

A Review on Machine Learning Applications in Vapor Compression Refrigeration (VCR) Systems

Arun Solanki
arunsolanki450@gmail.com

Khemraj Beragi
khemrajberagi@gmail.com

Abstract – The increasing demand for energy-efficient systems in various industrial and commercial applications has prompted a surge in the development of smart technologies, particularly in the field of Vapor Compression Refrigeration (VCR). Machine learning (ML), when integrated with Internet of Things (IoT) technology, is revolutionizing the optimization of VCR systems, enhancing energy efficiency, predictive maintenance, and fault detection. This paper reviews recent advancements in ML applications for VCR systems, emphasizing real-time system optimization, energy consumption reduction, and autonomous operational strategies. By leveraging ML techniques such as supervised learning, reinforcement learning, and deep learning, VCR systems can dynamically adapt to environmental fluctuations, improve system performance, and reduce operational costs. Furthermore, the integration of IoT sensors facilitates continuous data collection, providing valuable insights into system behavior and enabling predictive maintenance. The paper also explores the future of autonomous VCR systems, where machine learning algorithms will control and optimize system parameters in real time. This paper concludes that the ongoing advancements in ML and IoT integration will continue to drive the evolution of VCR systems, leading to more sustainable, energy-efficient, and reliable refrigeration solutions.

Keywords – Artificial Neural Networks, Compressor Control, Deep Learning, Energy Efficiency, Fault Detection, Machine Learning, Reinforcement Learning, Vapor Compression Refrigeration.