

The power of hot water tanks

Hot water tanks use a lot of energy, and many of them are operated inefficiently. Dr McCulloch has developed a sensor to detect and convey the level of hot water in a tank and thus improve operation and enable effective energy storage.



As renewable energy sources increase their share of energy output, energy storage and energy efficiency are going to become more important. This is particularly true of wind energy. Wind farms are able to produce significant amounts of energy, but the amount of energy that they create is highly variable and cannot be controlled.

The energy industry has traditionally adjusted supply to match demand. With substantial wind energy, demand will have to be matched to meet supply, according to Dr Malcolm McCulloch, University Lecturer in Engineering Science. A large amount of energy is used for central heating, refrigeration and hot water tanks. Dr McCulloch is interested in how energy can be stored and regulated in these three domains. His current focus is on hot water tanks, beginning with their use in homes.

Current hot water tanks operate inefficiently because they are unable to show the user how much hot water is available. Many users therefore use the 'boost' option to ensure they don't run out of hot water during a shower. Often this boost is unnecessary and wastes energy.

The solution to this problem is to fix a sensor to the tank that will indicate how much hot water it has. Dr McCulloch and a doctoral student, Peter Armstrong, have developed such a sensor which is now under trial in a number of homes. The sensor works by recording the hot water level and therefore its volume. This is made possible because hot water is lighter and rests on top of the cold water. There is actually a fine boundary between the cold and hot water called a thermocline. This line remains

intact until the tank is almost full of cold water.

The sensor is still at the prototype stage, but a number of companies have shown interest in its commercialisation.

It will prove to be particularly useful when novel energy tariffs are introduced over the next three to five years. Energy users will have a smart meter showing the different tariffs for different times of the day, so they will be able to decide when to switch on their appliances in order to minimise their costs. By varying the tariff, energy companies will be able to regulate demand. Consumers who have had a sensor fitted to their hot water tank will be able to use the energy in their tank much more efficiently and better regulate their demand. Therefore both energy providers and consumers will benefit from this sensor.

The next development for Dr McCulloch and Peter Armstrong will be to create a sensor for large-scale thermal stores.



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