

GE to take next leap in magnetocaloric refrigeration (w/ video)

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Lead Engineer Michael Benedict (left) and Venkat Venkatakrishnan (right), Director of Advanced Technologies, work in GE Appliances' labs on magnetocaloric refrigeration technology that can replace traditional compressors used in refrigerators for the last 100 years. Credit: GE

(Phys.org) —Before the microwave gained fame as a kitchen wonder, there was the, gasp, refrigerator, a kitchen wonder that could freeze meat and keep ice cream from melting on top, while preserving the life of leftovers and milk, juice and eggs below. For Americans, GE became an entrenched brand name in owning the modern fridge. Now GE wants to write the second chapter in home refrigeration. This week GE announced its research focus on magnetic (magnetocaloric) refrigeration, which uses no refrigerants or compressors and is 20 percent more efficient than what is used today. The technique involves the use of a water-based fluid and magnets. Rotating magnets change the magnetic field back and forth and pump water-based cooling fluid between the cold side to the hot side.

"This is a big deal," said Venkat Venkatakrishnan, a leader of the research team. "We are on the cusp

of the next [refrigeration](#) revolution." GE said the technology could be at work inside the fridge by the end of the decade; the company expects to commercialize their magnetic refrigeration technology by 2020.

One key benefit being touted is efficiency. In figuring out how to create the cold without chemical refrigerants or compression, Venkatakrishnan said the technology carries greater efficiency. Also, "because the technology does not contain traditional refrigerants, recycling refrigerators at end of life will be easier and less costly."

Specifically, the system uses a water-based fluid rather than a chemical refrigerant such as Freon to transfer heat from inside the refrigerator and achieve the cooling process. In place of the compressor, magnets create a [magnetic field](#), said a GE report, that "agitates particles in the fluid causing it to cool. The strength of the magnetic fields determines how cold the fluid becomes, and in turn, how quickly it cools the refrigerator."

(Their technology takes advantage of an old [discovery](#), the magnetocaloric effect. In the 1880s, German physicist Emil Warburg observed that certain metals would heat up near magnets and cool down when taken away.)

The team's materials scientists developed a type of nickel-manganese alloys for magnets that function at room temperatures. Engineers arranged the magnets in a series of 50 cooling stages. Today they are capable of reducing temperature by 80 degrees. The team aims to achieve a 100-degree drop in temperature at low power. "We are focusing on magnetic refrigeration as a potential replacement for all the refrigeration technologies currently in use," said Michael Benedict, lead engineer for GE Appliances' magnetocaloric project.

According to GE, the technology can be applied to

other heat pump applications such as HVAC and has the potential to impact nearly 60 percent of the average US household's energy consumption.

More information: [Press release](#)

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