorov Xondamir Nurmurod ugli, Dr. Mokh. Adib Sultan ST, MT</b>	
Integrating data science into innovative approaches to working capital management for enhancing financial stability in enterprises.....	68
<b>Doniyor Khoshimov, Ilmurod Kungratov Kuzibay ugli</b>	
Characteristics of interstitial nephritis against the background of uropathy in children.....	76
<b>Aralov Mirza Djurakulovich</b>	
Ways and methods of using renewable energy sources in industrial enterprises.....	79
<b>Bobobekov Ergash Abdumalikovich</b>	
Understanding the role of accounting reports in financial control: evidence from uzbek enterprises.....	84
<b>Abdimurodov Ulug'bek Olimjonovich, Aristanti Widyaningsih, Toni Heryana</b>	
Nalyzing the impact of investment volume in the tourism sector on the regional gross domestic product (case study of samarkand region).....	89
<b>Shukurov Ikrom Abdurashitovich</b>	
Types of accommodation facilities in uzbekistan and their characteristics.....	92
<b>Ikramov Akbar</b>	
Controlling inflation in uzbekistan: the role of monetary and fiscal policy.....	97
<b>Bahodirov Jahongir, Omonova Navruzoy</b>	
Digital banking: is it possible to open a digital bank in uzbekistan.....	102
<b>Abdushukurov Dilshodbek Shovkat ugli, Dr Maya Sari SE MM</b>	
From soviet legacy to global identity: the brand strategy of uzauto motors.....	109
<b>Movlonov Bekzod Baxtiyor Ugli, Prof. Dr. Vanessa Gaffar, Arief Budiman</b>	
Revisiting the returns to education and gender wage disparities in indonesia: evidence from IFLS4.....	115
<b>Kurbonov Davronbek Sherali ugli, Dr. Mokh. Adib Sultan ST, MT, Dr. Adon Asep Miftahuddin</b>	
Comparative analysis of accounting in indonesia and uzbekistan.....	122
<b>Abdimuradov Shohjahon Olimjon ugli, Aristanti Widyaningsih, Tony Heryana, Yusupov Komaliddin Bakhtiyor Ugli</b>	

Problems in the accounting of long-term assets and their solutions based on international experience.....	126
<b>Rizakulov Abdurauf Abdimutalibovich</b>	
Analysis of the economic efficiency and market competitiveness of BMB za'faron brand products.....	131
<b>Mirgulom Usmanov</b>	
Issues of improving the essence, classification, and identification criteria of extra-large and large taxpayers.....	134
<b>Xushatov Nuriddin Maxmatqulovich</b>	
Analysis of practical proposals for further improvement of tax administration in uzbekistan.....	141
<b>Umid Kh. Normurzayev</b>	
Modern directions for developing a service provision system based on digital platforms.....	149
<b>Berdikulova Madina Zokir qizi, S.B. Boboqulov</b>	
The impact of online motivation and trust on purchase intention in social media: a qualitative study among upi students .....	154
<b>Akhmadov Javokhir Abror ugli, Vanessa Gaffar, Arief Budiman</b>	
Place and analysis of active operations in the activities of commercial banks .....	161
<b>Sulxonberdiyeva Shodiya Shuxrat qizi, K. Karimova</b>	
Modernized heat receiver to improve thermal efficiency of parabolic trough collector .....	165
<b>Nurmamat Umaraliev, Yodgor Akbarovich Yusupov</b>	

# MODERNIZED HEAT RECEIVER TO IMPROVE THERMAL EFFICIENCY OF PARABOLIC TROUGH COLLECTOR

**Nurmamat Umaraliev**

(ORCID-0000-0001-9822-8115),

nurmuhammad@bk.ru

**Yodgor Akbarovich Yusupov**

ORCID: 0000-0002-9207-9558

edgoru88@gmail.com

Fergana State Technical University

**Abstract:** This article considers the design of a modernized heat receiver for a parabolic trough solar collector, aimed at improving the thermal efficiency of the installation. A comparative analysis of the thermal performance and calculation of the efficiency of the traditional and improved heat collectors is carried out. As a result of modernization it was possible to achieve an increase in heat transfer due to optimization of the shape of the receiving tube and application of selective coating.

**Key words:** parabolic trough collector, solar energy, heat receiver, thermal efficiency, selective coating.

## INTRODUCTION

The growing interest in renewable energy sources is driven by the need to improve the energy efficiency and environmental sustainability of energy systems. Among the various solar plant technologies, parabolic trough collectors (PTCs) occupy an important place due to their ability to focus solar energy on a linear heat receiver. However, thermal losses and design limitations of the receiving tubes reduce the overall efficiency of such systems. The objective of this study is to develop and experimentally verify a modernized heat receiver design to improve the efficiency of PTCs.

