



Roving Comforter (RoCo) – A Personal Cooling and Heating Device

RoCo is a Roving Personal Comforter, a device that provides ultimate personal thermal management for individuals in inadequately or even un-conditioned environments (see Figure 1 and Figure 2). It provides 12% to 30% energy savings compared with typical conditioned buildings and better thermal and mobile comfort to occupants.

RoCo is equipped with unmatched comfort technology:

1. Robotic platform: the robotic platform enables RoCo to follow one or multiple designated occupants and provides cooling/heating as required using technologies such as directional Wi-Fi from wearable device or RF. The advanced module is fully autonomous and equipped with face recognition technology to allow add-on features such as security access check and mobile personal toolbox.

2. Intelligent nozzles: RoCo's intelligent nozzle(s) will smartly deliver conditioned air to parts of the body needing it most. Thermal comfort studies reveal various parts of the body have different sensitivity levels for thermal sensation. RoCo ensures you get most cooling/heating where you need most through flexible

nozzles that not only adjust supply air locations, but also supply air conditions. The high-end module will save personal preference data such as air temperature and velocity for different human metabolic rates. RoCo knows your thermal requirements better than anyone else.

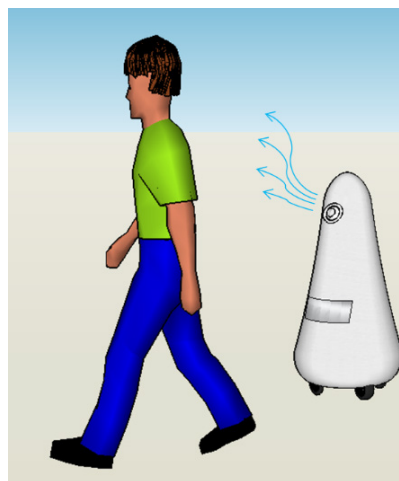


Figure 1: RoCo in operation following an occupant

3. Highly efficient thermal management module: the heart of this personal cooling/heating device is the next generation miniature heat pump system with built-in PCM storage. Benefitting from linear mini-compressor and next generation air-to-refrigerant heat exchangers, the system delivers cooling and heating at minimum power consumption without releasing waste heat. It is 30 percent more efficient than conventional residential or commercial heat pump systems which significantly cuts utility bills.



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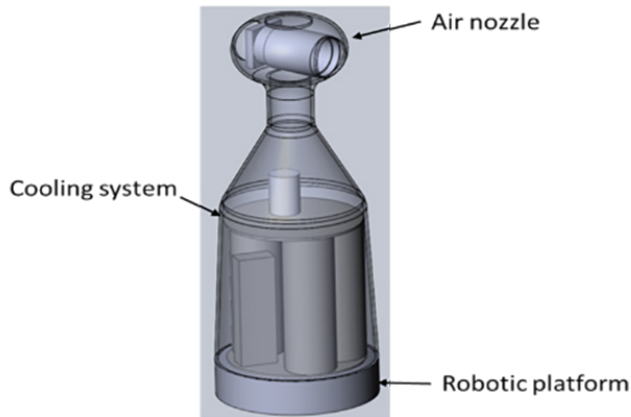


Figure 2: 3D drawing of an early RoCo prototype

RoCo research is sponsored by Advanced Research Projects Agency-Energy (ARPA-E) through a three-year contract. University of Maryland investigates performance in terms of comfort, energy efficiency, operating characteristics, ease of use and customer acceptance taking advantage of an open innovation platform.

There are different implementations of the device and many versions and features are currently being investigated. Figure 3 shows the energy savings from RoCo at different climate conditions. The first prototype comes as early as the beginning of 2016 and will be show-cased on ARPA-E Energy Innovation Summit at National Harbor, MD between Feb. 29-Mar. 2, 2016.

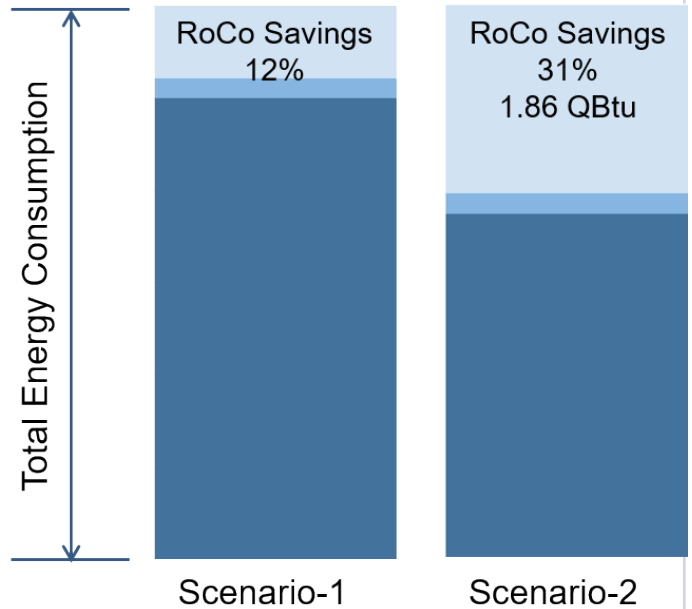


Figure 3: RoCo energy savings from expanded set-points for the same thermal comfort at different climates

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