

SAFETY ANALYSIS OF HYDROCARBON REFRIGERANTS USED IN REFRIGERATORS AND AIR CONDITIONERS

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Abstract

Hydro chlorofluorocarbons and hydro fluorocarbons are the most common refrigerants currently using in refrigerators and air conditioners. Due to ozone depletion and global warming potential hydro chlorofluorocarbons (HCFC) was scheduled to be phased out and HFCs future as replacement for chlorofluorocarbons (CFC) and HFCs are not certain. These environmental issues have led to consideration of hydrocarbon as alternative. Hydrocarbons have several positive characteristics such as zero global warming potential (GWP), very low ozone depletion potential (ODP), no toxicity and high miscibility with oil, but the main disadvantage is their flammability. This project addresses the various safety issues associated with hydrocarbons as refrigerants. This includes flammability analysis of hydrocarbon blends, finding the potential ignition sources, analysing the hydrocarbon dispersion in room. This study developed a leakage model of flammable refrigerants into an air conditioned room where influencing factor for concentration distribution of flammable gas are leakage rate and ventilation. Propane is selected as refrigerant to study the influencing factors of propane gas distribution in room. A computational fluid dynamics has been used for concentration analysis. Concentration profile of air propane mixture in three dimensional space is computed and obtained concentration profile is compared with flammability limits to analyse the risk of flammability. It is found that the possibility of refrigerant existing within the flammable range is limited only to the region close to leakage point and ceiling of the room.

Keywords: refrigerants, ODP and GWP, safety, hazard, hydrocarbon blends, propane, flammability, computational fluid dynamics.