## LITERATURE REVIEW

A number of studies are devoted to the issues of heat transfer enhancement in the PCC intake tube, including the use of turbulators, nanofluids and selective coatings [2-6]. For example, [4] demonstrated an increase in thermal efficiency of up to 12% by using copper oxide absorbing coatings. In [5], the use of a double-wall pipe with a thermal insulation gap is discussed, which reduced losses by up to 15%. Nevertheless, most of the works focus on theoretical modeling, while the practical implementation of modernized receivers requires further study.

## RESEARCH METHODOLOGY

The experimental study consists of the process of hot water treatment with temperature 80°C on the PTC (Fig.1.) with geometrical characteristics: width  $D=1640$  mm, length  $L=5000$  mm, focal length  $f=680$  mm and angle of coverage  $\alpha=60^\circ$ . The reflective surface is formed by sheets of mirror aluminum produced in Germany with integral reflection of solar rays  $R_z=0,79\div 0,80$ . The PTC is installed on the polygon of Fergana State Technical University in the west-east direction. The concentrator is fixed on two welded trusses, providing its installation at a specific angle relative to the horizon calculated for the latitude of the terrain. In the focal plane of the collector on adjustable fasteners installed receiver of the calculated dimension in the form of a tube. The receiver is a blackened stainless-steel pipe with an outside diameter of  $d=42$  mm, the length of which is  $l=5000$  mm. The heat carrier is water.



Fig.1. General view of the experimental PTC.

A parabolic trough collector with two variants of the receiving tube was investigated as part of the experiment:  
 Basic sample: a blackened steel tube with a diameter of 42 mm

Modernized sample [1] (Fig.2.): an aluminum tube hermetically sealed from both sides with length  $l=5000$  mm and outer diameter  $d=25$  mm (displacement tube) was placed in the initial heat receiver. The displacement tube is wrapped with a 15 m long and 3 mm thick aluminum wire in the form of a spiral, by means of which the displacement tube was fixed to the steel tube from inside.



Fig.2. Modernized receiver [1].

DS 1820b temperature sensors are installed at four points along the pipe:

t1 - at the inlet

t2 and t3 in the middle section

t4 - at the outlet.

Measurements were taken over several sunny days under similar weather conditions. The results were recorded in real time in DATA BASE.

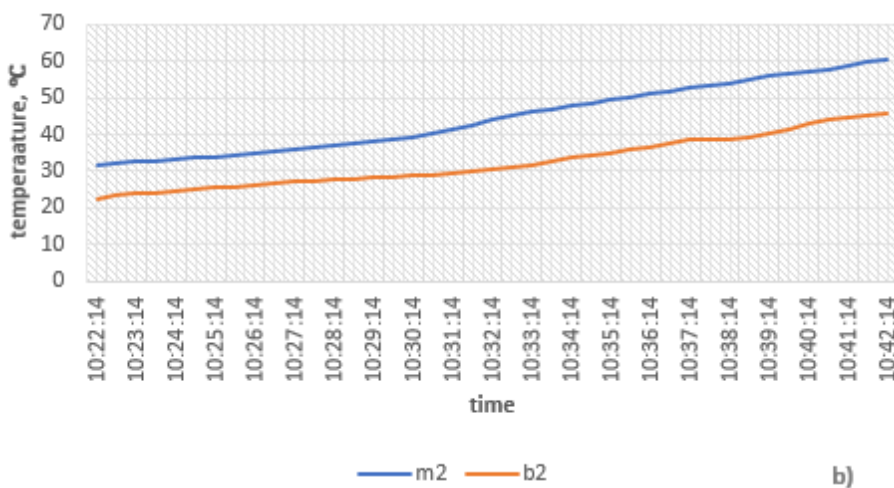
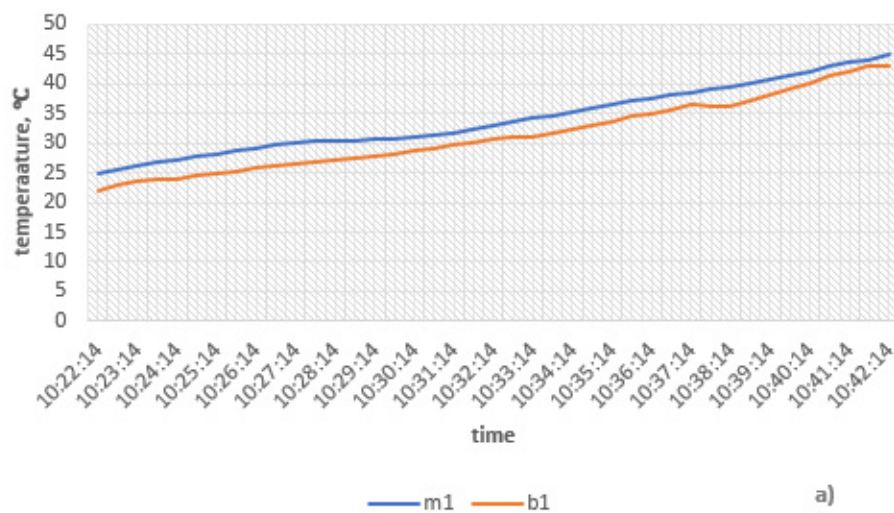
## ANALYSIS AND RESULTS

