

An Automated System for Calculating the Risk and Ecological Damage of Refrigerants

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The application software "EcoRef" is a multi-criterion analysis tool designed for determining ecological properties of refrigerants, and it is an integrated database of over 150 pure refrigerants and mixtures. An assessment model of the ecological risks and dangers of refrigerants, based on an additive factor and priori-and-posteriori models, was developed. The given approach provides a control over the direct and indirect factors of global and local risk. The ecological risk and danger criteria are calculated depending on the thermophysical properties and chemical structure of the substance. The database contains reliable data about well-known indicators of ecological damage, such as the ozone depleting potential, global warming potential, toxic danger coefficient, and flammability. Also, new indicators are formed according to multicriterion problems. The evaluation of refrigerant danger based on the hierarchical structure of ecological goals, changing priorities, and preferences, is particular to this proposed model. It has been shown that the dynamics of priorities change the evaluation of calculated ecological danger for most modern refrigerants by about 40 %, and create the conditions necessary for the choice of a usable alternative for substitution of unacceptable refrigerants. The estimated risk assessments of refrigerants are presented as graphics, figures, and tables. The results of this paper contain recommendations for the choice of preferable refrigerants for different types of refrigerating systems. Use of the database "EcoRef" will improve ecological risk assessments, and will make the choice of substitutes more cost effective.