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Heat exchanger technology and applications: Ground-source heat pump system for buildings heating and cooling**Abdeen M. Omer***Research Institute (ERI), UK*

Over the years, all parts of a commercial refrigerator, such as the compressor, heat exchangers, refrigerant, and packaging, have been improved considerably due to the extensive research and development efforts carried out by academia and industry. However, the achieved and anticipated improvement in conventional refrigeration technology are incremental since this technology is already nearing its fundamental limit of energy efficiency is described as 'magnetic refrigeration' which is an evolving cooling technology. The word 'green' designates more than a colour. It is a way of life, one that is becoming more and more common throughout the world. An interesting topic on 'sustainable technologies for a greener world' details about what each technology is and how it achieves green goals. Recently, conventional chillers using absorption technology consume energy for hot water generator but absorption chillers carry no energy saving. With the aim of providing a single point solution for this dual purpose application, a product is launched but can provide simultaneous chilling and heating using its vapour absorption technology with 40% saving in heating energy. Using energy efficiency and managing customer energy use has become an integral and valuable exercise. The reason for this is green technology helps to sustain life on earth. This not only applies to humans but to plants, animals and the rest of the ecosystem. Energy prices and consumption will always be on an upward trajectory. In fact, energy costs have steadily risen over last decade and are expected to carry on doing so as consumption grows. Refrigerants such as hydrochlorofluorocarbons (HCFCs) are present in the ground source heat pump (GSHP) systems and can pose a threat to the environment through being toxic, flammable or having a high global warming potential. However, new types and blends of refrigerant with minimal negative impacts are being developed. A correctly fitted system will also greatly reduce the potential for leakage, which is why using a professional installer is highly recommended. Significant CO₂ savings can be gained by displacing fossil fuels. Even compared to the most efficient gas or oil condensing boilers, a well-designed heat pump with COP of 3-4 will reduce emissions by 30-35%. Further carbon savings can be made if the electricity used to power the pump comes from a renewable energy source such as photovoltaic or a renewable electricity tariff. Also, measures can be taken to reduce the impact of pollution from using grid electricity generated through fossil fuel. For example, one can purchase dual tariff green electricity from a number of suppliers. However, even if ordinary grid electricity is used to run the compressor, the system will still produce less CO₂ emissions than even the most efficient condensing gas or oil boiler with the same output. The term "vapour compression refrigeration" is somewhat of a misnomer, it would be more accurately described as 'vapour suction refrigeration'. Vapour compression is used to reclaim the refrigerant and is more aptly applied to heat pumps. Vapour compression refrigeration exploits the fact that the boiling temperature of a liquid is intimately tied to its pressure. Generally, when the pressure on a liquid is raised its boiling (and condensing) temperature rises, and vice-versa. This is known as the saturation pressure-temperature relationship.

Biography

Abdeen Mustafa Omer (BSc, MSc, PhD) is an Associate Researcher at Energy Research Institute (ERI). He obtained both his PhD degree in the Built Environment and Master of Philosophy degree in Renewable Energy Technologies from the University of Nottingham. He is qualified Mechanical Engineer with a proven track record within the water industry and renewable energy technologies. He has been graduated from University of El Menoufia, Egypt, BSc in Mechanical Engineering. His previous experience involved being a member of the research team at the National Council for Research/Energy Research Institute in Sudan and working director of research and development for National Water Equipment Manufacturing Co. Ltd., Sudan. He has been listed in the book WHO'S WHO in the World 2005, 2006, 2007 and 2010. He has published over 300 papers in peer-reviewed journals, 200 review articles, 15 books and 150 chapters in books.