

Performance Analysis of Desiccant Dehumidifier using ANSYS Fluent

Tejas Prajapati¹, Dr. K.K. Bhabhor², D.B. Jani³

Student, Department of Mechanical Engineering (CAD\CAM)¹

Department of Mechanical & Industrial Engineering^{2,3}

Government Engineering College, Dahod, India

prajpatitejesh@gmail.com¹, kiranmech12@gmail.com², dbjani@rediffmail.com³

Abstract: Traditional cooling systems based on vapor compression are ineffective in humid climates due to their inability to remove moisture below the dew point of the conditioned air, which involves additional effort in the form of an electrical power supply to run vapor compressors. A solid desiccant cooling system reduces power usage while simultaneously providing fresh and clean air. It is important to examine and analyze the performance of desiccant dehumidifiers using the Honeycomb pattern in the desiccant wheel that will help to develop a more efficient cooling system. The Ansys (CFD Analysis) software was used to predict the results of a dehumidifier. The blocks were made of Zeolite 13X with a honeycomb geometry. The present study focuses on the effect of the desiccant wheel on the system. Two different process air temperatures of 27.9 °C, 33.4 °C with Relative humidity of 85% and 70 % respectively, were investigated under constant regeneration air temperature of 70°C and 0.5-4 m/s inlet air velocity. As a result, CFD simulation techniques aid in saving to avoid the cost and time.

Keywords: Dehumidifier; desiccant materials; solid desiccant cooling; Computational fluid dynamics (CFD), CFD technique.

REFERENCES:

- [1]. Bhabhor, K. K., & Jani, D. B. (2021). Performance analysis of desiccant dehumidifier with different channel geometry using CFD. *Journal of Building Engineering*, 44. <https://doi.org/10.1016/j.jobee.2021.103021>
- [2]. Halid, H., Hafiz, A. P., Sankar, S. R., & Professor, A. (n.d.). Experimental Analysis of Solid Desiccant Wheel Dehumidifier. *International Journal of Research in Mechanical Engineering*, 4, 104–109. www.iaster.com
- [3]. Rambhad, K., Jondhale, P., Kambale, R., Jedhe, V., & Thakare, K. (2021). CFD Analysis of Solid Desiccant Dehumidifier Wheel. *Article in International Journal of Analytical Experimental and Finite Element Analysis*, 8(1), 12–20. <https://doi.org/10.26706/ijaefea.1.8.20210302>