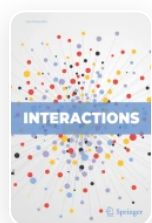


[Home](#) [Interactions](#) [Article](#)

Experimental analysis and development of fuzzy model for the prediction of COP and mass flow rate in air-conditioning system

Research Published: 05 July 2024

Volume 245, article number 134, (2024) [Cite this article](#)**Interactions**[Aims and scope](#)[Submit manuscript](#)[Ganapathi karthik](#), [A. Parthiban](#) , [T. Sathish](#) & [Jayant Giri](#)55 Accesses [Explore all metrics](#) →

Abstract

A research endeavor is currently underway to examine the experimental analysis and development of a fuzzy model aimed at predicting the Coefficient of Performance (COP) and Mass Flow Rate within the parameters of a refrigeration process utilizing a novel refrigerant blend with nano additive materials was used. Through the application of Fuzzy logic methodology, the inquiry has pinpointed the process parameters that exhibit the most advantageous outcomes in attaining an elevated COP, alongside diminished values for compressor discharge temperature, compressor power, and mass flow rates. The investigation delves into the potential utilization of a blend comprising R152a, R290, R600, and R600a with nano particle of Al_2O_3 . Validation of the projected outcomes was carried out through confirmation tests, which have deemed the results to align precisely

with the anticipated values. The principal objective of this empirical investigation is to evaluate the operational efficacy of a residential window air conditioning unit when contemplating the substitution of R-22 with a blend of R152a, R290, R600, and R600a with nano particle of Al_2O_3 .

 This is a preview of subscription content, [log in via an institution](#)  to check access.

Access this article

[Log in via an institution](#)

Subscribe and save

 Springer+ Basic

€32.70 /Month

Get 10 units per month

Download Article/Chapter or eBook

1 Unit = 1 Article or 1 Chapter

Cancel anytime

[Subscribe now](#) →

Buy Now

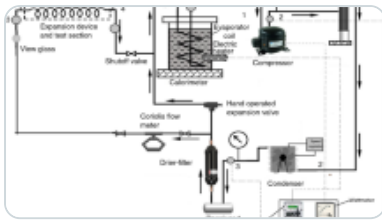
[Buy article PDF 39,95 €](#)

Price includes VAT (India)

Instant access to the full article PDF.

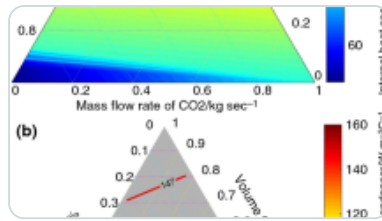
[Institutional subscriptions](#) →

Similar content being viewed by others



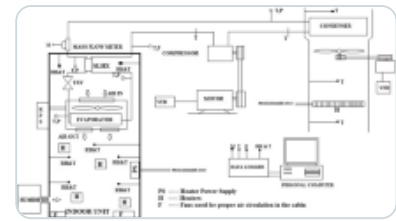
Component-wise exergy analysis using adaptive neuro-fuzzy inference system in...

Article | 31 October 2018



A novel machine-learning schemes to predict heat transfer coefficient during...

Article | 08 May 2023



Effect of thermostatic expansion valve tuning on the performance enhancement and...

Article | 11 January 2020

Data availability

Not applicable.

Code availability

Not applicable.

References

1. Ganapathi Karthik, A., Parthiban, C., Sasikumar, B. Radha., Krishnan: Experimental investigation on split type window Air conditioner using HFC and HC mixture as ecofriendly refrigerant alternate to HCFC-22. E3S Web of Conferences **399**, 06004 (2023)
[Article](#) [Google Scholar](#)
2. Daniel, S. Ajith., Arul, Gopal PM., Sudhagar, S.: Study on tribological behaviour of Al/SiC/MoS₂ hybrid metal matrix composites in high temperature environmental condition. Silicon **10**, 2129–2139 (2018)

