

Low Global Warming Working Fluids - The Frying Pan Or The Fire

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The fluorocarbon industry has undergone significant but successful product transitions from chlorofluorocarbons (CFCs) to hydrochlorofluorocarbons (HCFCs) to hydrofluorocarbons (HFCs) over the past 20 years. Today, HFCs are under regulatory pressure as the issue of climate change and greenhouse gas emission grows in significance. Though HFCs are potent greenhouse gases on a per kilogram emission basis, the projected radiative forcing from HFCs still represents only a small percentage of the radiative forcing attributable to the major greenhouse gases, CO₂, N₂O and CH₄. Nevertheless, industry is searching for low global warming substitutes for HFCs.

Molecular constraints imposed on HFC alternatives by environmental requirements and end use performance requirements limit the number of replacement options. The leading low global warming HFC alternatives under consideration by the refrigeration, air conditioning and foam insulation industries are summarized, including new low global warming potential fluorochemical materials such as 2,3,3,3-tetrafluoropropene (1234yf) and trans-1,3,3,3-tetrafluoropropene (1234ze E).

Selection of the best environmental solution not only depends on the greenhouse gas potency of the material itself, but it also depends on the energy efficiency of the system over the expected life of the system. An energy inefficient system employing a low global warming potential working fluid may actually increase carbon emissions due to increased fossil fuel usage. One measure of the total environmental footprint is life cycle climate performance or LCCP. The LCCP of various low global warming alternatives to HFCs is discussed in this presentation. These results emphasize the importance of analyzing the total environmental footprint of proposed HFC alternatives so that selection of an inappropriate technology does not exacerbate green house gas emissions.