COMMERCIAL AIR CONDITIONING

SOCIETAL IMPORTANCE

As the world's growing population dictates the development of all geographic climates, commercial air conditioning has become essential for health and comfort, worker productivity and economic vitality. The economies of many countries throughout the world are directly tied to an ability to cool the air in commercial buildings. Commercial air conditioning is used in stores, restaurants, schools, offices, hotels, long-term care facilities, hospitals, and other public places. Even in mild climates, commercial air conditioning has become a requirement to maintain health, productivity, and comfort.

Critical Application Considerations

The commercial air conditioning sector spans a broad range of applications running from small commercial package units (air and water source) to larger air source package units. Air-cooled and water-cooled chillers using scroll, screw, and centrifugal compressors in cooling and heat pump modes are very common. This broad range of equipment has traditionally driven multiple refrigerant solutions from high pressure (scroll compressor applications) to medium pressure (screw and centrifugal compressor applications) to low pressure (centrifugal compressor applications) solutions. **Challenges include balancing a simultaneous need for reducing size and cost while maximizing energy efficiency.** Historically, tradeoffs have been made and continue to be identified when looking for alternatives to existing HCFCs and higher GWP HFCs. The service industry is accustomed to servicing different types of refrigerants. Therefore, it can accept multiple refrigerants across this portfolio. In addition, larger charge sizes for this segment are more suitable for refrigerant recovery.

Environmental Considerations

Since commercial air conditioning equipment uses a significant amount of energy, environmental concerns include but go beyond the direct environmental impacts of the fluid on the climate. **These aspects are important, but the indirect impact that energy efficiency can have on climate change is the dominant effect.** For example, heat pumps provide more heating energy than they use, unlike conventional direct heating systems. **When considering a Life Cycle Climate Performance (LCCP) measurement that takes into account both direct and indirect impacts, one finds that the indirect impact represents 80-95% of the total climate change impact across this sector**.

Leak rates can also have an impact on the direct ozone layer and climate impacts. Therefore refrigerant technology that can help minimize refrigerant emissions is also a key consideration. On a related basis, end-of-life recovery and reclamation processes are an important means towards responsible refrigerant handling. Safety is an important attribute that must also be considered when looking at a balanced environmental solution. Given the larger charge sizes associated with equipment in this sector, and the fact that refrigerant is commonly circulated through the occupied space, hydrocarbons have seen very limited use given their high flammability.

Technology Trends

After HCFCs are no longer available, HFCs, widely used in equipment today, offer a proven, safe, and energy efficient solution for commercial air conditioning in a wide range of equipment from small room air conditioners to multi-split variable refrigerant flow (VRF) systems, to large chillers. HFCs provide efficient cooling in both existing and new equipment. But the policy pressures on high GWP compounds mandate a balanced approach. Considerations such as safety, energy efficiency, ozone depletion and GWP are even more important and should guide choices for retaining appropriate HFCs and selecting alternatives. **There is active development of new fluids and blends that offer significant reductions in GWP but can also be energy efficient, such as HFO-1234ze(E) and HFO-1234yf** which was initially designed for the mobile air conditioning application but has operating pressures and capacity similar to HFC-134a. In addition, HFC-32, which comprises 50% of the blend HFC-410A, is being reconsidered based on its good energy efficiency and capacity and its 67% lower GWP when used with scroll chillers. Some of the new HFOs, HFC-32, and ammonia are mildly flammable which requires safety standards to be re-examined to drive appropriate use of these new fluids. **While the next generation solutions are not yet identified, the Alliance principles can help guide the work to select the eventual alternatives.**

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The Alliance is an industry coalition that was organized in 1980 to address the issue of stratospheric ozone depletion. It is presently composed of about 100 manufacturers and businesses which rely on HCFCs and HFCs.

Today, the Alliance is a leading industry voice that coordinates industry participation in the development of international and U.S. government policies regarding ozone protection and climate change.