The experiment showed a stable increase in the output temperature of water in the modernized heat receiver by an average of 32-37% compared to the basic one. The temperature distribution graph is shown in Fig. 3. a) – d).

Fig. 3-a) shows the variation of the inlet temperature of the upgraded (m1) and base (b1) heat receivers as a function of time. Throughout the observed interval, the temperature of m1 is consistently higher than that of b1, indicating more efficient heating of the retrofitted heat receiver. The difference between the curves is maintained throughout the experiment, confirming a steady improvement in the thermal efficiency of the retrofitted design. The maximum excess of m1 temperature over b1 is observed closer to the end of the measurements, reaching about 2-3 °C.

Figs. 3-b) and c) show the temperature variation in the middle part of the receivers. Similar to the previous case, the m2 temperature is consistently higher than the b2 temperature throughout the experiment. The temperature difference averages 10-15 °C, which demonstrates the improved heat transfer properties of the upgraded receiver in the zone of maximum heat flux. By the end of the measurements, m2 reaches about 63 °C, while b2 reaches about 47 °C. The temperature values of m3 are significantly higher than those of b3 throughout the experiment, with the difference increasing over time. The temperature of m3 increases to ~76 °C, while b3 only reaches ~49 °C.

The 3-d plot shows that the output temperature of the upgraded receiver is consistently higher than that of the basic receiver throughout the measurements. In addition, the temperature rise of the upgraded receiver is faster and more uniform. This confirms more efficient heat absorption and retention, stable and high thermal efficiency of the modernized design, especially in the central part, where the main energy of solar radiation is concentrated, which indicates the increased efficiency of heat transfer in the design of the modernized receiver compared to the basic one.



