Hot new stuff in cooling business

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IN MANY PLACES such as Hong Kong, scorching summers mean that one can hardly survive without air-conditioners.

In India and China alone there has been a sales increase of 20 percent year-on-year. In 2011, buildings in China accounted for about 70 percent of the world's household air-conditioning units.

Air-conditioners use refrigerants that absorb and release heat efficiently at the right temperatures.

They are also key to refrigeration. Unfortunately, refrigerants can cause serious harm when released into the atmosphere.

Refrigerants such as chlorofluorocarbons harm the stratospheric ozone layer.

Even though new refrigerant – such as R410A (which contains only fluorine) – is widely used because it does not contribute to ozone depletion, it still has a high potential to contribute toward global warming. In fact there are no refrigerants that do not harm the environment.

Air-con compressors contribute to more than 50 percent of electricity use in the residential and office segments. The compressor increases the pressure of the refrigerant in the unit and accounts for more than 80 percent of the power used. So power consumption for running an air-con is very high, leading to huge electricity bills in summer.

An environmentally-friendly and power-saving cooling system using adsorption technology has recently been developed by the department of mechanical engineering of the Hong Kong University of Science and Technology. It does not use traditional refrigerants and compressors.

The adsorption cooling system offers game-changing technology because it can produce cool air using renewable energy, such as solar energy or waste heat. With these major energy sources being free of charge, this technology can cut a typical cooling bill by up to 80 percent.

Current cooling technologies are polluting, but adsorption cooling technology eliminates the use of compressors and refrigerants.

It benefits users and the environment as it uses a solid adsorbent to replace the compressor cycle while the solar energy or waste heat carries out the desorption function in the thermodynamic cycle.

A novel adsorbent material can be coupled with a nanofluid in the operation.

It is a composite material which can adsorb more water vapor than traditional materials – such as activated carbon or silica gel – leading to a higher cooling performance.

In addition, nanofluids – produced by dispersing nanoparticles into conventional heat transfer fluids such as water, glycol or oil – have been proposed to work as highly efficient heat exchange media with various superior properties. Thus they are thought to be the next-generation heat transfer fluids and can be used as a new refrigerant in adsorption cooling systems.

This new refrigerant does not contribute to ozone depletion or global warming. And by combining the new composite material with the nanofluid, the cooling performance of adsorption cooling systems can be further enhanced.

Using these advanced composite materials and nanofluids for the adsorption cooling systems means saving money, saving energy and protecting the environment.

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