

## **Mechanism for improvement in refrigeration system performance by using nanorefrigerants and nanolubricants - A review**

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### **ABSTRACT**

In order to improve the refrigeration system performance, researchers are introduced nanorefrigerants and nanolubricants in the recent development of HVAC system. However, the explanations of the nanoparticles contribution on the basis physical phenomena which affecting the vapor compression refrigeration system (VCRS) are limited in the literature. Hence, this paper presents a review on mechanism for improvement in VCRS performance by using nanorefrigerants and nanolubricants. The heat transfer augmentation, the refinement of refrigerant-oil mixture characteristic, and the tribology properties enhancement are among the major mechanisms that affect the VCRS performance. The performance parameters of VCRS such as compressor work and COP of refrigeration system using nanorefrigerants and nanolubricants have been discussed to relate between the mechanisms with overall system performance. The results showed that the utilization of nanorefrigerants and nanolubricants in the system was increased the heat transfer coefficients from 12 to 101% and the thermal conductivity enhancement for up to 4%. The solubility and miscibility of refrigerant-oil mixture with nanoparticles additives was enhanced for up to 12% although some reported that it was remained unchanged. The nanolubricants were behaved better tribology characteristics with 32% and 13% reduction of friction coefficient and wear rate, respectively. The effect of nanorefrigerants and nanolubricants on heat transfer, refrigerant-oil mixture and tribology had increased the overall performance of VCRS with 11% compressor work reduction and 24% of COP enhancement. Therefore, the nanorefrigerants and nanolubricants are expected to become the best candidate towards improving the efficiency of the VCRS.

**Keywords:** Nanorefrigerants; Nanolubricants; Cooling capacity; Heat absorb; Compressor work; Coefficient of performance