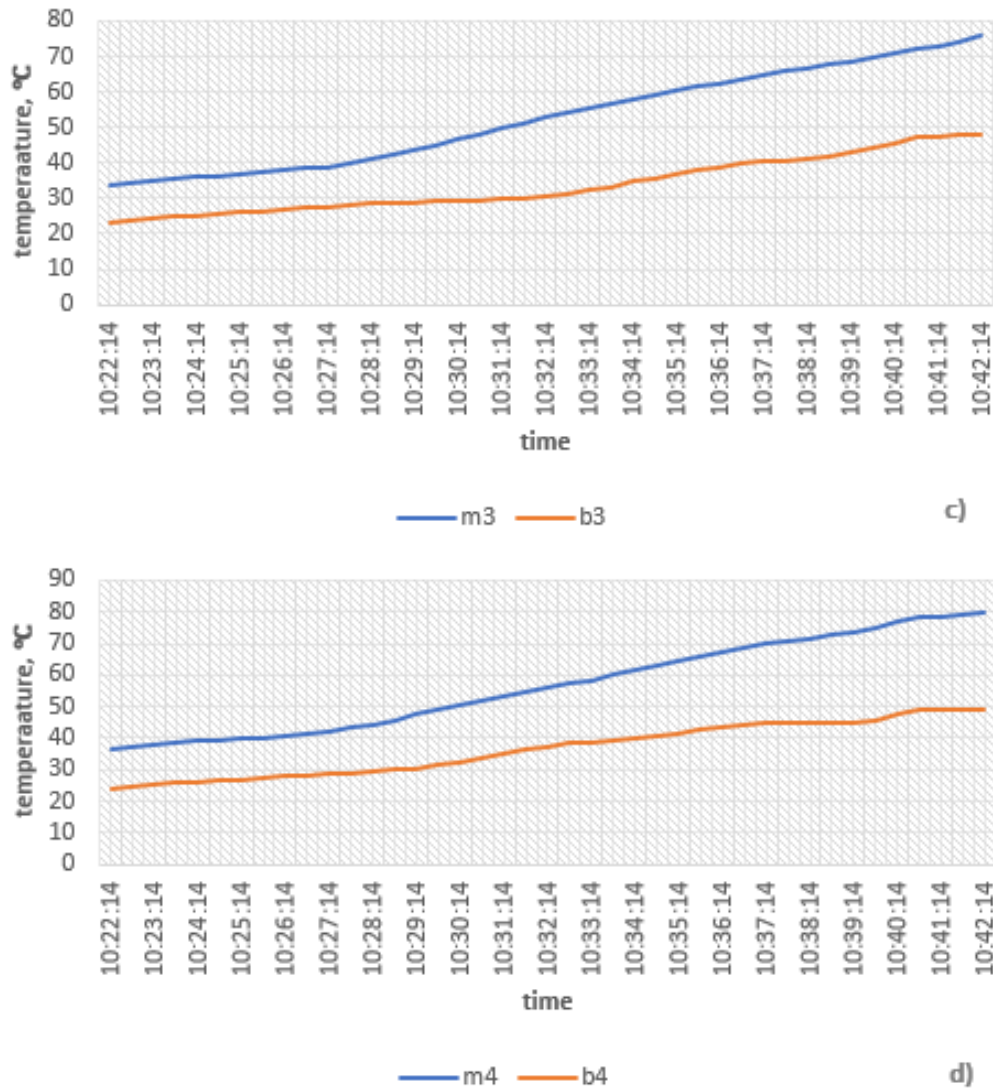


Fig. 3. Temperature trends in the modernized [1] and baseline receivers (a-d).

Therefore, the use of the displacement tube has significantly improved the heat transfer efficiency, as the modernized receiver shows better thermal performance compared to the base receiver.

## CONCLUSIONS

As a result of experimental works we have made sure that the thermal performance of the modernized heat receiver has improved due to:

- application of the displacement pipe, providing the directional movement of the coolant and more uniform heat distribution along the entire length of the receiver;
- optimized geometry of the heat exchanger part, which increases the heat transfer coefficient;
- increased heat exchange area and increased flow turbulence, which contributes to more efficient heat transfer from the tube walls to the heat transfer medium;
- more effective contact between the absorber element and the heat transfer medium, ensuring a rapid and stable temperature rise.

### List of used literature

1. K.N. Umaraliev, Y.A. Yusupov, N. Umaraliev, A.A. Kuchkarov, S. Ergashev. F., Solar radiation receiver of a parabolocylindrical concentrator for hot water treatment. Patent for useful model of the Republic of Kazakhstan № 10449.
2. Kalogirou S. A. Solar thermal collectors and applications // Progress in Energy and Combustion Science, 2004.
3. Xu F., Wang Z., et al. Experimental study on parabolic trough collector with heat pipe. Solar Energy, 2010.

4. El-Sebaii A.A. et al. Solar energy and its applications in Egypt. *Renewable and Sustainable Energy Reviews*, 2009.
5. Tyagi V.V., Kaushik S.C., et al. Advancement in solar thermal energy storage: a review. *Renewable and Sustainable Energy Reviews*, 2011.
6. Yu W., France D. et al. Review of nanofluid heat transfer in solar collectors. *Applied Thermal Engineering*, 2013.

**Proofreader:** Zokir ALIBEKOV

**Layout and Designer:** Oloviddin Sobir ugli

---

## 2025. № 6

---

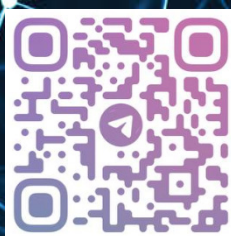
© When materials are reproduced, the INNOVATION SCIENCE AND TECHNOLOGY journal must be cited as the source. Authors are responsible for the accuracy of the information in materials and advertisements published in the journal. Editorial opinions may not always align with those of the authors. Submitted materials will not be returned to the editorial office.

To publish articles in this journal, you may submit articles, advertisements, stories, and other creative materials through the following links. Materials and advertisements are published on a paid basis.

You may subscribe to the journal at any time using the following details. Once subscribed, please send a screenshot or photo of your payment confirmation to our Telegram page @iqtisodiyot\_77. Based on this, we will send the latest issue of the journal to your address each month.

“The journal “INNOVATION SCIENCE AND TECHNOLOGY” has been registered by the Agency for Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan from 09.10.2024 under the registration number №390637. License number: C-5669633. PNFL: 30407832680027

**Our address:** Tashkent city, Yunusobod district, 19th block,  
House 17.



**Acceptance of articles**

Published every monthly



**Directions**

Social, economic, political, technological, scientific

 Scopus || Scientific electronic journal specializing in Scopus

**CERTIFICATE NUMBER: №390637**

**ORDER NUMBER ACCORDING TO THE LICENSE REGISTER: C-5669633**

**CONTACT:**

 Contact us  
**+998 97 748 70 03**

 Telegram channel  
**t.me/scopus\_IST2100**

 Journal official website  
**<https://ist-journal.uz/index.php/IST>**