3. Ganapathi Karthik, Parthiban A (2023) Optimization of process parameters of refrigeration process for a refrigerant mixture, Thermal Science, On LineFirst Issue, Pages: 220–220, <https://doi.org/10.2298/TSCI221005220K>
4. Santhanam, V., Dhanaraj, R., Chandrasekaran, M., Venkateshwaran, N., Baskar, S.: Experimental investigation on the mechanical properties of woven hybrid fiber reinforced epoxy composite. Materials Today: Proceedings **37**, 1850–1853 (2021)
[Google Scholar](#)
5. Prabhakaran, A., Sridhivya Krishnan, K., Dhinakaran, R., Baskar, S., Shaisundaram, V.S.: Analysis of the efficiency of an automotive alternator by replacing mild steel into aluminum as a material for rotor. Materials Today: Proceedings **37**, 1269–1273 (2021)
[Google Scholar](#)
6. Devotta, S., Padalkar, A. S., Sane, N.K.: Performance assessment of HC-290 as a drop-in substitute to HCFC-22 in a window air conditioner. Int. J. Refrig. **28**(4), 594–604 (2005). <https://doi.org/10.1016/j.ijrefrig.2004.09.013>
7. Hwang, Y., Gado, A., Radermacher, R.: Performance comparison of hydrocarbons R-290 with R-22 in residential heat pump system. Proceedings of IIR/IIF Commission B, **1**, p. B2
8. Shende, S.M.: Design of cold storage. International Research Journal of Engineering and Technology **5**, 262–265 (2018)
9. Rogala, Z.: Composition optimization method for mixed refrigerant MRJT cryo cooler. Cryogenics. **113**, (2021). <https://doi.org/10.1016/j.cryogenics.2020.103223>

10. Karthik, G., Parthiban, A., Sasikumar, C., Krishnan, B.R.: Experimental investigation on split type window Air conditioner using HFC and HC mixture as ecofriendly refrigerant alternate to HCFC-22. E3S Web of Conferences **399**, 06004 (2023)

[Article](#) [Google Scholar](#)

11. Maduwanthi SDT, Marapana RAUJ (2019) Induced Ripening Agents and Their Effect on Fruit Quality of Banana Hindawi. Int J Food Sci Volume 2019, Article ID 2520179, 8 pages <https://doi.org/10.1155/2019/2520179>
12. Mukund Joshi, Aniket Choudhari, Omkar Dixit, Mayuri Yadav V.N.: Raibhole Design, development and analysis of onion cold storage system. AIP Conf. Proc. **2469**, 020005 (2022). <https://doi.org/10.1063/5.0080344>
13. Wang, Y., et al.: The effective refrigeration temperature zone expressed by partial molar enthalpy difference of each component in mixed-refrigerant Joule-Thomson refrigerators. Cryogenics **128**, (2022). <https://doi.org/10.1016/j.cryogenics.2022.103590>
14. Baskar, S., Senthil Kumar, D., Dhinakaran, R., Prabhakaran, A., Arun, B., Shanmugam, Mohanraj: Experimental studies on mechanical and morphological property of the natural and SBR/BR hybrid rubber. Materials Today: Proceedings **37**, 1503–1506 (2021)

[Google Scholar](#)

15. Bi, Y., et al.: Conceptual design and optimization of a novel hydrogen liquefaction process based on helium expansion cycle integrating with mixed refrigerant precooling. Int J Hydrog Energy **47**, 16949–16963 (2022). <https://doi.org/10.1016/j.ijhydene.2022.03.202>

[Article](#) [MATH](#) [Google Scholar](#)

Acknowledgements

The author thanks the management of Vels institute of science, Technology and Advanced Studies, for giving their extended support to complete the work.

Author information

Authors and Affiliations

Department of Mechanical Engineering, Vels Institute of Science Technology & Advanced Studies, Chennai, Tamil Nadu, India

Ganapathi karthik & A. Parthiban

Department of Mechanical Engineering, Saveetha School of engineering SIMATS, Chennai, Tamil Nadu, India

T. Sathish

Department of Mechanical Engineering, Yeshwantrao chavan College of Engineering, Nagpur, Maharashtra, India

Jayant Giri

Contributions

GK and AP contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

T.S and G.J wrote the paper with input from all authors.

Corresponding author

Correspondence to [A. Parthiban](#).

Ethics declarations

Competing interests

The authors declare no competing interests.

Ethics approval

Not applicable

Consent to participate

Not applicable

Consent to Publications

Not applicable

Conflict of interest

The author declare no competing interests.

Additional information

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Rights and permissions

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.

[Reprints and permissions](#)

About this article

Cite this article

karthik, G., Parthiban, A., Sathish, T. *et al.* Experimental analysis and development of fuzzy model for the prediction of COP and mass flow rate in air-conditioning system. *Interactions* **245**, 134 (2024). <https://doi.org/10.1007/s10751-024-01979-x>

Accepted

26 June 2024

Published

05 July 2024

DOI

<https://doi.org/10.1007/s10751-024-01979-x>

Keywords

[Air-Conditioning](#)

[COP](#)

[Mass Flow Rate](#)

[Fuzzy logic](#)