# Engineering Refrigerants

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## Abstract

This study proposes the use of product design in the development of new refrigerants. Product design involves the use of consumer preference functions as described by Bagajewicz (2007). Consumer preference functions relate the satisfaction of consumers to different refrigerants based on their properties. The properties examined in this study were toxicity, flammability, explosion potential, global warming potential, ozone depletion potential and efficiency.

The method used to solve for new refrigerants was achieved using an iterative method based on group contribution theory. A detailed discussion of group contribution theory and the possible refrigerants generated is presented. The refrigerants were then ranked based on their efficiency estimated as $\Delta H_{ve}/C_p$, as presented by Sahinidis (2003). After completion of this, the new refrigerants were ranked using consumer preferences. The ranking system was drastically altered by the use of consumer preference functions. This is indicative of advantages to using a different object function when ranking possible refrigerants.

Another estimation performed in this study was the market potential. The target market was the automotive market because it offers high volumes of sales. The market potential was estimated to be 14.2 thousand metric tons of refrigerant need per year. This indicates that an alternative refrigerant will have the potential to generate high profits as the industry standard R-134a is phased out.