

PERFORMANCE PREDICTION OF VAPOUR COMPRESSION REFRIGERATION SYSTEMS RETROFITTED WITH NON-CFC ALTERNATIVES

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Chlorine based refrigerants (CFC) used in the refrigeration and air conditioning (RAC) industry are to be completely phased out from the developing countries in a few decades. Most of the currently available alternatives are either hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC). However, it is not always possible to find exact *drop-in* replacements for all the CFCs to be phased out, to match all the RAC applications. Thus, complete phasing out of CFC would mean discarding a large number of existing RAC installations in favour of new systems designed for HFCs or HCFCs.

Driven by financial consideration rather than environmental concern, retrofit of existing CFC based RAC systems with alternative refrigerants are being explored globally. Although there is no guarantee that all these attempts would be successful, there are no rules of thumb that predict the outcome of a retrofit exercise. The success of a system retrofit largely depends on the thermal-physical properties of the two refrigerants, original design and the load pattern. Therefore, for a given system, it is difficult to draw general conclusions on the outcome of a retrofit exercise without an in-depth performance analysis.

This paper briefly describes the development of a software tool to predict the likely outcome of a retrofit exercise. Different water-to-water or, air-to-air systems can be analysed using the presented approach. One important feature of the model is that potential for retrofitting a RAC system designed for a CFC could be explored with any alternative refrigerant available in the market. Mass, energy and momentum conservations of the given system form the basis for developing the model.

To demonstrate the application of the model, an analysis of a typical retrofit exercise is presented; potential for retrofitting an existing air-cooled R12 (CFC) chiller plant with R134a (HFC) is looked into. The analysis shows that for the selected chiller system R134a makes a suitable alternative refrigerant for retrofitting. However, for optimum system performances, certain hardware changes are suggested.